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EXPLANATORY NOTE

Illustrated articles are marked with an asterisk (*). New shop equipment as described in the departments "Shop Equipment News" and "Condensed Clipping Index of Equipment" with a double dagger (‡). Cross references to a particular initial work may apply also to its derivatives. The cross references condense the matter and assist the reader but are not to be regarded as complete or conclusive. So if there were a reference from "Milling" to "Jigs and Fixtures," and if the searcher failed to find the required article under the latter topic, he should look through the "Milling" entries, or others that the subject might suggest, as he would have done had there been no cross reference. The plural of any given item may not necessarily follow the singular immediately, as the items are listed in alphabetical order. All articles written by any given author are listed directly under his name in the special authors' index which starts on page 15. Articles that are not credited to any author may be found under the heading "No author," listed under "N" in the Authors' Index.

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Development of Machine Tools in New England

By GUY HUBBARD

The first of a series of articles—Original settlers men of mechanical ability—Difficulty of transportation—Genealogy of some famous establishments

WHILE much has been written about the history of American machine tools but little has been told about how and why they came into being and of the early efforts of the tool builders to establish interchangeable manufacture.

The State of Vermont, and more especially the town of Windsor and the region contiguous thereto, has had a very large part in the development of American machine tools. That Yankee ingenuity was responsible, not only for much of our automatic machinery but for our system of interchangeable manufacture as well, will be evidenced by the series of articles begun in this issue.

The articles have been prepared by Guy Hubbard, a native of Vermont and a great-nephew of Asahel Hubbard who was connected with the concern that, more than any other, was responsible for the early development of American machine tools and the interchangeable system.

While, no doubt, the work undertaken by Mr. Hubbard has been a labor of love on his part, he is to be congratulated on the results of his untiring energy in bringing to light facts, some of which were hidden in old records, while others existed only in the memories of descendents of the early mechanics.

FAR DISTANT from other centers of production, and from the sources of raw material; with apparent disadvantages of transportation and with no apparent advantages in regard to labor—the village of Windsor (see Fig. 1) seems to have been for years guilty of deliberately violating the laws of economics. Not only is this village in the upper valley of the Connecticut, notable today in the engineering field for its automatic machinery, but the surrounding region has enjoyed more than a century of remarkable history in invention and mechanics. The importance of this history may be realized by considering Professor Joseph W. Roe's "English and American Tool Builders." This broad work covers the development of machine tools from the boring of Watt's first steam-engine cylinder by Smeaton at the Carron Iron Works in 1769, down to the production tools in use in 1915; yet not only is a full chapter devoted to the Windsor industries, but elsewhere in the book numerous references are made to the mechanical developments emanating from the neighborhood of this Vermont village. While we must admit that England, with her Maudslay, her Clement, her Nasmyth and her Whitworth, was the birthplace of the machine-tool industry, it cannot be denied that New England, the birthplace of mechanics whose names will ever be remembered by engineers, gave to the world the interchangeable, or American system of manufacture, won leadership both in the refinement of the older machine tools and in the creation of new ones. This statement will be better appreciated by a study of the genealogical chart shown in Fig. 2 and the map in Fig. 3.

While dealing primarily with the apparently narrow subject of the industries of a country village, the story is not one of mere local interest but one of the developments of American manufacturers, giving some of the history of such industries and inventive mechanics whose influence has spread far beyond the shadow of Mount Ascutney to further industrial progress, not only in America but beyond the seas. For instance, New Haven had the famous gunsmith and inventor, Eli Whitney, but Windsor trained Benjamin Tyler Henry, who developed the Winchester rifle at New Haven; while it is true that Hartford had Col. Samuel Colt, yet from Windsor came Richard S. Lawrence, who became its leading manufacturer; Providence had Joseph R. Brown, but Windsor gave Frederick W. Howe to Providence where he succeeded Mr. Brown as a leading mechanical engineer.

In August 1764, the first settler of Windsor, Captain Steele Smith, removed with his family from Farmington in the mechanical colony of Connecticut and made his home in the Vermont hills.

Shortly after the settlement of the town two dams about two hundred yards apart were built near the

GENEALOGY OF THE MACHINE INDUSTRIES OF WINDSOR, VERMONT

Compiled by Geo. Hubbard, Windsor, Vermont, 1922.

SOURCES

As name WINDSOR indicates, many of the early settlers were CONNECTICUT YANKEES from the HARTFORD DISTRICT.

TINMOUTH IRON WORKS (Near Rutland, Vt.), 1785-1870.
WINDSOR & PLYMOUTH, ASCUTNEY IRON CO., 1836-1872.
Tyson's Furnace, Plymouth, Vt.
Isaac Tyson, Jr. Builder and Proprietor. (Well known Baltimore Chemist and Manager of Copperas Works at Strafford, Vt.)
Francis Draper.....Superintendent of Furnace

DEWITT CLINTON was Governor of New York and builder of the Erie Canal. He came to Windsor, Vt., in 1827 to assist in the Connecticut River Project, and at that time became interested in the Rotary Pump.
CAPTAIN SAMUEL MOREY, born at Hebron, Conn., in 1762, built and operated on the Connecticut River near Fairlee, Vt., a successful Steamboat in 1793.
THOMAS BLANCHARD, born at Sutton, Mass., in 1788, was inventor of Gunstock Lathe. In 1829, he built at Springfield, Mass., the steamboat "Vermont" and in the fall of that year navigated it from Hartford, Conn., to Windsor, Vt., for the Conn. River Valley Steamboat Co.

JOHN M. COOPER was an inventor from Guildhall, Vt.
ASAHEL HUBBARD, born at Meriden, Conn., in 1787, came to Windsor, Vt., in 1800, and learned trade there.
JABEZ PROCTOR was a Mill Owner of Proctorsville, Vt.
NICANOR KENDALL, born at West Windsor, Vt., in 1807, learned trade of Gunsmith there in a shop of Asa Story. Kendall was a son-in-law of Asahel Hubbard.
COLMAN S. HUBBARD, son of Asahel Hubbard, learned his trade under his father and Nicanor Kendall.
CARLOS COOLIDGE, born at Windsor, Vt., in 1792, graduated at Middlebury College and became a Windsor lawyer.

RICHARD S. LAWRENCE, born at Chester, Vt., in 1817, learned Machinist and Gunsmith trades at North Watertown, N. Y. Came to Windsor, Vt., in 1838.
BENJAMIN TYLER HENRY, born at Claremont, N. H., in 1821, learned trade there at shop of J. B. Ripley & Co.

SAMUEL E. ROBBINS, born at Boston, in 1810, was a wealthy Lumber Merchant of Boston and Bangor, Maine.
SEWEL F. BELKNAP, born on farm near West Dummerston, Vt., in 1812, rose from laborer to Railway Contractor, and before death at thirty-six built Boston, Portsmouth & Saco; Fitchburg; and Central Vermont Railways.
WARREN CURRIER, born at Walpole, N. H., in 1817, studied Law at Windsor, Vt., and became an attorney there.
LEMUEL HEDGE, born at Windsor, Vt., in 1786, became a Cabinet Maker and Mechanic there. Invented Paper Ruling Machine, 1817; Engine for Dividing Scales, 1827.
COURTLANDT C. PALMER, born at Stonington, Conn., in 1800, was a leading New York Hardware Merchant and backer of the inventors Walter Hunt and Louis Jennings.
CHRISTIAN SHARPS, born at Washington, N. J., in 1811, learned Gunsmith trade in local shops. He invented his famous Breech Loading Rifle at Cincinnati, in 1848, conceiving his idea from the Hall Breech loader of 1811.
FREDERICK W. HOWE, born at Danvers, Mass., in 1822, learned Machine Design and Construction under Zeba Gay of SILVER & GAY COMPANY, North Chelmsford, Mass.
HENRY D. STONE, born at Plainfield, N. H., in 1815, learned trade of Patternmaker at Woodstock, Vermont.
DANIEL B. WESSON, born at Worcester, Mass., in 1825, was Gunsmith and Inventor for George Leonard, Jr., of Shrewsbury, Mass., maker of Revolving Hammer Pistols.
EDWIN CLARK, was from Grower & Baker Sewing Machine Co.
GEORGE A. FAIRFIELD, born at Lansingburg, N. Y., in 1834, learned Machinist's trade under Lucius and Ira Dimmock, builders of Textile Machinery at Northampton, Mass.
CHARLES E. BILLINGS, born at Weathersfield, Vt., in 1835, learned Blacksmithing under his father at Windsor, Vt.
GEORGE W. HUBBARD, nephew of Asahel Hubbard, was born at Windsor, Vt., in 1836, and studied Engineering at Norwich University, Norwich, Vermont.

LAMSON & GOODNOW CUTLERY WORKS, 1842
Shelburne Falls, Mass.
Ebenezer G. Lamson.....Founder and President.
(Mr. E. G. Lamson was born at Stirling, Mass., in 1814.)
Abel F. Goodnow.....Treasurer
B. Buchanan Yale.....Sales Agent

EASTBURNE E. LAMSON, born at Shelburne Falls, Mass., in 1843, was a student at Brown University.
LIEUT. RALPH H. LAMSON, nephew of E. G. Lamson, was an officer in United States Navy during Civil War.
GENERAL HIRAM BERDAN, born at Phelps, N. Y., in 1824, was a well-known Mechanical Engineer and was Commander of famous Berdan Sharpshooters from 1861 to 1864.

DESCENT LINE OF THE WINDSOR INDUSTRIES

YANKEE INGENUITY—NATIVE BORN—WATERPOWER PATENTS
By Inclination and of Necessity many of the early inhabitants of Windsor became Millwrights, Gunsmiths and Inventors. From Vermont Timber and their Native Iron, with the help of ample Water Power, and under the protection of the United States Patents, these men, more than a century ago, began to manufacture in quantities their novel and practical Devices.
In an attempt to solve their Transportation Problem, and to more fully develop their Water Powers, they organized:
THE CONNECTICUT RIVER COMPANY, 1824-1828.
THE CONN. RIVER VALLEY STEAMBOAT CO., 1828-1832.
Canalization of River—Development of Steamboats.
Gov. DeWitt Clinton.....Promoter and Advisor.
Capt. Samuel Morey.....Canal Engineer.
Thomas Blanchard.....Steamboat Builder and Pilot.
THE ASCUTNEY MILL DAM COMPANY, 1833.
Construction of Stone Dams on Mill Brook.
The following Chain of Industries resulted:

THE AMERICAN HYDRAULIC COMPANY, 1828-1829.
THE NATIONAL HYDRAULIC COMPANY, 1829-1839.
Rotary Pumps and Fire Engines—Underhammer Guns.
John M. Cooper.....Inventor of Rotative Piston.
Asahel Hubbard.....Inventor of Rotary Pump.
Jabez Proctor.....Financial Backer and Manager.
Nicanor Kendall.....Gunsmith and Inventor.
Colman S. Hubbard.....Machinist and Gunsmith.
Gov. DeWitt Clinton.....Promoter of Rotary Pump.
Carlos Coolidge.....Patent Attorney.

N. KENDALL & COMPANY, 1839-1843.
KENDALL & LAWRENCE, 1843-1844.
Hubbard's Rotary Pumps—Kendall's Underhammer Guns.
Nicanor Kendall.....Gunsmith and Proprietor.
Richard S. Lawrence.....Gunsmith and Designer.
Benjamin Tyler Henry.....Gunsmith and Inventor.

ROBBINS, KENDALL & LAWRENCE, 1844-1849.
THE WINDSOR CAR & RIFLE COMPANY, 1849-1850.
THE ROBBINS & LAWRENCE COMPANY, 1850-1856.
THE VERMONT ARMS COMPANY, 1856-1858.
"Windsor" U. S. Rifles—Railway Cars—Sharps Rifles—Jennings Repeating Rifles—Revolving Hammer Pistols—British Enfield Rifles—Gun Machinery and Machine Tools—Single and Double Thread Sewing Machines.
Samuel E. Robbins.....Manager and President, 1844-56.
Nicanor Kendall.....Superintendent (Retired in 1849).
Richard S. Lawrence.....Mechanical Engineer, 1844-56.
Sewel S. Belknap.....Silent Partner. (Died in 1849).
Warren Currier.....Incorporator and President.
Lemuel Hedge.....Iventor of Band Saw in 1849.
Courtlandt C. Palmer.....Promoter of Jennings Rifle.
Christian Sharps.....Inventor of Sharps Rifle.
Frederick W. Howe.....Designer and Superintendent.
Henry D. Stone.....Superintendent and Inventor.
Benjamin Tyler Henry.....Gunsmith and Inventor.
Daniel B. Wesson.....Expert on Revolving Pistol.
Francis Draper.....Superintendent of Foundry.
Edwin Clark.....Inventor of Sewing Machine.
Carlos Coolidge.....Patent Attorney.
George A. Fairfield.....Gunsmith and Machinist.
Charles E. Billings.....Apprentice and Die Sinker.
George W. Hubbard.....Apprentice Draftsman.

RELATIONSHIPS

FALES & JENKS MACHINE COMPANY, Pawtucket, R. I.
David Fales and Alvin Jenks formed a partnership at Central Falls, R. I., in 1830, and in 1833, purchased the R. I. patent rights on the Hubbard Rotary Pump. This company still manufactures it, almost unchanged.

ORIGINAL CITY WATER WORKS OF ST. LOUIS, MO.
Asahel Hubbard built and installed first pump in 1830.

Father of Senator Redfield Proctor, who was Secretary of War, Governor of Vt., and founder of Vt. Marble Co.

WHITNEY ARMS COMPANY, Whitneyville, Conn.
Colman Hubbard.....Secretary, 1860-1865.

ROBBINS & LAWRENCE, 1851-1856.
SHARPS RIFLE MANUFACTURING COMPANY, 1851-1875.
Hartford, Conn.
Sharps Rifles—Enfield Rifles—Machine Tools—Gun Machinery—Weed Sewing Machines.
Richard S. Lawrence.....Master Armorer, 1852-1872.
(Aided C. M. Spencer to perfect Spencer Repeating Rifle.)
Christian Sharps.....Inventor and Superintendent.
(Also Proprietor of SHARPS & HANKINS ARMORY, Phila.)
Hezekiah Conant.....Draftsman and Inventor.
(Taught C. M. Spencer drafting, and with him joint inventor of Willimantic Spooler, first machine built by PRATT & WHITNEY, Founder of CONANT THREAD COMPANY.)
Rollin White.....Gunsmith and Inventor.
(Original Inventor of SMITH & WESSON REVOLVER.)
Joseph Dana Alvord.....Contractor.
(Became leading Contractor at WHEELER & WILSON CO.)

After 1875 the Sharps Plant became:
THE WEED SEWING MACHINE COMPANY, 1875-1893.
Weed Sewing Machines—First Spencer Automatic Screw Machines—Col. Albert Pope's First Bicycles.
George A. Fairfield.....Founder and President.
THE POPE MANUFACTURING COMPANY, 1893-1914.
Columbia Bicycles—Pope-Hartford Automobiles.
Col. Albert Pope.....Founder and President.
George A. Fairfield.....Director.
Ned Lawrence.....Superintendent.
(Son of Richard S. Lawrence.)
PRATT & WHITNEY COMPANY, Hartford, Conn.
This company, whose origin was influenced by Sharps Company, purchased the old Sharps Plant in 1914.

Howe's Plain Miller became LINCOLN MILLING MACHINE.

ROYAL ARMORY OF GREAT BRITAIN, Enfield Lock, England.
Robbins & Lawrence at Windsor, built nearly all the Mechanical Equipment and first 25,000 Interchangeable Army Rifles for British Government, 1854-1856.

President of MISSOURI CAR & FOUNDRY CO., 1872-1876.

E. A. STEARNS & CO., Brattleboro, Vt., 1830-1868.
(Now part of STANLEY RULE & LEVEL CO., New Britain.)
Hedge Dividing Engines—Hedge Patent Jointed Rules.
Lemuel Hedge.....Inventor and Founder.

THE PROVIDENCE TOOL CO., (Now RHODE ISLAND TOOL CO.)
Frederick W. Howe.....Superintendent, 1861-1865.
ELIAS HOWE SEWING MACHINE CO., Bridgeport, Conn.
Frederick W. Howe.....Superintendent, 1865-1868.
BROWN & SHARPE MFG. CO., Providence, R. I.
Frederick W. Howe.....Incorporator and Supt., 1868-1873.
(As Consulting Engineer developed Wilcox & Gibbs Sewing Machine and Goodyear Welt Sewing Machinery.)
Henry M. Leland served under Mr. Howe about 1870.

SMITH & WESSON, Norwich, Connecticut.
B. Tyler Henry.....Gunsmith and Inventor, 1851-1855.
Daniel B. Wesson.....Founder and Inventor.
VOLCANIC REPEATING ARMS COMPANY, 1855-1857.
NEW HAVEN ARMS COMPANY, 1857-1865.
HENRY REPEATING ARMS COMPANY, 1865-1866.
WINCHESTER REPEATING ARMS COMPANY, 1866-
New Haven and Bridgeport, Conn.
Smith & Wesson, Volcanic and Henry Repeating Rifles improved forms of Jennings, and forerunners of the modern Winchester Lever Action Repeater.
B. Tyler Henry.....Inventor and Founder.
Gov. Oliver Winchester.....Financier and President.

COLT'S PATENT FIRE ARMS MFG. CO., Hartford, Conn.
Charles E. Billings.....Toolmaker and Diesinker, 1856-62.
Christopher Spencer.....Machinist, 1854-1857.
George A. Fairfield.....Contractor, 1857-1865.
E. REMINGTON & SON, Ilion, New York.
Charles E. Billings.....Forging Contractor, 1862-1865.
WEED SEWING MACHINE COMPANY, Hartford, Conn.
George A. Fairfield.....Manager and President.
Charles E. Billings.....Superintendent, 1865-1868.

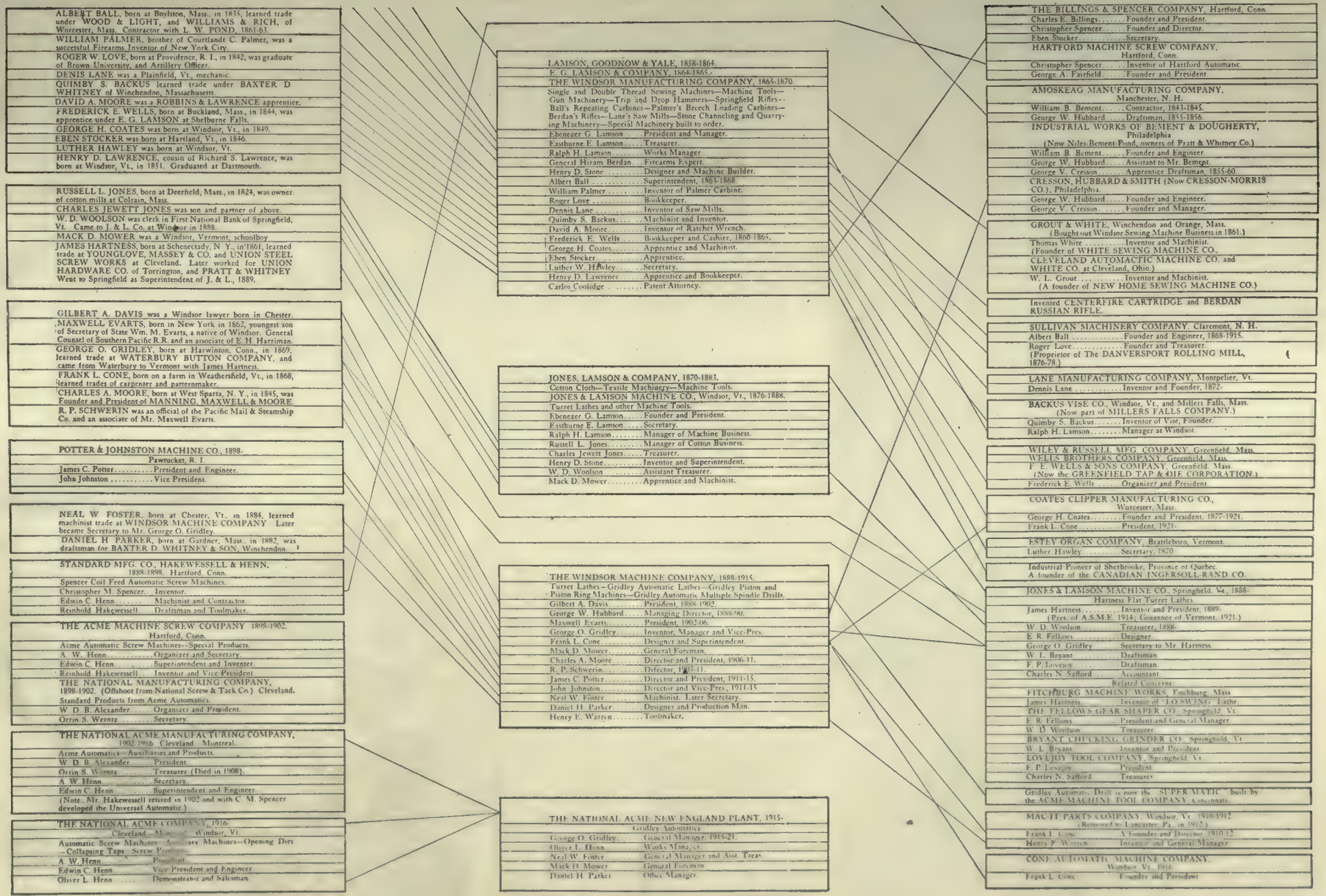


FIG. 2—GENEALOGICAL CHART



FIG. 1—THE VILLAGE OF WINDSOR, FROM AN OLD LITHOGRAPH

mouth of Mill Stream, and before 1769 a sawmill at the upper one and a gristmill at the lower one were in operation, Israel Curtis and his son Zebina being the pioneer manufacturers of Windsor. It was about these dams that much of mechanical history was to be made within the next hundred and forty-two years.

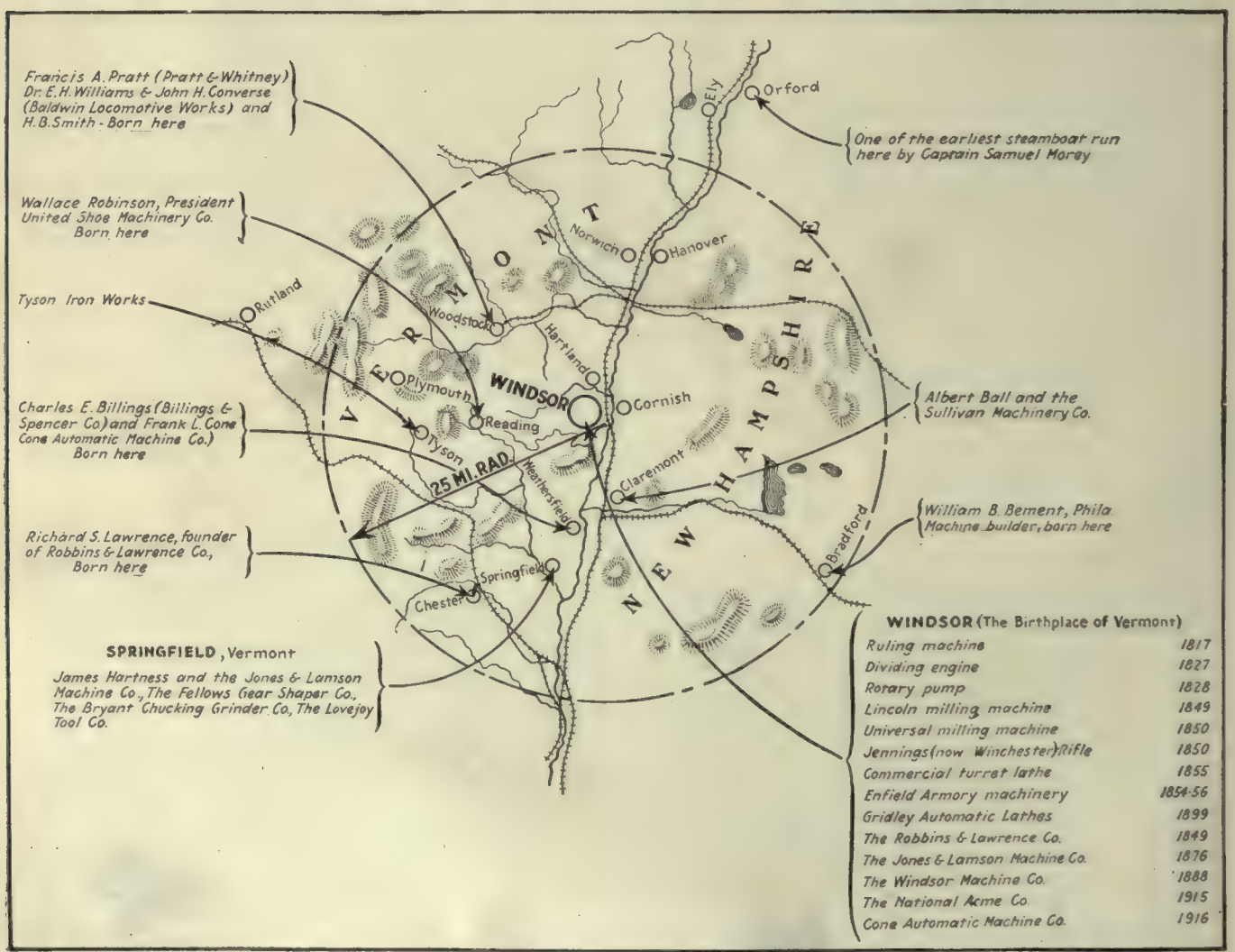


FIG. 3—THE WINDSOR REGION AND SOME OF ITS SONS

Tooth Forms of Green, Burnished, Hardened and Ground Gears

By K. L. HERRMANN
Studebaker Corporation

Conclusion of the article — Changes due to repeated hardening—Grinding teeth of spiral bevel-gears more important than teeth of spur gears—Hobbing machines

CURVES combining the findings of many tests made are shown in Fig. 11. The curve at the top represents one side of a green-gear tooth with the spacing error shown at the right-hand side. The second full line represents this same tooth-form, while the dotted line shows the tooth-form after carburizing. The next pair of curves show the tooth-form after the first hardening. For the purpose of further studying variations, the gears from which these curves were made was hardened ten times with variations as shown in the succeeding curves both for tooth-form and spacing. One of the many interesting features is that this gear continued to shrink in outside diameter, which after the final hardening, was 0.040 in. under the original diameter, while the root diameter steadily increased. Another subject for very careful study can be found in the curves produced by checking for spacing.

The change in the shape of this gear is shown

A paper presented at the Annual Convention of the American Gear Manufacturer's Association, Cleveland, Ohio, April 21, 1923.

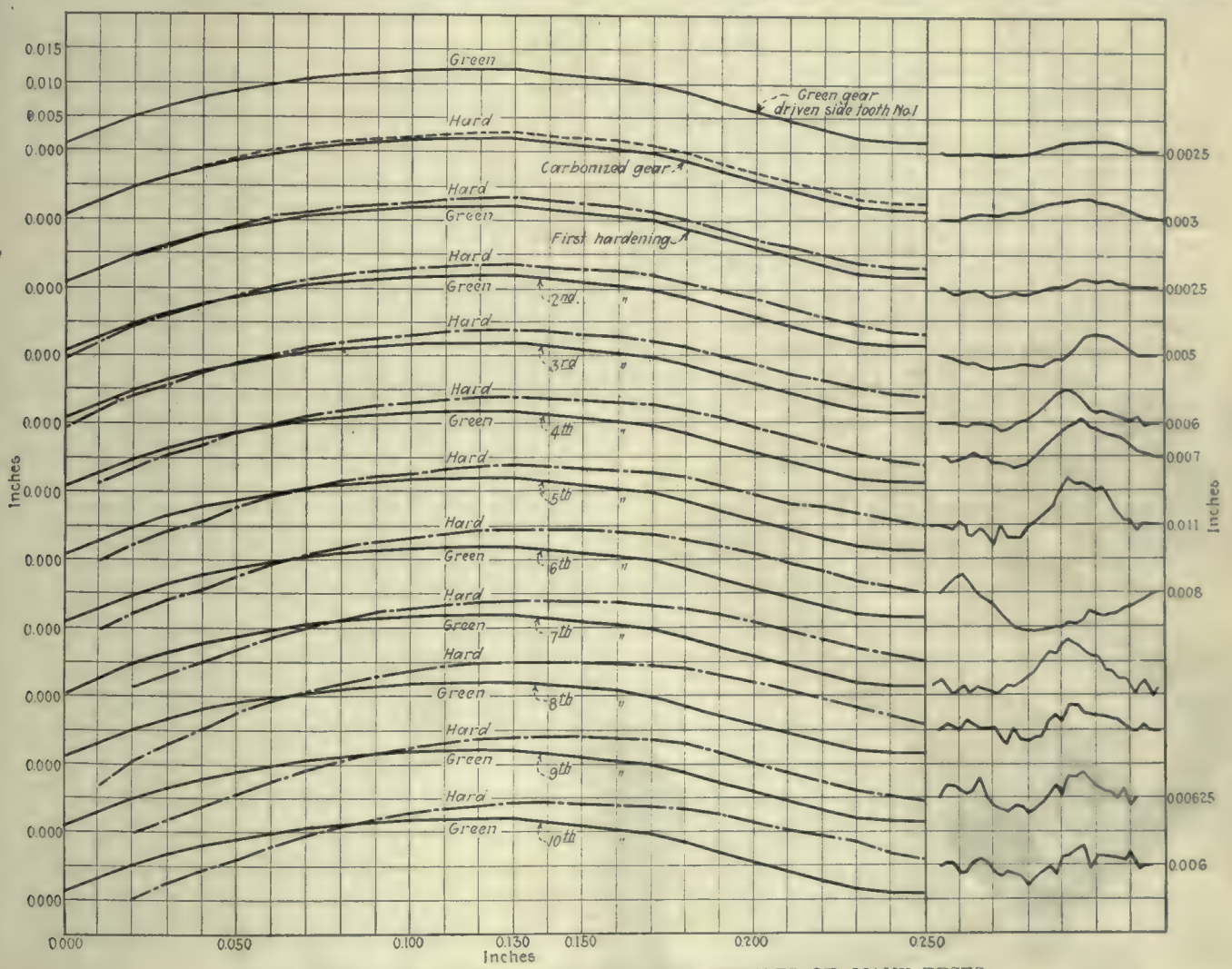


FIG. 11—TOOTH CURVES COMBINING THE RESULTS OF MANY TESTS

graphically and somewhat exaggerated in Fig. 12. It will be noted that the tooth thickness was reduced at the point, while at the base considerable expansion took place. The possibilities when more favorable steel and hardening conditions are selected, are shown in Fig. 13. One of many experiments consisted of careful forging,

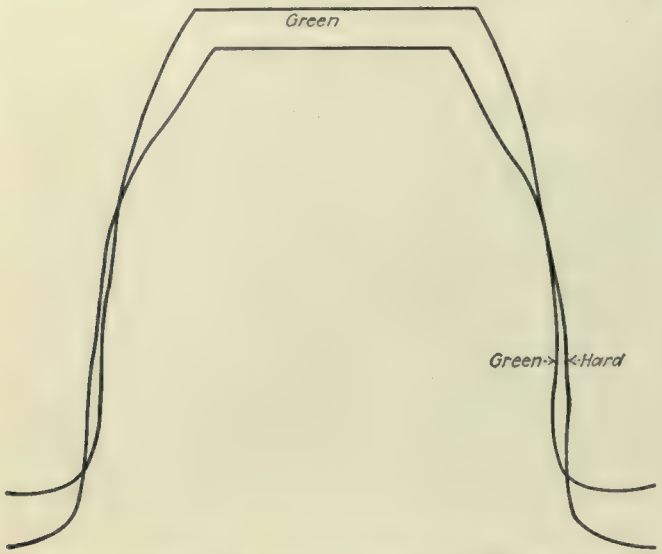


FIG. 12—CHANGES OF TOOTH SHAPE DUE TO HARDENING

heat treating, cutting and hardening these gears, all under the observation of an experienced metallurgist.

The results relative to spacing when checked by the previously described method are shown in Fig. 14 in which the full line is the green gear, and the dot-dash line the hardened gear. It will be seen that although these gears were forged, cut and heat-treated alike, No. 4 gear came out radically different from the others. Similar tests were made by cutting gears, the blanks for which were taken from several positions in a billet. The results were inconsistent because two gears, side by side, taken from the same plane of the billet did not in any way produce comparable results.

The curves of spiral bevel-gears in Fig. 15 were plotted from tests made by the fixtures shown in Fig. 22. In spiral-bevel gears, hardening changes in tooth form may lead to the impression that the teeth have straightened out. A careful examination of these curves will indicate that this is not necessarily true, and that if grinding spur gears has a decided advantage, grinding spiral bevel-gears is of still greater importance. This is especially so, because of the many limitations in the selection of steels that will stand up in gears in rear axle work.

The coast and drive sides of gears ground on the Lees-Bradner machine are shown in Fig. 16. The accuracy of these tooth forms and the consistency with which this accuracy is produced is found even more

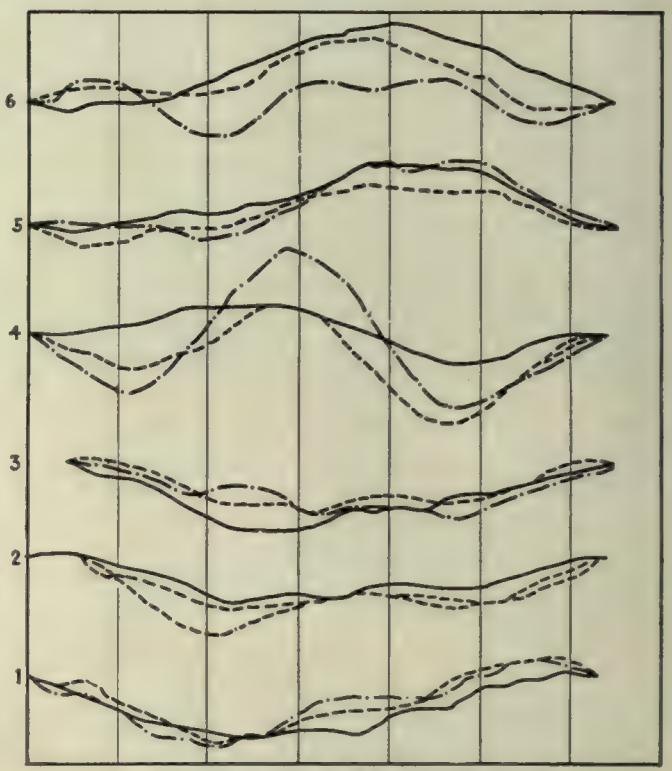


FIG. 14—RESULTS OF SPACING TESTS

favorable than is indicated by the several curves. The machine on which these gears were ground is shown in Fig. 17.

Gears of equal accuracy ground on the American Grinding Machine Co.'s machine are shown in Fig. 18.

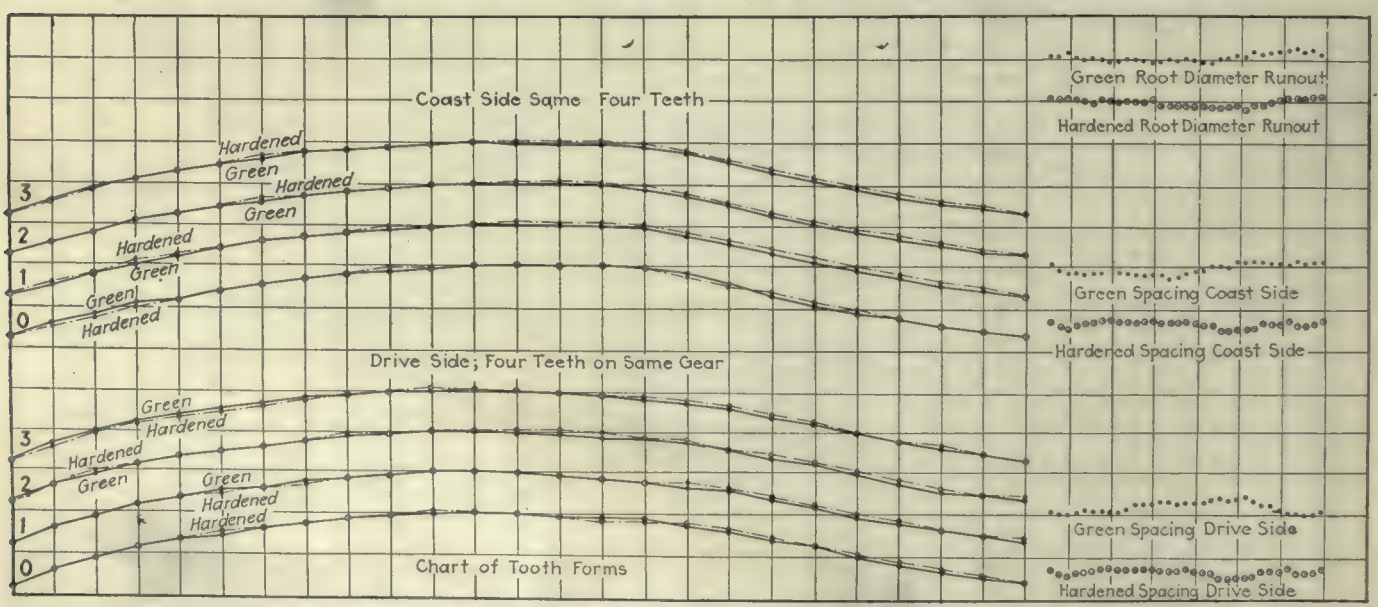


FIG. 13—TOOTH CURVES FROM GEARS HARDENED UNDER IDEAL CONDITIONS

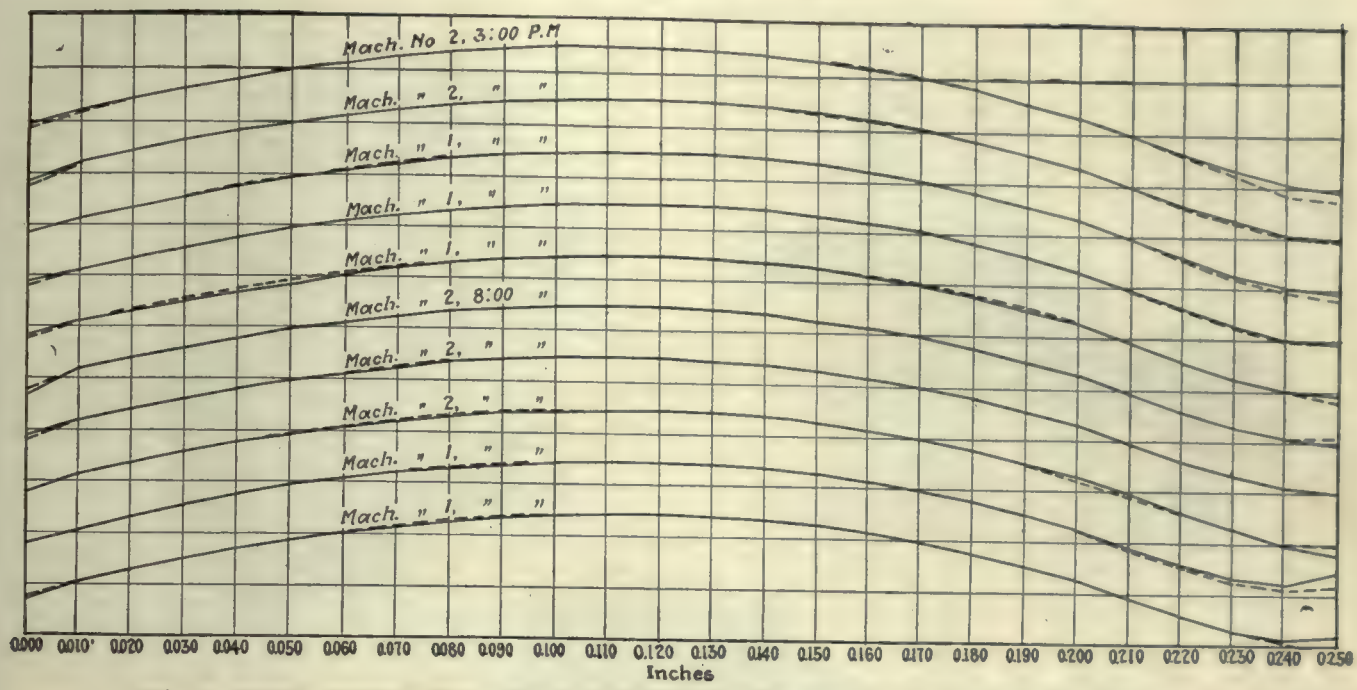


FIG. 16—TOOTH CURVES FROM GEARS GROUND ON LEES-BRADNER GEAR GRINDING MACHINE

The results of checking for spacing are of interest. The machine on which these gears were ground is shown in Fig. 19.

In Fig. 20 is shown one of the universal checking fixtures used in our plants. We have several types along similar lines which we prefer to use, because for a number of years, curves have been made on these fixtures and studied by us. There is, however, offered a series of new fixtures for checking tooth-forms, a very good one being manufactured by the Illinois Tool

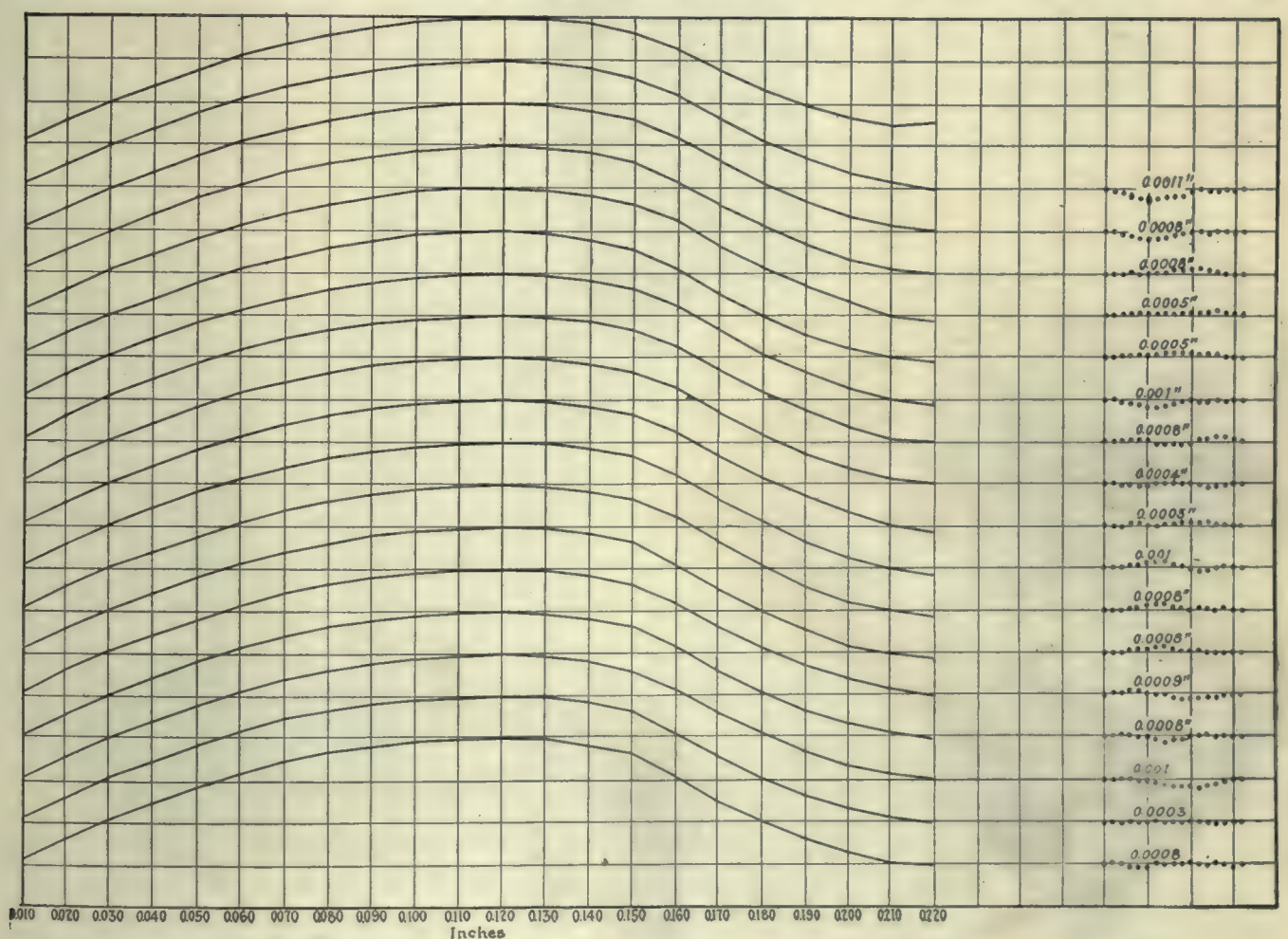
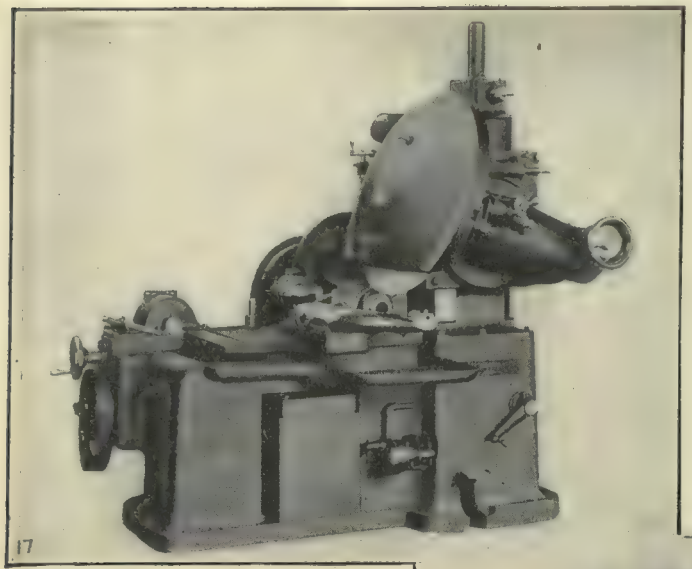
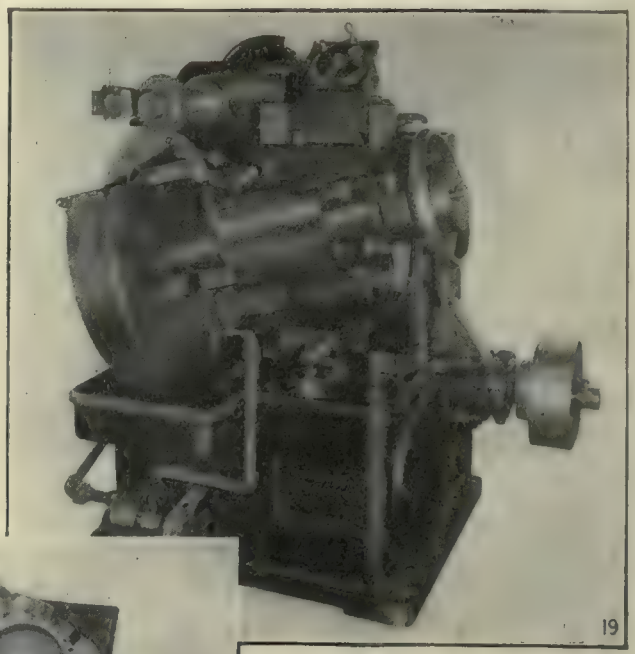
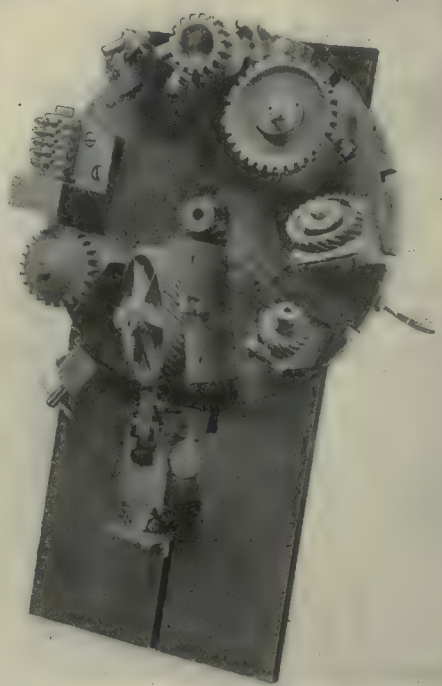
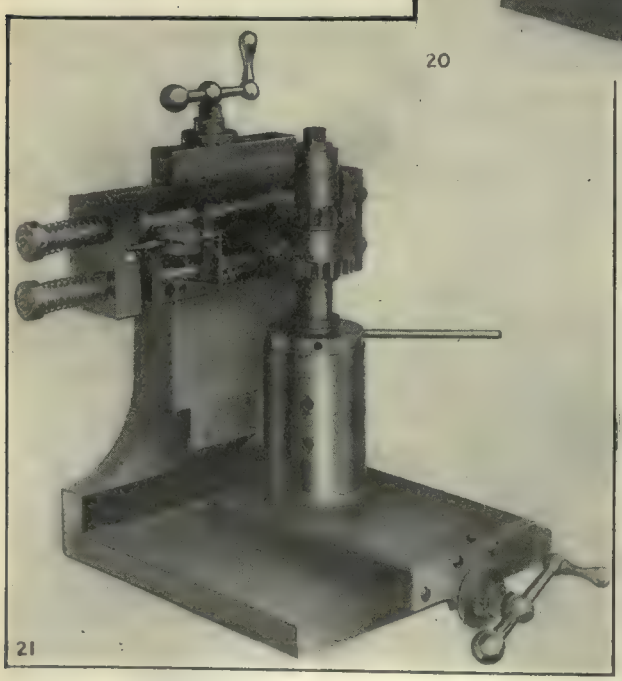


FIG. 18—TOOTH CURVES FROM GEARS GROUND ON AMERICAN GEAR GRINDING MACHINE









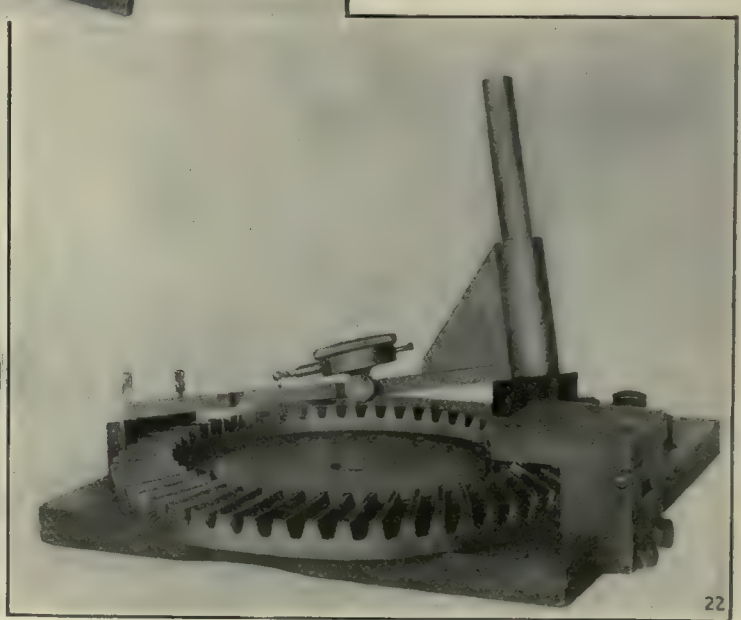


FIG. 17—LEES-BRADNER GEAR GRINDING MACHINE. FIG. 19—AMERICAN GEAR GRINDING MACHINE. FIG. 20—UNIVERSAL FIXTURE FOR CHECKING GEARS. FIG. 21—ANOTHER TYPE OF GEAR-CHECKING FIXTURE. FIG. 22—FIXTURE FOR CHECKING SPIRAL BEVEL GEARS

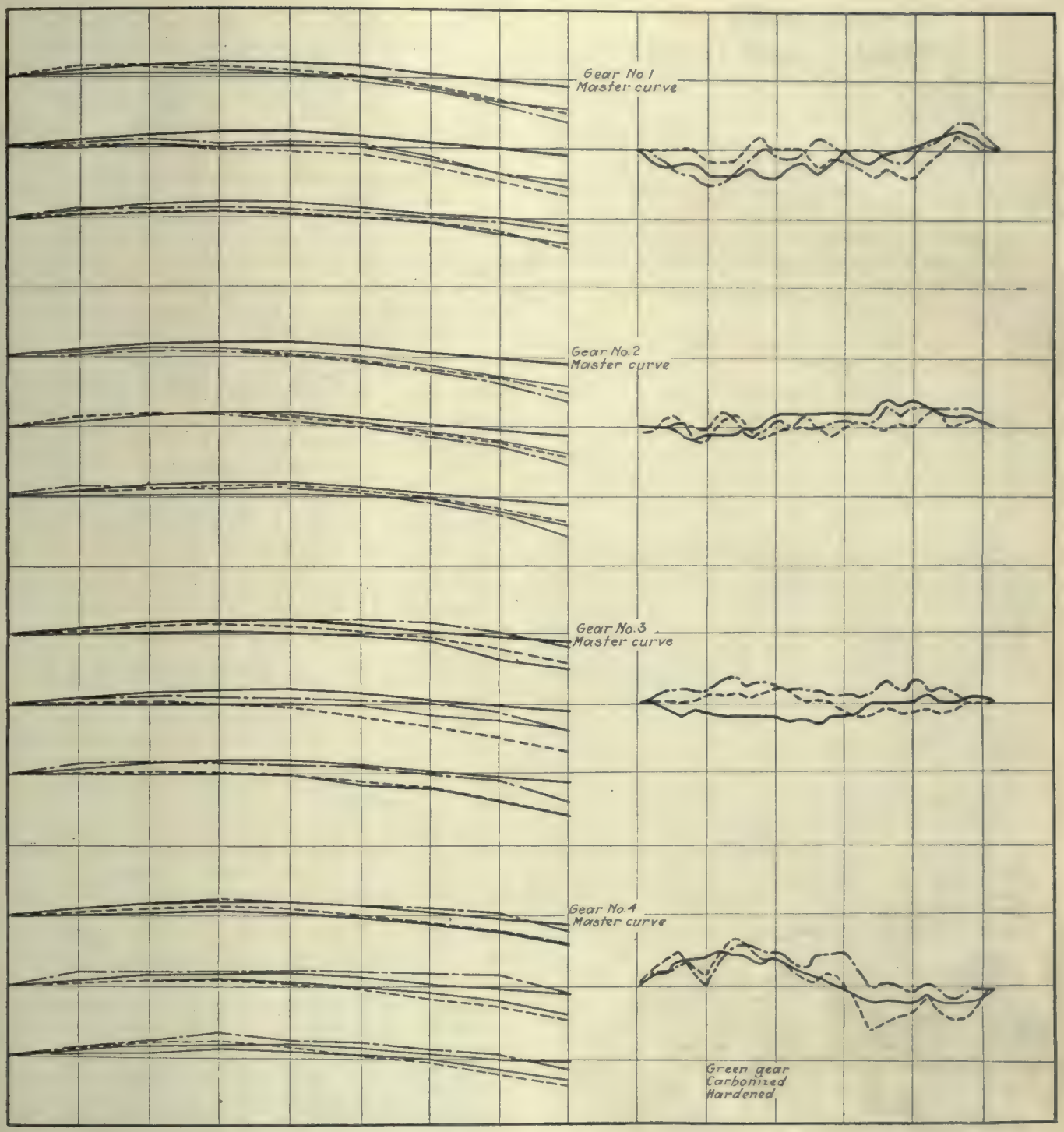


FIG. 15—CURVES FROM TEETH OF SPIRAL BEVEL-GEARS

Co. The same company also supplies checking equipment for various cutters and cutting machines. We understand that more recently the Lees-Bradner Co. has put out a very efficient gear-tooth checking fixture.

The Gear Grinding Machine Co. is supplying the fixture shown in Fig. 21. This is the most rapid and accurate production checking fixture with which we have had experience. It is also made with attachments for charting. These three fixtures deserve the serious attention of those studying gear tooth-forms.

Time and space limitations prevent the discussion of the many details which the charting of gear tooth-forms and spacing has brought out, also the acknowledgment in detail of the help rendered by representatives of such firms as Barber-Coleman, Brown & Sharpe, Gould & Eberhardt, Lees-Bradner, Pratt & Whitney, and especially Mr. England of the Illinois Tool Works and Mr. Hazelton of the Cincinnati Gear Cutting Machine Co., both of whom have in an unusual way assisted in the progress of this work.

[The experiments described and the results and data given in this article show conclusively that the problems in gearing confronting the automobile manufacturer are many and varied. It is evident that automotive engineers are going ot the elimination of gear noises in the right way and it is to be hoped their efforts will result in practically noiseless gearing in the near future.—Editor.]

Custom and Usage Vs. Quality and Content

Right of seller of industrial supplies to prove custom and usage, relative to quality and content, in the face of the terms of a written contract

By Leslie Childs

THE question of when, and under what circumstances, custom and usage may be proven, relative to the quality or content of materials or supplies purchased is one of considerable importance to industrial executives in general. This is true because in contracts of this kind not infrequently words used carry a different meaning, in the light of the custom and usage of a given trade, than is ascribed to them in their ordinary and every-day use.

To meet this situation then, the law has declared that the meaning of words, in the light of the custom and usage of a given trade, is admissible to prove the intent of the parties, and this in the face of the terms of a written contract that according to the ordinary meaning of the words used may import a different construction. The importance of a knowledge of the limitations of this rule to the industrial executive charged with the entering into contracts of this kind is fairly obvious, and its practical application to a particular situation may prove of interest and perhaps some profit to even the best informed.

With this in mind, the recent Pennsylvania case of the Electric Reduction Co. vs. the Colonial Steel Co., 120 Atl. 116, is well worth a brief examination. The facts and circumstances which culminated in the action were, as taken from the report, in the main as follows:

Contract to Furnish Ferro-Tungsten Powder "Free From Tin" Entered Into

The Electric Reduction Co. sold and delivered to the Colonial Steel Co. a large quantity of ferro-tungsten powder. The contract of sale, which was in writing, stipulated that the material so supplied should be "free from copper, tin and all other impurities."

Delivery under the contract was made in five separate consignments. The first shipment was accepted and paid for, and a substantial sum had been paid upon the last four deliveries when, it appears, the Colonial Steel Co. caused analyses to be made which showed the last shipments contained tin. Upon making this discovery the steel company notified the other of the rejection of the shipments named, and asked for directions as to their disposition.

A controversy followed which resulted in the filing of the instant suit by the Electric Reduction Co. in an attempt to recover the balance of the purchase price, in accordance with the terms of the contract. The outcome of this lawsuit turned on the interpretation to be given the words, "free from copper, tin and all other impurities" as used in the contract of sale.

The Electric Reduction Co. admitted that the article supplied did contain a certain amount of tin, but contended that the words "free from tin" as used in the contract complied with a general and universal meaning with respect to the sale of ferro-tungsten powder and meant that the article was commercially free from tin; and that the parties so used these words in the contract. The Colonial Steel Co. denied the correctness of this contention and the outcome of the case turned on this one question.

Upon the trial of the case the trial court permitted the Electric Reduction Co. to introduce evidence which tended to prove that the words "free from tin," according to the custom and usage of the trade, meant that tin did not exist in sufficient quantity to impair the quality of the finished steel. On the other hand, the Colonial Steel Co. introduced evidence that tended to prove that the words "free from tin" meant what they said, and that there was no custom or usage in respect to the trade meaning of the words as contended for by the other.

On this conflicting evidence, the trial resulted in a judgment for the Electric Reduction Co. for the full amount of its claim. From this judgment the Colonial Steel Co. prosecuted an appeal to the Supreme Court of Pennsylvania where, among other things, it was contended that error was committed in allowing the introduction of this evidence as to custom and usage, as it tended to vary the terms of the written contract. In passing upon this phase of the case the court quoted in part, from 17 C. J. 498, as follows:

Ruling of Supreme Court

"While words in a contract relating to the ordinary transactions of life are to be construed according to their plain, ordinary and popular meaning, yet, if, in reference to the subject-matter of the contract, particular words and expressions have by usage acquired a meaning different from their plain, ordinary and popular meaning, the parties using those words in such a contract must be taken to have used them in their peculiar sense and that sense may be fixed by parol evidence."

Following the above statement of the generally accepted reason, for allowing the introduction of parol evidence in respect to custom and usage, the court in approving the application of the rule in the instant case, among other things, said:

"The admission of evidence of a custom is not dependent on the rule that parol evidence is inadmissible to vary a writing, nor inconsistent therewith, but upon the ground that the law makes the custom a part of the contract. . . . Our conclusion is that in the case before us parol evidence was properly admitted to show the trade meaning of the words in dispute. . . ."

In conclusion, after giving additional reasons for its conclusion and considering other points not material to the subject of this article, the Supreme Court of Pennsylvania affirmed the judgment rendered in the lower court in favor of the Electric Reduction Co., holding, as outlined in the opinion, that parol evidence relative to the trade meaning of the term "free from tin" was properly admitted, and the judgment resulting from the trial of the issue so raised would not be disturbed.

The foregoing Pennsylvania decision is one of force and value on the point decided. It illustrates in a clear manner the application of the rule which permits the introduction of parol evidence to prove custom and usage in the face of the specific terms of a written contract. And if, in a given contract, words are used that are susceptible of both a custom and usage and ordinary meaning, a mutual interpretation of their meaning might with profit be inserted in the contract for security against after dispute. Truly then, when taken in connection with the facts involved, this Pennsylvania decision becomes one well worth having in mind, by industrial executives in general, when contracts of the character described in the case reviewed are being entered into.

Repairing Locomotives in a Machine-Tool Shop

BY SPECIAL CORRESPONDENCE

The second of three articles—Rod, valve and motion work—Worn guides, crossheads and pistons built up with manganese bronze — Welding broken frames

ROD, VALVE AND motion work is carried on in separate departments manned by operatives skilled in their particular work, to which each operative devotes his entire time and is thus enabled to concentrate his attention upon the problems immediately before him. These departments are located in the central section of the shop under the sawtooth roof and adjoining the locomotive floor, so that the latter is readily accessible when a workman is obliged to get a measurement from, or fit a part to, any particular engine.

To the rod department, a general view of which may be seen in Fig. 8, the main and side rods are delivered when first taken from the engine, and here they are inspected for cracks, which by this time have made themselves visible by the exudation of oil upon the white painted surfaces referred to in the previous article. If serious defects are found a rod is scrapped and an order sent out for a forging to replace it.

Replacement of the bronze bushings of side rods and the replacement or re-boring of the two-piece crankpin brasses of the main rods is a practical certainty, and as soon as a rod is checked over to determine its fitness for further service it is dispatched to the forcing press at one end of this department to have the bushings pressed out.

Standard sizes are adhered to as closely as possible



FIG. 8—A VIEW IN THE ROD DEPARTMENT

so that if a rod is undamaged, new bushings are ready to be forced in and scraped to a bearing upon the pins. In some cases the holes in the rod may be pounded out of shape by reason of the engine having remained too long in service, and in such cases it is necessary to re-bore the holes and fit special bushings.

Main rod brasses are often fitted with babbitt strips, hammered into transverse dovetailed grooves in the brass. In Fig. 9 may be seen such a brass in the vise where it is undergoing the scraping operation to fit the composite surface to the crank-pin.

The forging for a new side rod of the articulated type is shown in Figs. 10 and 11, in the preliminary stages

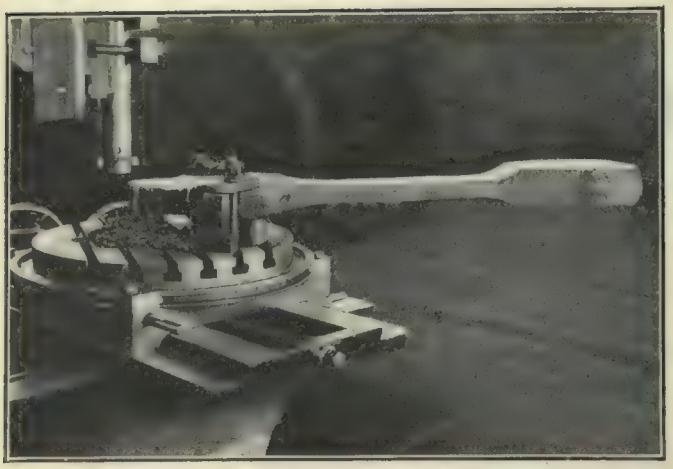


FIG. 9—A MAIN ROD BRASS WITH BABBITT BEARING-STRIPS

of its machining. The sides of the forging are first planed off at the enlarged ends to provide a convenient surface for laying out, and the surface is then chalked and laid out in accordance with the original drawing of the locomotive to which it belongs. It is not, as a rule, difficult to obtain the original drawings of an engine from its builders, but if such drawings are unavailable the rod must be laid out from measurements taken from the engine.

After a rod is thus laid out it goes to the slotting machine, Fig. 10, where the contour is machined approximately to line, and from there it is taken to a vertical milling machine, Fig. 12, to be finished exactly to line. When the ends are milled, the rod then goes to the double-head shaper, Fig. 13, where the fillets are formed to join the plain middle section with the enlarged ends.

The middle section of the rod is finished by planing on four sides and is then channelled out on one side for the purpose of reducing the weight. Because of the fact that this part of the rod is tapered and that the sides of the channel are to be parallel with the outer surfaces



FG. 10—A SIDE-ROD IN THE SLOTTER

instead of with each other, it is necessary to take two cuts over the length of the rod when milling the channel. The work is done on an Ingersoll planer-type milling machine with a cutter equal in width to the narrow end of the channel, the rod being reset for the second cut.

In Fig. 14, a new rod is shown set up in a horizontal boring mill for the purpose of boring the holes for the crankpin brasses and also for the knuckle pin that joins the two sections of the side rod together. Accuracy of spacing in the matter of center distances is of extreme

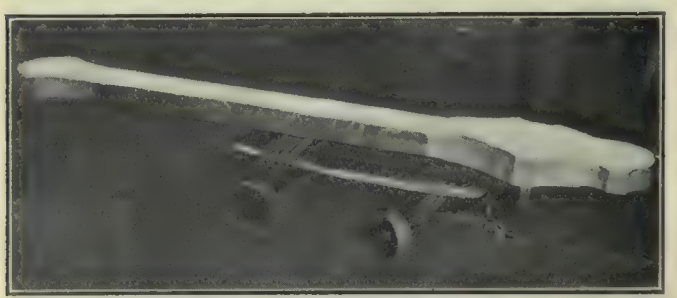


FIG. 11—FORGING FOR A SIDE-ROD

importance, for this distance must, of course, conform exactly with the center distance between the driving wheels of the engine.

The importance of autogenous welding in railroad repairs can hardly be overestimated. Not only are many of the minor parts salvaged by its application, but rarely does one see in a locomotive repair-shop an engine that has not at some time required a welding operation

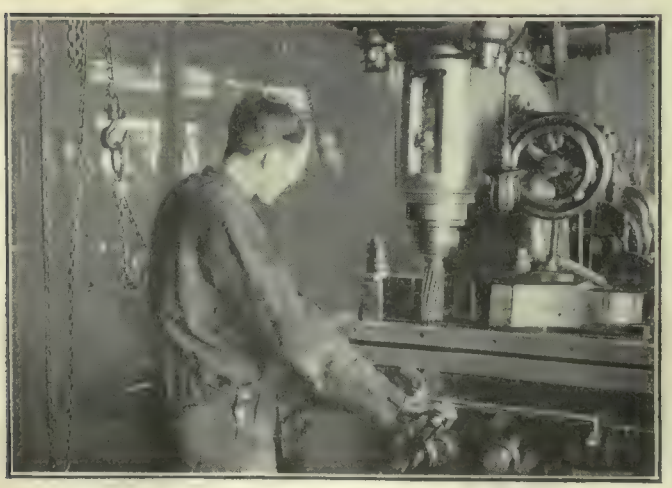


FIG. 12—MILLING THE END OF THE ROD

upon its main frames, a defect which before the days of autogenous welding, would have involved almost a complete rebuilding of the machine.

At the time these photographs were made there was in the shop a very heavy locomotive of the consolidation type which had a broken frame. A forging was made to



FIG. 13—PLANING THE FILLETS

replace the forward end of the frame, which was broken through the forward yoke. That end of the frame was taken out and the new piece welded in its place. As the work was carried on at the same time with other necessary repairs, there was no extra delay in restoring the engine to service.

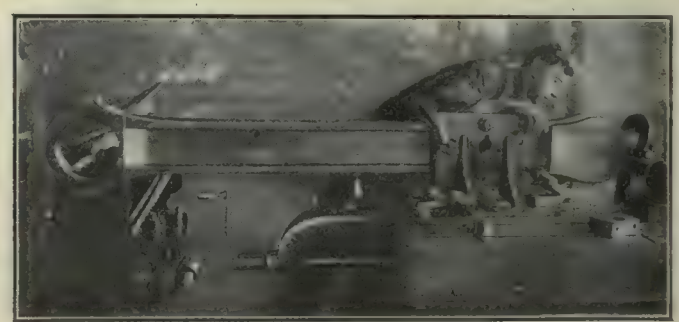


FIG. 14—BORING HOLES IN THE ROD FOR THE BRASSES

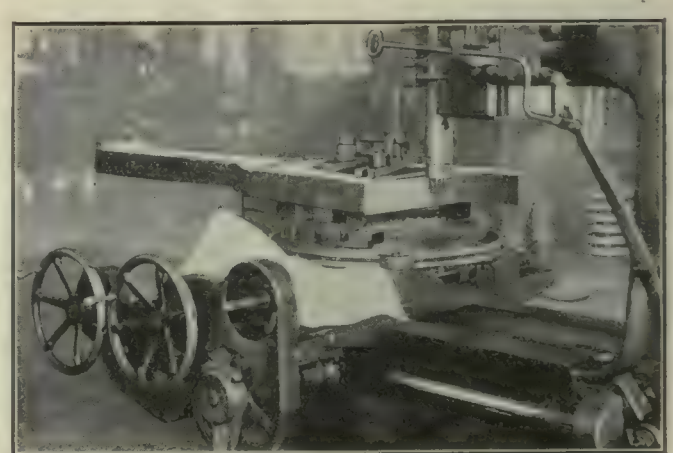


FIG. 15—MACHINING A NEW SECTION TO BE WELDED INTO THE MAIN FRAME

The weld was made by the electric arc process, the time required being something less than four hours. The work was done by the foreman-welder and one helper. Fig 15 shows the new part of the frame on a slotting

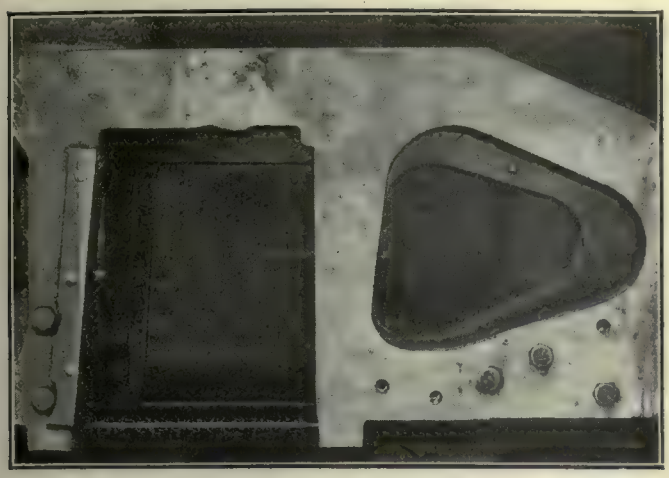


FIG. 16—COMPLETED WELD ON THE MAIN FRAME

machine where it is being machined to shape, and Fig. 16 shows the weld after completion.

Thermit welding also is applied to the mending and especially to the reinforcing of locomotive frames. Such a reinforcement at a point where other engines of the same kind had developed weakness is shown in Fig 17, applied to the frame of an engine of the Santa Fé type. Both frames were reinforced in the same manner, 800 lb. of metal being melted simultaneously in two crucibles. The picture shows the weld immediately after the molds had been removed and the sprues and risers cut off by means of the acetylene torch.

Worn crosshead guides, that before welding was available would have to be replaced, are now built up with the aid of the oxy-acetylene torch and replaned as in Fig. 18, being made ready to put back into service in a few hours instead of a week or more as formerly.

Crosshead shoes are renewed by welding plates of steel in the bearing surfaces and replaning the shoes to the original dimensions. Fig. 19 shows planing the guide bearings of the shoes with the crosshead in place on the rod, by which means accuracy of alignment is assured.

Locomotive pistons are peculiarly subject to wear,

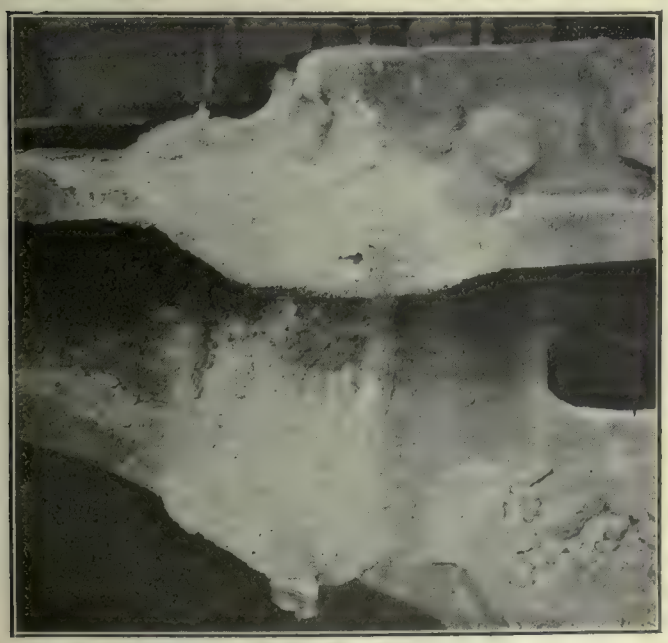


FIG. 17—MAIN FRAME REINFORCED BY THERMIT WELDING

and a worn piston is out of round for the reason that the wear is always on the lower half. Instead of scrapping the worn piston and substituting a new one, the welder builds up the worn part with manganese bronze and the piston is re-turned to its original diameter.

Welding is also applied to the mending of cracked

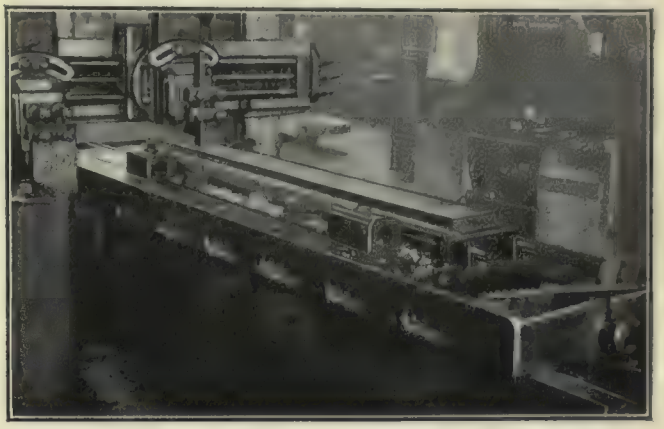


FIG. 18—REPLANING CROSSHEAD GUIDES

and broken cylinders, valve chambers, etc., and to many of the minor parts of an engine. No other process discovered in recent years has contributed so much to the advantage of railroad repairs, as by its use many parts

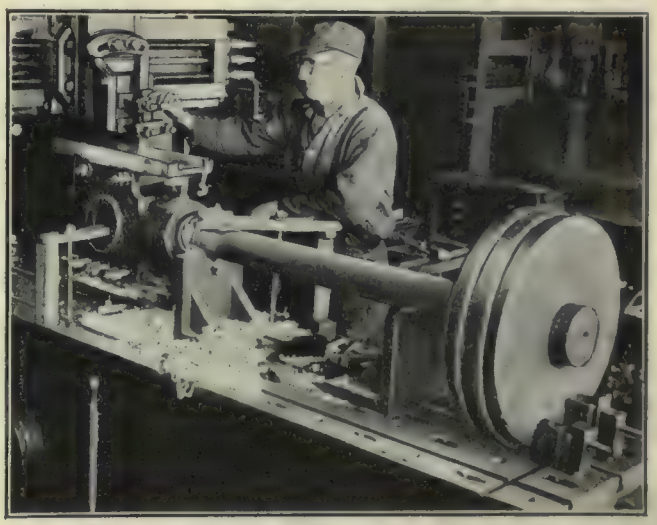


FIG. 19—RE-PLANING CROSSHEAD SHOES

that would have formerly taken days and even weeks to replace, can now be restored to service in a few hours at most, and with the strength of the part advanced beyond its original capacity by any degree that may be desired.

Canada Takes More Agricultural Implements

Preliminary statistics of Canadian trade for 1922-23, compiled by the Dominion Bureau of Statistics show that agricultural implements valued at $8,423,995 were imported into Canada during the fiscal year ended March 31, 1923. The Department of Commerce reports that this is a slight increase over the fiscal year 1921-22, when implements imported were valued at $7,718,032. Practically all of these imports were from the United States, amounting to $7,546,472 in 1921-22 and $8,352,-071 in 1922-23 the report states.

The Electrician

By George Walter
In Charge of Maintenance, Millholland Machine Co.

ECONOMIC conditions in manufacturing America during the past two years or more have caused a great many changes to be made in the organization of factory and machine-shop personnel. Reductions have been made wherever possible and individual production has been materially speeded up. Overhead expense has been cut down to the limit and wages have been reduced by manufacturers struggling for an existence over the lean period. With the hope of better meeting keen competition the employers have steadily demanded more and better work from the workmen.

They have found one of the hardest types of employee to deal with in this situation to be the man engaged in maintenance work. He knows that the shop superintendent must be tied up heart and soul in production. The average shop superintendent knows but little concerning the real nature of maintenance work; he knows that when something breaks down it must be repaired. The maintenance man then appears very important.

Electricity in industry is comparatively new. Men who have had their minds full of mechanical problems have found little time to devote to its study. They have found it cheaper and more satisfactory to turn the care of the electrical equipment in their shop over to a man who has made electricity his field. They do know that many queer things happen in the electrical world, and their minds are to a certain extent open to the tales of the electrician when he "gets up against it." The fact remains, however, that the electrician no longer stands upon the pinnacle he once did. There has been a tremendous slump in the demand and price offered for his services.

Low Wages Offered Electricians

Over a year ago I found myself temporarily out of employment, and decided to apply for an electrician's berth somewhere. I found that almost every place where I applied had approximately fifty per cent of the men laid off, and twice as many on the waiting list. A millwright, an oiler or a handy man had been pressed into service renewing fuses and lamps, oiling cranes and motors, and doing such jobs. As to wages: "Considering that you have had quite a little experience, I could probably find a place for you at — cents per hour." The rate was less than ten per cent above that being paid labor at the time. I was looking for a temporary job and had laid no claims to being anything of an expert. I had simply claimed to be a first-class electrician. Nevertheless it quite clearly demonstrated the employer's classification of the present-day electrician.

This employer may not know much about electrical maintenance work, but he does know when he gets results. If he has to send for outside help every time a starting box gets out of order he wants to know what the trouble is. If he is told that the plant electrician is as good as the ordinary, he is apt to decide that the ordinary is not so very good.

A man electrically inclined should after a year's experience as a helper, be qualified to become a plant electrician. This electrician is not expected to be a technically trained man. It is expected, however, that he be a man with a thorough working knowledge of the plant's electrical equipment.

He should have an intimate acquaintance with the starting boxes and the motors. He should know the type of construction of the electrical equipment on the overhead cranes, what the inside of the plant's transformers look like and what each one is for, and the different voltages used in the plant and why. It is a good plan for him to know every line of conduit, its capacity and present load, its voltage and the kind of current.

He should not only know the right and the wrong way to install a motor or a line of conduit, but he should be able to do the work itself and in its entirety. It is important that he know the right and wrong way to install a knife switch; it may save a life some day, maybe his own. He should at an early date make himself thoroughly familiar with the latest rulings of the underwriters. He may thus be able to save himself much humiliation, and his company a great deal of money

The Electrician's Self-Conceit

Because of the danger of having inexperienced help manipulate electrical equipment, the average employer feels duty bound to have an experienced man at hand for this purpose. This man is the so-called electrician. You can see him idling around the shop almost any time of the day. When a fuse blows out he saunters up to his bench to get a new one and saunters back again to install it. He watches several men try to lift a casting without success. They have to go to the labor foreman for a man to help them. "It's no use asking the electrician; he'd get his hands dirty." That's just the trouble, he's afraid of getting his hands dirty or soiling his clean overalls. When visitors come to the plant he tries to leave the impression that he holds some sort of exalted position, a job a little better than the other fellow's. He wonders why the company doesn't feel the same way about it when pay day comes around, or why some other shop is paying the electrician a salary far in excess of his. He, at least, seems to think he is making good his bluff.

If you were the manager of a plant too small to maintain an electrical engineer, what would you give for a man who would apply himself to the study of your electrical equipment during his idle time? For instance, if when another machine was to be installed, he came to you and informed you that the motor running such and such a lineshaft had a capacity load and would not carry the new equipment, giving you the figures? Such a man might cost you a new motor and save you your old one. You would be ahead in the long run.

If a certain type of starting box were not adapted to local conditions, who should know it better than your electrician? If a new motor was to be installed, why shouldn't he know what construction would be necessary to bring power to it, and why shouldn't he be able to do the work as well, including the installation and setting of the motor?

The electrician's job in the small and medium sized machine shop today is just what that individual makes it. The day of spare-time study is here, and coupled with practical experience where can a wage earner get a better training for something bigger and better? Why should the growing plant go outside for the chief electrician when it has reached the turning point toward success? There might be at hand a practical man thoroughly acquainted with the plant's equipment—a man who not being contented with being a dub all his life, had fitted himself for something better.

Industrial Cost Accounting for Executives

By PAUL M. ATKINS

The fifteenth article of the series—Composition and disposition of administrative and selling expenses — Outside service costs — Analysis of advertising

ADMINISTRATION and selling expenses are often grouped together for discussion and that plan has been followed here for the sake of convenience. It must not be thought from this arrangement, however, that these two groups of expenses are to be treated in all respects alike. From the point of view of industrial cost-accounting they do have this in common, it is true, that they both differ in their incidence and disposition from manufacturing expenses. Selling expenses are entirely a cost of selling, while administrative expenses represent partly a service to selling and partly to production and, in some cases, a service to the business as a whole which can be attributed to either. Let us first consider the composition of the various accounts in the groups before passing on to a brief study of their disposition.

There are a number of accounts which are similar in many respects to those discussed in the preceding article. The part of the building occupied by the departments in question, together with their equipment must be maintained quite as well as the same class of assets in the factory. Of course, in the office departments there is seldom anything like the amount of work of this kind to be done that there is in the factory, and so the extensive subdivision of the maintenance accounts which was discussed in the preceding article is not needed here. Usually one account will be sufficient except, possibly, for such a department as the experimental department when it appears in this group. In such a case, the same accounts will be needed as for a factory department.

Offices Must Be Kept in Good Shape

It must not be thought from what has just been said, that the maintenance work of selling and administration departments is a wholly insignificant item which can be neglected in the cost records. The office must be cleaned with considerable frequency, the general appearance of this section of the building must be kept in much more attractive shape than is necessary for the factory. With the introduction of modern methods of record keeping there has come the extensive employment of machines of various kinds—typewriters, adding machines, billing machines and calculating machines—and all of the equipment must be kept in satisfactory condition. There is not a department in the two groups which does not require a maintenance account.

Every department requires the services of individuals to carry on its various functions, and hence, wages and salaries must be paid. With the exception of the remuneration of the salesmen, there is practically none of this which can be treated satisfactorily as direct wages. Occasionally, in the drafting or experimental departments orders are issued in such a form that the time of those working on them can be charged directly to them, and under such conditions when these departments are in the administrative group, there is also the possibility of an exception here. The distinguishing characteristic of these departments in respect to labor costs in contrast to the factory departments is that in the former most of the labor is indirect. In general, however, it is not necessary to subdivide the account because the debits to be made to it are sufficiently homogeneous to render that unnecessary.

Division of Salaries

The principal problem which comes up in connection with the account is the division of the salaries of those individuals who render services in more than one department. If their time is divided in an easily measured manner, then the salaries can be allocated in the same proportion. If such is not the case, then it becomes necessary to estimate the distribution. The estimate should be made by several persons independently and the results compared in order to eliminate personal reactions as far as possible.

Supplies is another account which will be found in most departments. Pencils, paper and ink seem like small items, but they all count up in the long run. Printed forms, in particular, are costly and their use should be controlled. It is expensive not to use printed forms when their employment would result in the reduction or elimination of errors, but to use them for scratch pads as is so often done by clerks, should be entirely forbidden. It is quite desirable that each department should be made responsible for its own consumption of such materials.

A reclamation of errors account should appear in the classification for most departments. It must not be thought for a moment that the factory is the only section of the business that can make costly mistakes. An error on the part of a clerk in the order department may result in incorrect instructions being transmitted to the planning department, and as a result large quantities of goods may be made up which do not meet the customer's requirements and must be scrapped. It is only appropriate that the department which made the mistake should be charged with its cost, and that the factory or the business as a whole should not promiscuously bear the burden.

The point may seem insignificant but a little analysis will show that it has considerable bearing on the control

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of the business. Many a manager will insist on having capable employees in the factory and energetic salesmen on the road, and is willing to pay liberally for them. Yet, he will often try to operate his business with the cheapest possible clerical labor in his office—cheapest in the sense of wages paid and services rendered, but often the most expensive in the long run. An account of a kind which indicates unmistakably the cost of his policy will give him some idea of the inefficiency of such methods and enable him to form some idea of the importance of such work.

If the chief executives will be perfectly frank with themselves, such an account should appear in the executive department and, if justly used, it will often show large amounts from time to time. When executives make mistakes, and even the best of them do from time to time, they are apt to be the most expensive of all.

Telephone and Telegraph Expense

There are certain other accounts which appear in some of the departments that are rarely or never met with in the factory departments. Telephone and telegraph charges are among them. The sales department, traffic department, executive department, and often the purchasing department are the ones which most extensively make use of this convenience. It is usually not difficult to record the source of the outgoing long distance calls and telegrams and so to correctly apportion the charges. Of course, most departments make use of inside telephone connections, and the cost of such service can be distributed on the basis of the number of telephones in each department. Often, the charge is on a rental basis and so can easily be incorporated with the fixed charges.

The progressive manager generally realizes that he is not omniscient and neither are his associates or employees. Hence, he is increasingly making use of outside services of various kinds, some of which are already well established as sound business practice. Few concerns go for any great length of time without having their books of account audited. That is primarily a service to the accounting department in checking up its work, and through it to the business as a whole.

There are very few concerns whose credit departments are not equipped with service rendered by either Dun or Bradstreet and often with both. The executive department is usually provided with reports such as Babson's or Brookmire's, and frequently industrial engineers, lawyers and other specialists are called upon for advice. All the various departments which avail themselves of such services should be provided with expense accounts to which the costs thereof may be charged.

It sometimes happens that a business is built up by the efforts of a few individuals. This is, of course, the ordinary way of development in the case of a partnership, but it holds true also for corporations. Under such circumstances it is often of vital importance to the company not to lose the services of these individuals, and if they are lost for any reason, the balance sheet is likely to be affected adversely. It is not possible to protect against possible severance of connection for all reasons, but is is possible to insure against financial difficulties due to the death of the person holding the key position, and this is often done. The premiums of the life insurance policy are paid by the company and are properly an expense of the department in which the person works. Hence, an expense account should be provided. Of course, on the death of the person insured the company receives the amount of the insurance which it has carried to use in any way needed to meet the emergency.

When we come to the selling departments we find that there are several kinds of expenditure which differ from those already considered. In certain respects the work of these departments is analogous to that of the manufacturing departments. We often speak of the salesman *making* sales and in so doing we indicate that similarity. Just as we have *direct* costs of production so we also have *direct* costs of sales. The whole subject is rather outside the scope of this series of articles, but a few words devoted to some of the more outstanding features of the problem may aid in getting some grasp of the situation. The question of selling costs is a subject as large in many ways as that of production costs, which will be treated in the series.

We may think of the salesmen's salaries, their commissions, traveling expenses and such other items as bonuses, as being the direct cost of selling, for they can be allocated with some definiteness against the sales which result from the efforts of the salesmen. These different forms of remuneration should be charged directly against the cost of selling and not debited to the wages and salaries account in the sales department. The same thing should be done with the traveling expenses in charging them to cost of selling and not to some expense account of the sales department. It should not be inferred from the foregoing that there should be no traveling expense account for the sales department because it is usually necessary to carry such an account to take care of the traveling costs of the sales manager himself.

Advertising and the Advertising Department

The advertising department also offers some interesting questions. One of these is in connection with the cost of advertising. Should it be treated as a part of the expense of the department or not? A little analysis will reveal that the amount paid for advertising is not a part of the cost of operating the department. It is the result of the operation of the department, it is true, and the ratio of this expenditure to the returns obtained is one way of measuring the departmental efficiency, but it can hardly be considered an expense of operation. If it is not a cost of operation, then it should not be treated as a departmental expense, though it may, under certain circumstances be entered as a non-assignable expense. The most satisfactory way to handle such an item is to charge it to an advertising account at the time the expenditure is made. It can then be credited to the account and debited to any account which may appear appropriate. Perhaps the most suitable place to allocate it is to the cost of selling directly without passing it through any other account.

There are several details which ought to be remembered in connection with the expenditure. The full effect of advertising is often not felt till sometime after publication. Hence, it is sometimes distinctly incorrect to charge off the entire cost of advertising in the period in which it appears. It also happens that in some cases a single article of a whole line is advertised, but in trying to ascertain the cost of selling the goods it must not be forgotten that much of the benefit of the advertising is shared by the entire line and even by the business of the company as a whole, and hence, the entire cost of the advertising should not be allocated

against the single article which is especially stressed therein.

Of course, the selling departments have many other expense accounts like those of other departments already described, such as accounts for maintenance, supplies, insurance and fixed charges. Taken altogether with any other additional special expense accounts, means are provided for the costs of operation of this group of functions of the business.

The Disposition of Selling and Administrative Expense

When accounts have been provided for the recording of the different administrative and selling expenses, the next question which arises is in regard to their disposal. Probably, the commonest as well as the simplest method of dealing with the problem is to charge them off to profit and loss. This enables the books to be closed and disposes of the expenses so that the next month's transactions may be recorded, but it can hardly be said to aid very much in the control of the business.

What the executive wants to know is the cost of manufacture, the cost of selling and the wasted production and sales capacity. Methods have been developed for dealing with the problems in so far as production is concerned, some of which will be discussed in succeeding articles. In regard to sales, however, very much less has been accomplished in that direction. Some steps, it is true, have been taken toward allocating the selling costs against the sales. It may be done by debiting to a trading account the total of the controlling selling expense account, adding the cost of advertising for the period and salesmen's remuneration and expenses. In some cases, too, a certain share of the administration expense account is also debited. It is correct in so far as it accomplishes the segregation of expenses concerned only with selling from those which form a part of the costs of production, but it is lacking in that it does not distinguish between the utilized and unutilized sales capacity.

This is not such a serious problem as the same one in regard to production, because in dull periods it undoubtedly does cost more to make sales than in the busy cycle when salesmen are often hardly more than order-takers. It is not fully satisfactory, however, and it is to be hoped that commercial cost-accountants will progress as rapidly in the solution of this problem as industrial cost-accountants have with their form of it during the last few years.

If this last described method is employed—and it seems to be about the best in use at present—the trading account will appear somewhat as follows:

Trading Account

General journal (amount of cost of sales. Credit therefor to merchandise account.)

General journal (amount of selling expenses. Credit therefor to selling expense account.)

General journal (amount of advertising chargeable in period. Credit therefor to advertising account.)

General journal (amount of direct selling cost. Credit therefor salesmen's salaries account and salesmen's expense account.)

General journal (part of administration expenses. Credit therefor to administration expense account.)

General journal (balance of this account closed into profit and loss account. Credit therefor to profit and loss account.)

General journal (amount of net sales. Debit therefor to general sales account.)

The disposition of that portion of administration expenses which represents the costs of the benefits of these functions to production is discussed in a later article in which the distribution of manufacturing expenses is treated.

While only a very little space has been given to the investigation of selling expenses, the executives must remember that it is quite as necessary to control these expenses, and that they can give him as much information for the guiding of his policies as the manufacturing expenses. A series as long as the present one would be necessary to deal adequately with the subject.

Why Make Square-ended Pins?

By John R. Godfrey

There's something mighty queer about the inner workings of the alleged brains of those who inflict motor cars on the over-anxious public. It looks almost like a conspiracy on their part to increase the income and well-being of garages and the men who infest them. There are exceptions, of course, but after the average man looks over my car for any reason, I go over it pretty carefully myself to see how many cotter pins he has left out, or taken out. I've been even more particular about this since I had a wheel come off out on the road, because the tried-and-trusted employee of a well known firm had left the cotter out of the axle end. And, as I find it more comfortable for all concerned to have four wheels on the bus, I always inspect for cotter pins after a visit to the so-called automobile service station.

The designers, however, seem to make it as difficult as possible to do a little job yourself. Brake rod pins, for example, almost invariably have the ends square instead of chamfered. It's easy enough to slip them through the holes in the rod and clevis when everything is new and the body isn't on the chassis. But when something lets go on the road and you crawl underneath the car, its a different story.

Square-ended pins don't go into place worth a cent unless everything is in line, and it's no great joy to lie in the road with both hands working at the vitals while choice gobs of oil drop into your eye, or otherwise decorate your beautiful countenance. It's then that the maker of square ended pins gets blessed good and plenty. Even a slight chamfer on the end helps and a taper, for perhaps a sixteenth of an inch, is a real joy. It ought to be a jail offense to make 'em any other way.

Annual Report of Engineering Foundation

Civilization must choose between research and going back, it is asserted in the annual report of the Engineering Foundation, which, reviewing the eight years of its history, finds that, particularly as the outcome of the War, research effort is growing among American engineers, industrialists and business men.

Founded by Ambrose Swasey, a Cleveland manufacturer and a native of New Hampshire, with an endowment of $500,000, the Foundation in the report, made public by Chairman Charles F. Rand, tells of numerous achievements accomplished during the past year in association with the National Research Council and other agencies.

Proposed Definition of Terms Relating to Metallography

AS AN indication of the growing realization of the importance of standardized nomenclature in different lines of engineering, we print the proposed definitions of the American Society for Testing Materials regarding Metallography. These definitions have not yet been adopted and must not be considered as standard until further action has been taken. Criticisms of these tentative definitions are solicited and should be sent to G. F. Comstock, Secretary of Committee E-4, Titanium Alloy Manufacturing Co., Niagara Falls, N. Y.

Alloy.—A union, possessing metallic properties, of two or more metallic elements, or of metallic and non-metallic elements, which are miscible with each other, at least to some extent when molten, to form a homogeneous liquid and do not separate into distinct layers when solid.

NOTE.—Such combinations when cold may consist of mechanical mixtures, eutectics or eutectoids, solid solutions, or chemical compounds, one or more of which may exist at the same time.

Alpha Brass.—A copper-zinc alloy with a copper content greater than approximately 64 per cent. It is composed of but one type of crystals all of which are of the same composition.

Beta Brass.—A copper-zinc alloy with a copper content of approximately 54 per cent, composed of but one type of crystals all of which are of the same composition.

NOTE.—At ordinary temperatures, the normal range of beta brass is from 51 to 55 per cent copper. Quenching from higher temperatures considerably broadens this range. Between 64 per cent copper and 55 per cent copper, the copper-zinc alloys consist of mixed crystals of alpha and beta, the relative proportion of which depends upon the composition and heat treatment. When rapidly cooled from high temperatures (that is, from at or near the melting point) mixed alpha and beta may occur with copper as high as 70 per cent.

Etching Reagent.—A substance or reagent used to reveal the structure of a metal or alloy causing a difference in the appearance of different constituent parts or different grains.

NOTE.—This substance is usually a solution of the reagent in water, acid or alkali, but etching may in some cases be brought out by a differential oxidation produced by "heat tinting."

Equi-axed.—This term is applied to the grains of a metal or alloy after solidification and to grains of metals or alloys which have been strained and allowed by a process of suitable annealing to assume a condition approaching crystalline equilibrium.

Equi-axed Grain.—An unstrained grain which has approximately equal dimensions in all directions.

NOTE.—This term is practically restricted to unstrained metals.

Grain.—A term used for an allotrimorphic crystal present in metals and in one-constituent alloys.

NOTE.—Although a crystal may show division by "twinning," etc., it is regarded as the grain rather than smaller sub-divisions. In the case of alloys of more than one constituent, the crystal which, by its transformation, gave rise to these constituents is taken as the grain when its limits are still discernible; if the limits are not discernible the individual constituents are considered as grains.

Grain Size.—This is preferably expressed as the number of grains per unit area of cross-section. The average cross-sectional area of the grain may also be given or the average dimensions. Grain size of strained material is expressed by the average number per linear unit in two directions, or by the average number per unit cross-sectional area, together with the ratio of length to breadth (L/B).

NOTE.—By the "intercept" Method for grain count, the number of grains and fractions of grains along a line of known length on two axes at right angles to each other are counted. By the "Planimetric" Method for grain count, the number of grains and fractions of grains within a definite area are counted.

Intercept Method for Grain Count.—See note under Grain Size.

Macrograph.—A graphic reproduction of any object which has been magnified not more than 10 times.

NOTE.—When it is desired to indicate that it is a photographic reproduction, the term "photomacrograph" may be employed.

Magnification.—The ratio of the size of the image to that of the object, based on linear dimensions, and generally expressed in "diameters," thus: $\times 100$ or 100 diameters.

Metal.—Any of the metallic elements, either of very high purity or of ordinary commercial grades.

NOTE.—Brass or other alloy is a metal in the commercial sense, but an alloy in the scientific sense.

Micrograph.—A graphic reproduction of any object magnified more than 10 times.

NOTE.—When it is desired to indicate that it is a photographic reproduction, the term "photomicrograph" may be employed.

Muntz Metal.—A term often loosely applied to a brass, i.e., a copper-zinc alloy, that can be mechanically worked while hot. Originally applied to brass of the composition: Copper, 60 per cent; zinc, 40 per cent; such brasses consist of a mixture of two constituents termed "alpha" and "beta."

Planimetric Method for Grain Count.—See note under Grain Size.

Modern Agricultural Implements in Egypt

Imports of agricultural implements into Egypt in 1922 were valued at $319,921, an increase of nearly 50 per cent over 1921, when imports were valued at $219,682, says the Agricultural Implements Division of the Department of Commerce. Notwithstanding this increase, these figures indicate a backward trend in the use of implements in Egypt as compared with pre-war years. Imports in 1913 amounted to $1,329,725, while in 1920, which was a boom year in Egypt and when money was plentiful because of the high prices obtained for the cotton crop of that year, imports amounted to only $636,836, which was less than half of the amount imported in 1913.

Cheap and abundant labor and the conservatism of the native farmers serve to restrict the use of modern implements. Deep plowing is not required as the soil is regularly renewed by flooding. Numerous canals are required by the irrigation system and consequently the land is divided into small sections. The native types of implements which have been used for centuries appear entirely satisfactory, and can be purchased at a comparatively low cost. However, there is a spirit of progress noticeable in some sections of the country and implement makers consider the future as hopeful.

Bookkeeping for the Small Plant

By C. J. MORRISON

The requirements for setting up a bookkeeping system—Numbering accounts, checks and stubs—Making entries in purchase book and ledger—Drawing up statements

A SHORT time ago a small manufacturer went to his bank and asked one of the officers to help him make out his income tax report, and, as this is a service rendered by the banks, the officer gave a ready consent. However when the manufacturer began to unpack a large satchel and to place stack after stack of canceled checks upon the desk the bank officer began to wonder what kind of a task he had undertaken and he did not feel at all assured by the explanation, "The checks show my expenses while the monthly statements of deposits give the receipts and the difference is the profit for the year." When asked about the inventory and other capital expenditures, the manufacturer replied, "I think the inventory was about the same at the end of the year as at the beginning, and no additional equipment was purchased during the year." The task could not be performed during banking hours, but ran far into the night as well as taking all of a Saturday afternoon and when completed was of doubtful accuracy.

If this manufacturer was the only one who kept his books in such a manner, no more thought need be given to him, but unfortunately he is one of many. Yet for a small establishment to keep the accounts properly is a very simple matter which requires little time and no special training.

Dismissing the question of inventory for the present and considering only the regular bookkeeping, all that is required is a check book, invoice blanks, two dozen folders for filing, a large loose-leaf binder to take sheets about 11x14 in. and, for the binder, a supply of paper ruled with many columns. The folders should be marked two for each month in the year and one set labeled, "Bills Payable" and the other "Accounts Receivable."

Numbering the Accounts

As bills are received they should be numbered consecutively and placed in the folder for the month when they were received. A convenient way to number is to use for the first part, the number corresponding to the month and for the last part the bill's individual number; thus 101 would be the first bill received in January, 110 the tenth received in January, while 1001 and 1010 would be the first and tenth bills in October. The system allows 99 bills to be received in each month which is probably enough for a small establishment, but if such is not the case, a start should be made with 1001 which allows for 999 bills each month. In the latter system the first bill in October would be 10001.

Just so far as possible all bills should be paid by check and the number of the check should be placed on the bill which it pays. A few items such as street car fares and postage cannot be paid by check, but must be handled through the "Petty Cash." An easy way to handle these matters is to draw a definite amount of money for petty cash, keep an account of the money spent and each week draw a check to reimburse the

No 118 Date March 8 1923						
Favor of Power & Light Corp.						
For 303					24	50
No 119 Date March 8 1923						
Favor of Cash					225	00
For 304						
No 120 Date March 9 1923						
Favor of C. B. Brass Co					245	00
For 305						
			Total Checks Drawn		494	50

Date 1923		Deposits			
		Balance Brought Forward		1078	82
March	5	Richard Roe & Co 210		51	00
	6	The Specialty Co. 215		206	05
	8	Rex Mfg. Corp. 218		343	00
		Total Deposits		1678	87
		Deduct Checks Drawn, Nos. 118-119-120		494	50
		Balance Forward		1184	37

FIG. 1—ENTRIES ON CHECK BOOK STUB

petty cash. A regular bill should be made for this disbursement, numbered, and placed in its place in the proper folder. Such a bill for a typical week might appear somewhat as follows:

No. 308
PETTY CASH

Street car	$2.10
Postage	1.08
Delivery charge	.35
Total	$3.53

Ck. 216

The entry "Ck. 216" shows the number of the check with which the bill was paid.

Invoices should be numbered in the same manner as the bills and a copy of each invoice should be placed in the accounts receivable folder for the month in which it was issued.

The checks and their corresponding stubs should be numbered consecutively and the stubs should show the amount of each check drawn, to whom payable and for what bill. The stubs should also show the amount of

PURCHASE BOOK MONTH OF March 1923

Date 1923	Bill No.	Ck. No.	Description	8+9+16 Accts. Payable Total 1	Rent 2	Payroll 3	Small Tools and Supplies 4	Light and Power 5	Freight, Express and Delivery 6	Repairs 7	2 to 7 Inc. Factory Sub-total 8	10 to 15 Inc. Adm. Sub-total 9
Mch. 1	301	113	Cons. Realty Co.	100 —	100 —						100 —	
2	302	114	City Supply Co.	28 35			10 75				10 75	3 10
7	303	115	Power & Light Corp.	24 50				24 50			24 50	
8	304	119	Cash	225 00		225 00					225 00	
8	305	120	A. B. Brass Co.	250 00								
9	306		Home Box & Lumber Co.	55 10						25 10	25 10	
9	307	121	National Trucking Co.	3 50					3 50		3 50	
10	308	122	Petty Cash	3 53					35		35	3 18

FIG. 2 (a)

Salaries 10	Office Supplies and Expense 11	Sundry 12	Travel and Hotel 13	Ins. and Taxes 14	Advertising 15	Capital Sub-total 16	Mdse. 17	Equipment 18
	3 10					15 00	15 00	
						250 00	250 00	
						30 00	30 00	
	1 08		2 10					

FIG. 2 (b)

FIG. 2—PURCHASE BOOK

each deposit, from whom received and to what invoice the amount applies. A typical stub is illustrated in Fig. 1. The figures after the names show the numbers of the bills and invoices to which the checks and deposits apply. All receipts should be deposited even though some may be in cash and cash is withdrawn at the same time. No checks should be drawn for personal bills, but a separate bank account should be kept for such matters.

As bills are paid the check number should be written on each bill and, similarly, as payments of invoices are received the check number, bank and date should be written on each invoice or if the payment is made in cash, this fact and the date should be recorded. A typical record on a payment made by check would be as follows: "1026,M&M., Newark, N. J. 3/5/23."

The Purchase Book

Two pages of the loose-leaf book which face each other should be made out somewhat as illustrated in Fig. 2, a and b, but with whatever changes may be necessary to satisfy the requirements of the business. One firm may own the property and not need the "rent" column, while some other concern may wish several columns for merchandise so as to keep separate accounts of different items.

As each bill is received it should be assigned a number and entered in the purchase book, but the check number should be left blank until the bill is paid. Typical entries would be as shown where bills 301 to 305 inclusive, 307 and 308 are paid and 306 has not been paid. At the end of the month all of the columns should be footed up and the totals entered at the bottom of the page. The total of column 1 should equal the sum of the totals of 8, 9 and 16 and if it does not, there is a mistake which must be found. However, if care is used in making the entries, there will be little or no trouble at the end of the month.

As checks are drawn to pay the bills, corresponding entries should be made on the credit (cash paid out) side of the ledger as shown in Fig. 3. The column headed "net cash" should show the amount for which each check is drawn while the "accounts payable" column gives the amount of each bill and when there is

MONTH OF March 1923 CASH PAID OUT Cr.

Date 1923	Details	Bill Number	Net Cash	Disc.	Accts. Payable
Mch. 1	Cons. Realty Co.	301	100 00		100 00
2	City Supply Co.	302	28 28	57	28 85
8	Power & Light Corp.	303	24 50		24 50
8	Cash	304	212 50		212 50
9	A. B. Brass Co.	305	244 00	60	250 00
9	National Trucking Co.	307	3 50		3 50
10	Petty Cash	308	3 53		3 53

FIG. 3—CREDIT OR CASH PAID OUTSIDE OF THE LEDGER

Dr. MONTH OF March 1923 CASH RECEIVED

Date 1923	Details	Net Cash	Disc.	Accts. Rec.	Interest	Miscl.	Capital
Mch. 1	Balance	900 00					
2	Rex Mfg. Corp.	101 50		101 50			
5	John Doe Co.	105 60	2 15	107 75			
	Richard Roe & Co.	51 00		51 00			
6	The Specialty Co.	206 05	4 20	210 25			
8	Rex Mfg. Corp.	343 00	7 00	350 00			
	Bank	5 00			5 00		
	Cash Sale of scrap	3 70				3 70	

FIG. 4—DEBIT OR CASH RECEIVED SIDE OF THE LEDGER

no discount the two entries are the same. The entries should be footed up at the end of each month and the sum of the totals of the net cash and discount must equal the total of accounts payable. Also the total of column 1 of the purchase book less the total of the bills not paid must equal the total of the accounts payable on the ledger.

As payments of invoices are received entries should be made on the debit (cash received) side of the ledger as shown in Fig. 4. Care should be taken to enter under "net cash" the exact amount received while the discounts deducted are shown under "discount" and the amount of the invoices paid, net cash plus discount, under "accounts receivable." At the end of the month the total of the net cash on the debit side less the total of the net cash on the credit side gives the balance to be carried forward to the next month and this balance should be the same as the balance shown in the check book, which in turn must check with the statement from the bank.

Annual Statement Easily Drawn

At the end of the year a statement, itemized to meet the requirements of the government, can be made up in a very short time. The only item missing is that of inventory and a simple method of keeping it will be given in another article. Moreover, a statement can be drawn off at any time to show the owner the exact status of the business. The items in the purchase book which bear no check number show the outstanding bills (accounts payable) while the invoices which have not been marked as paid give the accounts receivable.

A statement as of March 1, 1923, might appear as follows:

ITEMS		WHERE OBTAINED
Assets		
Cash	$900.00	Debit side of ledger and check book.
Accounts receivable.	3,250.00	Invoice folders.
Merchandise	10,215.00	To be described later.
Total quick	$14,365.00	
Machinery and fixtures	5,225.00	Value before books were started plus purchase book entries under "quipment."
Total	$19,590.00	
Liabilities		
Accounts payable	2,125.10	Items in purchase book without check numbers.
Reserve for dep.	1,045.10	Predetermined rate to be written off each month and the total to date used in the statement.
Capital invested	14,000.00	Items in ledger under "capital."
Total	$17,170.20	
Surplus	2,419.80	
	$19,590.00	

Little work is required to draw off a statement of this sort each month and the increase in the surplus will show the profit made. Also in case there is occasion to borrow money, the most recent one of these statements can be presented to the bank and will be found to satisfy its requirements.

Depreciation of a Lathe—Discussion

By W. T. Bowker

On page 694, Vol. 58, of the *American Machinist*, appear a few remarks upon the sound value or going value of a lathe as compared to its sale value, and I merely wish to state that Mr. Thwing's conclusions in this matter are extremely sound and follow the accepted practice of almost all appraisal companies.

As a usual thing, the owner of a factory is more interested in what might be termed the "utility value" of his equipment than he is in the amount of money it would bring on the market when considered as second hand equipment, and in most cases the securities commissions who administer the blue sky laws of various states have come to the agreement that the utility value of a lathe, or of a complete plant, is the value to the public asked to buy the plant in the form of preferred stocks, bonds, and other securities.

In my experience in the appraisal business I have found, on numerous occasions, machines which, considered from the viewpoint of their sale value or salvage value, were worth absolutely no more than the scrap metal price of the machine delivered at the melting cupola, but the machines were used and useful and the owner was obtaining production from them. They had utility to him, and for that reason it was necessary to assign a certain value to them.

I remember one factory which I appraised that was in the business of making sewing machines. There was a battery of Lincoln milling machines which had been used to produce rifle parts during the Civil war. Those machines were used to make small sewing machine parts and were every bit as efficient and useful to their owner as new machines that he could have purchased. They could have been sold to but very few other manufacturers or even second hand dealers for any more than their junk value.

Too much confusion exists in the minds of many people on what constitutes value, but I think it can be safely stated that in most cases the value to be determined is the value in use and not at all how much the thing valued would bring in the second hand market, or under forced sale or liquidation.

TABLE XXV

France—Imports of Machine Tools

"Machines-Outils"

Countries of Origin	1909 Q.M.	1909 Francs	1910 Q.M.	1910 Francs	1911 Q.M.	1911 Francs	1912 Q.M.	1912 Francs	1913 Q.M.	1913 Francs	*1914 Q.M.	*1914 Francs	1915 Q.M.	1915 Francs
Sweden	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Great Britain	28,874	.....	29,908	.....	30,605	.....	38,247	.....	50,920	.....	.....	.....	44,909	.....
Denmark	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Germany	77,666	.....	79,008	.....	89,197	.....	116,965	.....	120,439	.....	.....	.....	901	.....
Saar Basin	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Belgium	14,293	.....	13,058	.....	16,279	.....	26,621	.....	24,517	.....	.....	.....	.....	.....
Netherlands	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Switzerland	4,548	.....	3,458	.....	2,715	.....	3,764	.....	5,499	.....	.....	.....	19,809	.....
Czecho-slovakia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
United States	14,932	.....	21,455	.....	30,195	.....	35,620	.....	44,558	.....	.....	.....	218,431	.....
Canada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Spain	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,383	.....
Brazil	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Italy	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	624	.....
Norway	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Other foreign countries	2,682	.....	2,878	.....	2,594	.....	3,311	.....	3,236	.....	.....	.....	988	.....
Total	142,995	29,313,975	149,765	30,701,825	171,585	35,174,925	224,528	46,028,240	249,169	51,079,645	.....	.....	288,045	177,147,675
Colonies and Protectorates	36	7,380	18	3,690	7	1,435	3	615	27	5,535	.....	.....	28	17,220
TOTAL	143,031	29,321,355	149,783	30,705,515	171,592	35,176,360	224,531	46,028,855	249,196	51,085,180	152,303	31,222,115	288,073	177,164,895
Average Exchange Rates		.193		.193		.193		.193		.193		.199†		.182
Value in U. S. Dollars		5,659,021		5,926,164		6,789,037		8,883,569		9,859,439		6,213,201		32,244,011

* No detailed statistics available for 1914.
† Seven months' average.

Countries of Origin	1916 Q.M.	1916 Francs	1917 Q.M.	1917 Francs	1918 Q.M.	1918 Francs	1919 Q.M.	1919 Francs	1920 Q.M.	1920 Francs	1921 Q.M.	1921 Francs	1922 Q.M.	1922 Francs
Sweden	981	.....	733	.....	118	.....	2,407	.....	4,461	.....	.....	.....	.....	.....
Great Britain	65,198	.....	125,073	.....	86,760	.....	76,404	.....	91,178	.....	.....	.....	.....	.....
Denmark	478	.....	.....	.....	.....	.....	.....	.....	4,082	.....	.....	.....	.....	.....
Germany	.....	.....	.....	.....	.....	.....	*4,911	.....	*139,492	.....	.....	.....	.....	.....
Saar Basin	.....	.....	.....	.....	.....	.....	1,080	.....	1,315	.....	.....	.....	.....	.....
Belgium	.....	.....	.....	.....	633	.....	10,477	.....	93,105	.....	.....	.....	.....	.....
Netherlands	.....	.....	.....	.....	.....	.....	.....	.....	1,152	.....	.....	.....	.....	.....
Switzerland	76,614	.....	41,396	.....	22,147	.....	32,768	.....	46,055	.....	.....	.....	.....	.....
Czecho-slovakia	.....	.....	.....	.....	.....	.....	.....	.....	2,983	.....	.....	.....	.....	.....
United States	324,554	.....	378,061	.....	180,165	.....	208,879	.....	184,727	.....	.....	.....	.....	.....
Canada	.....	.....	.....	.....	.....	.....	.....	.....	3,133	.....	.....	.....	.....	.....
Spain	5,364	.....	3,762	.....	870	.....	2,321	.....	1,127	.....	.....	.....	.....	.....
Brazil	305	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Italy	536	.....	899	.....	1,010	.....	1,569	.....	10,688	.....	.....	.....	.....	.....
Norway	.....	.....	174	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Other foreign countries	470	.....	739	.....	95	.....	1,736	.....	795	.....	.....	.....	.....	.....
Total	474,500	291,817,500	550,837	338,764,755	291,798	179,455,770	341,552	230,547,600	584,293	584,293,000	.....	.....	.....	.....
Colonies and Protectorates	226	138,990	92	56,580	47	28,950	936	631,800	241	241,000	.....	.....	.....	.....
TOTAL	474,726	291,956,490	550,929	338,821,335	291,845	179,484,675	342,488	231,179,400	584,534	584,534,000	.....	.....	.....	.....
Average Exchange Rates		.170		.173		.178		.135		.070				
Value in U. S. Dollars		49,632,603		58,616,091		31,948,272		31,209,219		40,917,380				

Q.M. = Metric quintal = 100 kilograms = 220.46 lb.
* These figures include reparations shipments.

Simplification of Paper Sizes

Abstract of report of the Sectional Committee on Book and Magazine Paper to the Committee on Simplification of Paper Sizes appointed by the Bureau of Standards, Department of Commerce

FOLLOWING upon the report of the Committee on the Elimination of Waste in Industry of the Federated American Engineering Societies, it was revealed that further studies of the more intimate detail of the various elements that enter into the equation, such as raw materials, would prove that further elimination of waste, through simplification and standardization methods could be effected.

In August, 1921, the Department of Commerce appointed a committee to investigate the size and grade situation in the manufacture and use of printing papers. This committee made a report showing existing sizes of publications and mailed out 20,000 copies with a questionnaire requesting criticisms and suggestions.

In September, 1922, the general committee was sub-divided into sections, and the report being considered here is that of the sectional committee investigating the situation now existing in the book and magazine paper field.

> At one time there were sixty different sizes of a certain type of machine, but through exhaustive research and with the help of the paper manufacturer, publisher, printer, and binder, this has been reduced to six, thus simplifying and economizing the production of printing and binding, as well as eliminating waste in material and human effort.

The latest statistics available through the Federal Trade Commission, Department of Commerce, and the American Paper and Pulp Association, show that slightly over 1,000,000 tons of book and magazine paper are produced annually in the United States, in which production there are utilized 258 book paper making machines, ranging in width from 56 in. to 196½ in., and having a total estimated capacity of 3,849 tons per 24-hr. day. A quick mental analysis of this vast range in widths implies immediately to our minds the vast changes that have taken place in the past fifty years in the development of paper making machinery, and the total lack of standardization, as well as the variations of opinion as to the flexibility of these machines and what is the best practice as to width sizes. It must be remembered that paper making machines are of tremendous proportions as to length and take up considerable space and investment in paper mills, and determine the contributory factors, such as water pulp conveying devices, digesters, beaters and all the elements that enter into the securing of the finished product, namely, paper in rolls. From this basis the recommendations contained in this report must originate.

The statistics given in the report show that there are many more violations of the recommended standard sheet and roll width sizes in the magazine field than now exist in the jobbing or commercial fields, which in turn accounts largely for the conditions reported in the printing industry by the committee on elimination of waste in industry, when they stated that "the United Typothetae of America by actual survey throughout the country estimated the over-equipment of printing machinery at from 50 to 150 per cent, representing hundreds of millions of dollars of idle equipment," due to a large extent to lack of standardization. In another part of the report on waste in industry it is stated that at one time there were sixty different sizes of a certain type of machine, but through exhaustive research and with the help of the paper manufacturer, publisher, printer, and binder, this has been reduced to six sizes to meet all practical needs, thus simplifying and economizing the production of printing and binding, as well as eliminating waste in material and human effort.

The information compiled shows that there are today 441 different sheet sizes and 93 different roll widths of book paper being used in the magazine publishing field alone.

The committee's idea in submitting the detailed reports has been to so arrange these varying page sizes into groups that they will fit into the range of the suggested sheet sizes and thus carry back, by the slightest variations, while still retaining their general appearance, this standardization to the paper machine itself. The present conditions appear to be unintentional, arising from a lack of guidance and as a result of custom which has been crystallized into habit and needless prejudice, but we feel that these objections can be removed by education and appeal to self interest and the benefits to be obtained. Certainly the advantages far outweigh the drawbacks.

The most economical or ideal production of book paper would be with the elimination of all orders requiring less than a 24-hr. run of a paper machine, which would amount to from 20 to 25 tons per day, depending upon their minimum special direct-making-order trade customs to a 24-hr. machine run for a size and weight. Through a reduction in the present wide variety of paper sizes substantial savings would be made in the cost of printing, printing machinery manufacture as well as in paper costs.

Those sizes and roll widths given in the recommendations should therefore be used as guides for the elimination of paper orders that call for less than 25-ton orders or a 24-hr. run for a book paper machine of the ordinary type.

It is also to be remembered that while to the large users of paper who are in a position to have their paper manufactured especially for their own requirements, the full weight and purport of this report will not be of immediate concern, it should be realized that the benefits to be derived from a general standardization of various printed forms would result in great benefits to advertisers, lithographers, machine manufacturers, printing production generally, as well as in paper making machines for paper mills.

Therefore the committee wishes to submit here its recommendations for sheet sizes in their single and doubles, as well as rolls, as outlined in the accompanying table, in which are given a broad range of untrimmed page sizes that will cut to advantage from the sheets as given, and will be the first step toward effecting the savings that are possible by adherence to this program.

RECOMMENDED SHEET SIZES AND ROLL WIDTHS FOR UNTRIMMED PAGE SIZES

Sheet Sizes—Single	Sheet Sizes—Doubles	Untrimmed Page	Untrimmed Page	Untrimmed Page
	37 x 49		6⅛ x 9¼	9¼ x 12¼
26 x 29	29 x 52		7¼ x 13	13 x 14½
25 x 38	38 x 50	4⅜ x 6¼	6¼ x 9½	9½ x 12½
28 x 42	42 x 56	5¼ x 7	7 x 10½	10½ x 14
28 x 44	44 x 56	5¼ x 7	7 x 11	11 x 14
30½ x 41	41 x 61	5⅝ x 7⅝	7⅝ x 10¼	10¼ x 15¼
32 x 44	44 x 64	5⅞ x 8	8 x 11	11 x 16
33 x 46	46 x 66	5⅞ x 8¼	8¼ x 11½	11½ x 16½
35 x 45½	45½ x 70	5⅛ x 8¾	8¾ x 11⅜	11⅜ x 17½

ROLL WIDTHS

25, 28, 30½, 32, 33, 35, 37, 38, 41, 42, 44, 45½, 46, 49 50, 56, 61, 64, 66 and 70.

Untrimmed sizes are given because of the lack of standards in trimming and also because of variations in trim due to some publications being side-wired and others saddle-stitched. The average trim off the above sizes is ⅛ in. off head and ¼ in. front and bottom.

The four sizes included in this list, 26x29, 25x38, 32x44, 34x45½, and their doubles, are the sizes the committee on simplification of paper sizes has recommended for general printing use and for jobbers to stock.

Greek Industries Gaining Ground

The textile industry in Greece is rapidly gaining ground and promises to become of the utmost importance to the country within the next few years, according to advices received by the Department of Commerce. This industry includes the manufacture of cotton, wool, and silk fabrics, and hemp and jute products. It is believed that the large influx of refugees will have the effect of transplanting the carpet industry of Asia Minor into Greece.

Some 150,000 persons were engaged in the manufacture of carpets in Asia Minor, of which it is stated that about 75 per cent are Greeks and Armenians, who are now in Greece. Raw materials, wool, cotton, dyes, etc., will be found in Greece of a better quality than in Turkey. The tanning of leather by chemical processes is also steadily gaining ground.

Factors Governing the Strength of Gear Teeth—Discussion

By G. W. Drake

I wish to call attention to an error in the article, "Factors Governing the Strength of Gear Teeth," by Douglas Hamilton, in Vol. 58, page 787, of the *American Machinist*.

Mr. Hamilton makes the statement that a steep helix angle reduces the cross section of the tooth on the normal plane, and hence weakens the tooth. He shows in Fig. 5 outlines of gear teeth on the normal and diametral planes to prove his statement.

The error in his statement and in the outlines shown will be readily seen when it is considered that it is almost universal custom to cut helical gears with regular standard spur gear cutters, in which case the cross section of the tooth on the normal plane will always be the same thickness regardless of the helix angle, and the thickness of the tooth on the diametral plane will vary with the helix angle. It would be possible, of course, to have the thickness of the tooth vary as Mr. Hamilton has shown, but it would not be practical as a general thing because it would require a special thickness of cutter for each helix angle.

I am aware of the fact that the Fellows Gear Shaper Co. advocates such a system and that the same company makes a similar statement and shows the same diagrams in its treatise, "Helical Gear." But it must be noted that the recommendation is for the adoption of only two helix angles, 15 deg. and 23 deg. in order to reduce the number of cutters required to as few as possible. The cutters are thinner than the standard cutters, one thickness for the 15-deg. angle and another thickness for the 23-deg. angle, and of such thickness that teeth cut by them will be of the same thickness on the diametral plane as regular spur gear teeth. Helical gears are by this system calculated in the same way as regular spur gears so far as pitch diameter and number of teeth are concerned.

The statement in question, however, should not be made as a general statement, but should be qualified as applying to the Fellows Gear Shaper Co.'s method of producing helical gears. When the helical angle is increased it becomes necessary to reduce the number of teeth if the pitch is to be maintained, or a finer pitch should be used if the number of teeth is to be maintained. For cases where the helical gears are to replace spur gears and it is desirable to maintain the same pitch diameters, number of teeth and center distance between shafts, the following method by E. J. Lees, of the Lees-Bradner Co., will be found very satisfactory. An example will illustrate it.

Example: To replace an 8 pitch spur gear with a helical gear of the same diameter and number of teeth, use a standard 10 pitch cutter (14½ deg. involute) with a helical angle of 36 deg., 52 min., and a 10 pitch depth. The resulting gear will then be the same on the diametral plane as an 8/10 stub tooth gear, except that the teeth are cut at an angle. If desired a 9 pitch cutter can be used with a helical angle of 27 deg., 16 min. To find the helical angle use the following formula:

$$\text{Cosine of helical angle} = \frac{\text{Normal Pitch of Spur Gear.}}{\text{Normal Pitch of Helical Gear}}$$

Example: $\frac{8 \text{ pitch}}{9 \text{ pitch}} = 0.8888 =$ cosine 27 deg., 16 min.

The Methods and Principles of Frank B. Gilbreth, Inc.—V

By K. H. CONDIT
Editor, *American Machinist*

Route sheet to keep track of materials and parts—The instruction sheet—Duties of the foreman and inspector in keeping the production stream flowing smoothly

IN THE last article we discussed means of keeping the storeroom running in such shape that it could not be responsible for the failure of the man at the machine or the bench to get work materials as he needed them. Assuming that the storeroom is not at fault there may be other reasons why he does not get them. The move man, for instance, may not be functioning as intended.

In the small plant it is quite possible for the foreman to keep track of the movement of raw material and parts in process from machine to machine, but in larger plants some means of checking the movement of work is usually necessary. The Taylor route sheet illustrated in Fig. 17 was devised for this purpose and is used by the Gilbreths where it is applicable. In the form shown the columns at the right, which are used to check the work done on the part and its movement from machine, have not been filled out. A single line put in the proper column indicates the completion of the action designated at the top and enables the man in the routing office to keep track of what happens in the shop.

The columns at the left are used to record certain other facts about the job. Omitting the first two for the present we can see from the third column whether there is to be an instruction card telling what is to be done and whether the workman received it.

In the old days when operations were simpler and tools less complicated the all-round machinist needed only to be told what kind of results were wanted. He took care of the details himself and resented any further instructions. In small job and repair shops today the same conditions exist and the same methods may be used satisfactorily provided the right kind of machinist is on the job and handles the whole thing himself from start to finish.

A different method must be followed in the modern production shop where each man does only a very few of the many operations performed on a given piece. If he had to stop every time a new job came along to find out from the man who performed the previous operations just what he had done, and from the foreman or superintendent just what the piece was to be used for and what he was to do to it, and then tell the next man where he left off, progress would be slow. All sorts of instruction cards and forms have been worked out in various shops, some of them good, others

C M 10 32 R W - 1 M 10 32 R B 1 C

TIME FOR OPERATION | BONUS | INST CARD | TOOL LIST | SKETCH

Cylinder Base. Dr. 6633.1

Iron Casting.

MATERIAL ORDERED

MATERIAL IN STORES

551	193	1	1	1st. Bore and face. B 1	1 M 10 32 R B 1 C
461	161	2	1	2nd. Bore for trunnion shaft. B 3.	
312	109	3	1		2 M 10 32 R B 1 C
90	31	1	1	3rd. Layout.	3 M 10 32 R B 1 C
				4th. Drill and tap. D 5.	4 M 10 32 R B 1 C
				Send to L 5 and post 4RB2C.	
				To Assembly.	

TOTAL 1414494

MOVE | OPERATION | FIRST INSP. | FINAL INSP.

40 WANTED
WEIGHT

Do not post until MV6614.2B7C are at D 5.

FIG. 17—TAYLOR ROUTE SHEET

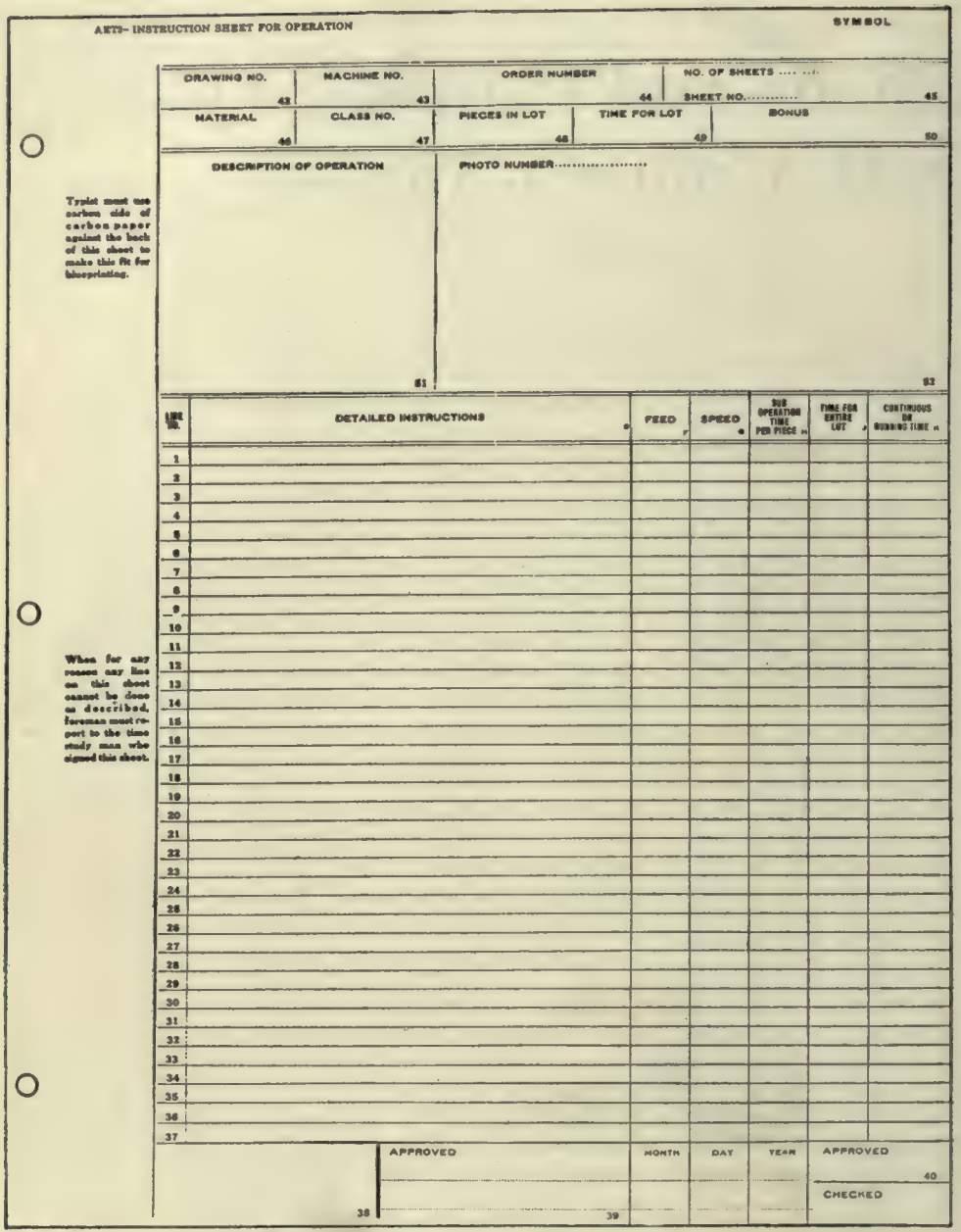


FIG. 18—GILBRETH INSTRUCTION SHEET

bad. One designed by the Gilbreths is shown in Fig. 18.

Enough was said about blank forms in the previous article to obviate the need of any particular comment on this except to say that wherever desirable a photograph of the piece is attached in space 52 to reduce the danger of mistakes due to ambiguity of the written description of the operations to be performed or to make more quickly understood what is wanted. It seems like a waste of words to say that the instructions should be complete and explicit, yet we have all seen many instructions that were hopelessly vague and depended to a large extent on the fact that the man to whom they were addressed had a good idea of what was needed from long experience with the job in question.

Unfortunately for the executive who is too lazy or too inaccurate to get out usable instructions, workmen do die and they do quit. And then a new man has to be broken in and it sometimes happens that nobody in the place knows all the details of the job done by the former holder of it and chaos is the result. Instructions, therefore, should be so explicit that they can be handed to a man who never saw the work before and will tell him so well what he is to do that he can start right in with no need for more than a question or two of his foreman. In fact, they should be so carefully thought out that there should be no need for revising them until the operations themselves are changed. Mr. Gilbreth sets a five-year limit on this. In other words, if no change in method is made in five years it is high time to find out why not.

One other point in connection with the instruction sheet is of importance. It has to do with the proper time of giving the sheet to the operator. If he gets it just as the old job is finished he naturally has to take time to study it to see what the new job calls for. It is much better practice to give it to him well before he wants it. As a matter of fact, it is sometimes advisable where the jobs are of short duration to give him several sheets ahead. Then as the machine works through a piece instead of standing idly by wondering what his friends are doing, it is much more interesting to hang the next sheet or two on the frame or hook over the machine and study it to see what is to be done next.

The same reasoning applies to the tool list for the next job. In addition the early receipt of the tool list may have this effect. The man who gets it may have had experience on similar work and may remember the tools he used to get the best results. When he gets the list and finds the tools are not the best ones for the job he can call his foreman and tell him about it. In this way the workman checks up on the planning department. If he got the list just as he needed the tools he might very reasonably decide that it would be easier and quicker to get the tools called for than to take the trouble to upset the system enough to get the ones he knows are better for the job. He might well consider that it was not his affair.

It seldom happens that many errors are caught on the planning department. For one reason, their pride would suffer seriously if there were very many. For another, the man who was making such errors would soon be transferred to some position better suited to his ability.

Getting back now to the matter of keeping the workman supplied with work, it is the Gilbreth rule that at least one day's supply should be at the machine. The rule applies within reasonable limitations even where conveying systems are used. Conveyors have accidents

occasionally and something may happen to the supply of parts before it reaches the conveyor. The man at the machine can then draw on his reserve supply and keep from losing his bonus through no fault of his own.

There are various ways of keeping track of material supplies at the machines but the one best way is to make the foreman also responsible that the men under him have a day's supply ahead all the time. If the foreman has to go to each machine every morning and every night to assure himself that the required supply of material is on hand it is a fairly safe bet that he gets better acquainted with his men than if he does his work from an office chair. At the same time he can keep an eye on conditions at and around the machines and will hear of difficulties as the men get to know him. Many times he will get word of trouble symptoms soon enough to take steps to prevent the trouble from developing. A man will tell him of a slipping belt or an ominous squeak as he passes where he would put off making a special trip to the foreman's office to report the trouble until it was really serious.

According to the Gilbreth ideas the foreman has three other jobs beside seeing that his men get material to work with. The first of these is to teach, the second, to see that conditions are right at each man's place and the third, to investigate at once the failure of any man to meet his task or time program requirements. In larger plants or in smaller ones where one foreman has a large number of men under him, some of his efforts may be supplemented by his inspector. The duties of the inspector include not only inspection for both quality and quantity but also for standard conditions of working as called for on instruction sheet and tool list. If either falls below standard he must find out why, which necessitates inspection of conditions at the work place. The foreman and the inspector independently are responsible that conditions are in accordance with those under which the task or time program was set and therefore every man in the department shall be able to make his task. Between them they should catch any deviation from standard practice before it becomes serious and keep everything running smoothly.

Who Was to Blame for This Injustice?—Discussion

By F. P. Terry

The contribution under the above heading, page 555, Vol. 58, of *American Machinist*, by Alvaro De Palante, was read by me with interest, partly because I had a very similar experience some time ago. I was the superintendent, and the "Rob Brown" of a foreman had to go.

After carefully reading Mr. De Palante's description of the case, I fail to see any injustice, but rather an error of judgment, both by foreman and superintendent. In the first place Brown committed a grave error in judgment, and must be considered mostly to blame for accepting a job which he was not capable of filling, no matter how pressing the invitation. We must, of course, give full credit to the fact that he never presumed he could do it, and it was not of his own seeking, but we must also remember that the superintendent was actuated by the best of motives, and the resultant failure would cause him bitter reflections. He had promised every assistance possible, and no doubt had the foreman known how to take advantage of this, he would have been still in his position, or a better one, and to find out that useless work has been sent out and to say or do nothing for a week, puts this foreman out of the picture altogether.

During the past twenty years I have fathered many young men along the thorny path that every foreman must tread before he reaches comfortable traveling, and the ones who have been most successful took full advantage of the help I had offered, even to obtaining my judgment on minor details and tittle-tattle, and, while not encouraging this sort of thing, I have always considered that the foreman has to deal with them and the sooner he learns how the better. In no case should a foreman do as Brown did, as by so doing he also commits the superintendent and puts both in a false position. Some may think that at least Brown should have been offered his old position again, but any superintendent knows this is a difficult proposition. Many reasons could be given against it, but the feelings of the foreman who has failed and the life he would have with his fellow workers are sufficient to condemn it.

In my own case, my failure adopted an attitude of hiding everything he possibly could from me, spoiled work in particular. Although more often than not he was not to blame for the errors, his unholy dread of getting others into trouble brought about his downfall. He had a favorite habit of slipping back bad castings to the foundry foreman for replacement, without the foundry superintendent or myself being informed, and, when after many fatherly warnings on my part he caused me to miss a very important shipment, he had to go. Had I been informed at the proper time nothing would have happened, and why he did not know this and act accordingly is a mystery I can never explain. Some men seem born to make trouble for themselves and everyone else about them. It may be fate, and if Mr. De Palante puts Brown's troubles down to fate he will not be far wrong, as he certainly cannot blame the superintendent beyond the fact that he over-rated Brown's abilities, a simple error of judgment, or in other words, an experiment that failed, from which both parties will certainly benefit in the end.

Tests All-Metal Plane

The Army Air Service is testing at McCook Field near Dayton, an all-metal airplane designated as the CO-1, the first of the kind designed by the army and the latest type of airplane brought out by its engineering division. It has already made a maiden flight and full performance trials are under way.

The plane may be left in the open indefinitely, making the use of hangars unnecessary. It has the further advantage that while the usual fabric wing and fuselage has to be removed once a year, in the case of the all-metal plane the duralumin covering is a permanent part of its structure and does not require replacement.

Both wings of the new planes are covered with corrugated duralumin and the structure proper is heat-treated steel and duralumin. The plane weighs 3,000 lb. empty and 4,750 lb. when fully loaded. Unlike most metal-covered planes, the CO-1 is not overweight and air experts have said that it can carry loads greatly in excess of the specified design load of 1,750 pounds.

It is powered by the Standard Liberty-twelve engine and has a gasoline capacity of 125 gallons. Glass windshields are provided at the sides of the pilot's cockpit.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

A Novel Gantry Plate-Drilling Machine

BY FRANK C. HUDSON

During the late war, Seattle, Wash., was a very active shipbuilding center, and all the available machining capacity was pressed into service. Among the shops engaged in building marine boilers was that of the Puget Sound Machinery Co., now known as the Garret & Shipman Co. The work involved the drilling of large numbers of boiler plates ranging up to 1⅛ in. in thickness.

Machine tools of all kinds were scarce and difficult to obtain, so, in order to facilitate the work, a special



FIG. 1—A LARGE GANTRY PLATE-DRILLING MACHINE

type of drilling machine was designed and built, as shown in Fig. 1. As will be seen, this machine consists primarily of a table on which the plates to be drilled are supported, and a "gantry," spanning the table and running on a substantial track on each side. The cross member of the gantry is a pair of substantial I-beams on which are mounted trolleys, which are shown more in detail in Fig. 2.

Each of these trolleys carries a specially designed support for a heavy Van Dorn electric-drill, known as the C-2,900, and wound for direct current. The upper part of the support is a cylinder which provides hydraulic feed for the drills, each drill being entirely independent in every way.

Although both views show only two drilling heads in operation, four of these heads were used simultaneously during the rush period, when a maximum output was necessary. These comparatively small machines handled 1⅛ in. drills through three thicknesses of ⅞-in. boiler plates, or a total of 4⅛ in. of metal drilled. Using high-speed drills, the average time per hole was 8 min., including all shifting and changing necessary, not only of the drilling heads on the supporting beam but of the gantry along the rails as well.

The general dimensions of this machine can be readily estimated from the size of the men, and it is well to remember that the sheets on a large marine boiler run up into considerable length. The table is over 50 ft. long, and the track enough longer so that the

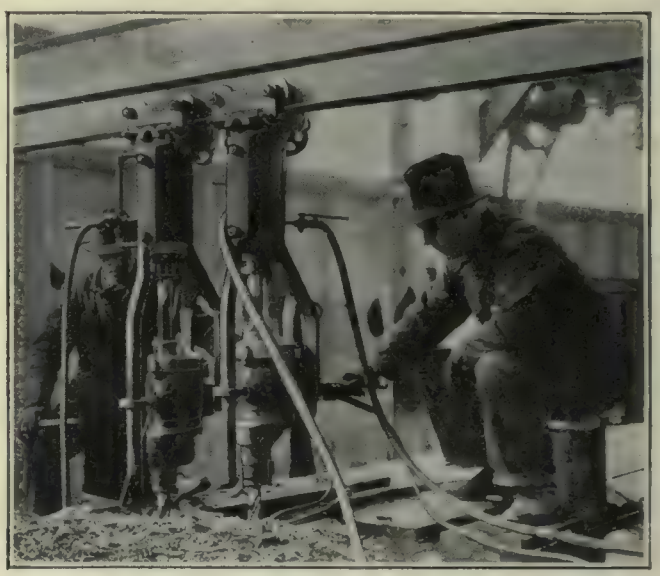


FIG. 2—TWO OF THE DRILLING HEADS AT WORK

extreme end of the plate can be reached by the drills without difficulty.

A little study of Fig. 2 will show what a simple device is sufficient for holding the drill head from turning, and also for guiding it as it is fed down by the hydraulic cylinder above. It will also be seen that each drilling head is provided with a horizontal adjusting mechanism, so that it is not necessary to bring the gantry itself to the exact position required. The location of the drills across the plate is easily secured by moving the trolleys on the lower flanges of the I-beams. This machine was extremely economical and efficient method in handling the work, and is still being used for a large variety of plate drilling.

Regrinding, Reboring or Reaming Cylinders—Discussion

BY ROBERT TAIT

Under the above title on page 744, Vol. 58, of the *American Machinist*, M. I. Seiler has an interesting article concerning the relative merits of reaming, boring and grinding the cylinders of automotive engines. He still hugs the delusion that grinding will charge the cylinder surface with particles of abrasive from the wheel, causing rapid wear when the motor is put into service. I have before me a "Machine Shop Library" published by the McGraw-Hill Book Co. in 1912, and in the volume on grinding, this matter is taken up and disposed of

quite thoroughly, indicating that this question was under consideration over 11 years ago.

It has been my privilege to have some experience in boring, reaming and grinding cylinders. Boring, if done carefully, on a good machine will produce a creditable job. Reaming cannot be depended upon at all, for several reasons.

A very large per cent of the pleasure car cylinders which are refinished are from cars in the low or medium price class and a large proportion of such cylinders are out of square with the crankshaft. Reaming, no matter how carefully done, will not correct this error, and it is a most serious one.

After a cylinder has been scored by a piston, no reamer made will survive the ordeal of scraping off the hard spots which scoring invariably causes and produce a round straight hole without being resharpened. As the vast majority of those who make a practice of reaming cylinders have no means of grinding the reamers, faulty work is bound to result.

If boring or reaming is the proper method of finishing cylinder bores, why do the makers of every really high grade car in this country finish them by grinding?

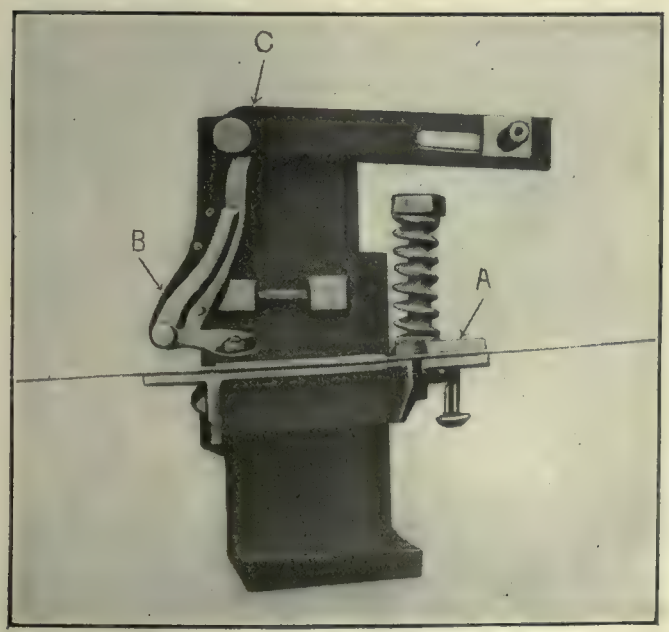
Feeding Device for Punch Press

By Clifford H. French

Having a lot of washers to punch, and only being able to get about 1,000 an hour by hand feeding, the American Machine Co., of Pueblo, Colo., built the feeding device shown. It is attached to the punch press table beside the die and feeds the strip of metal with every stroke of the press.

There is a friction plate at *A* to prevent "throwing," while the feed is secured by the latch *B*, pivoted on the arm *C*. This arm is operated from the slide of the press, the stroke being adjustable by moving the connection in the slot. The feeding latch drops into the punched holes, so the device has to be located after the first washer is punched out. The first of the strip is punched by hand, then the feed takes hold.

This device increased the output from 1,000 to 6,000 washers per hour.



SMALL AUTOMATIC FEEDING DEVICE

Device for Testing the Tooth Faces of Hobs and Gear Cutters

By A. W. Freeman

This device consists of a steel angle with a V cut in the bottom of its base and a slot milled in the upright portion, wide enough for a free sliding fit for the Kotch indicator *A*, as shown in the accompanying

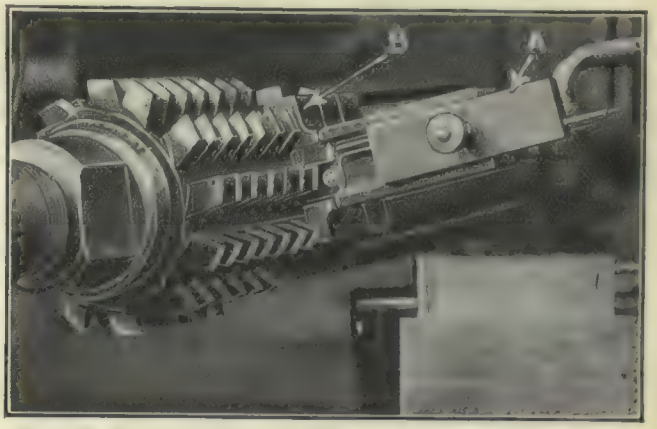


FIG. 1—HOW THE HOB TESTING-DEVICE IS USED

illustrations. At the lower end of the slot is a tooth stop *B*, the face of which is radial to a circle whose periphery touches both sides of the V in the base. To use the device, it is placed with the V resting on the arbor at the end of the hob, with the tooth stop *B* resting against one tooth of the hob and covering about one-half of the tooth face. The Kotch indicator is then placed in the slot until the indicator finger connects with the face of the tooth alongside the tooth stop.

If the tooth face is correct the indicator will register

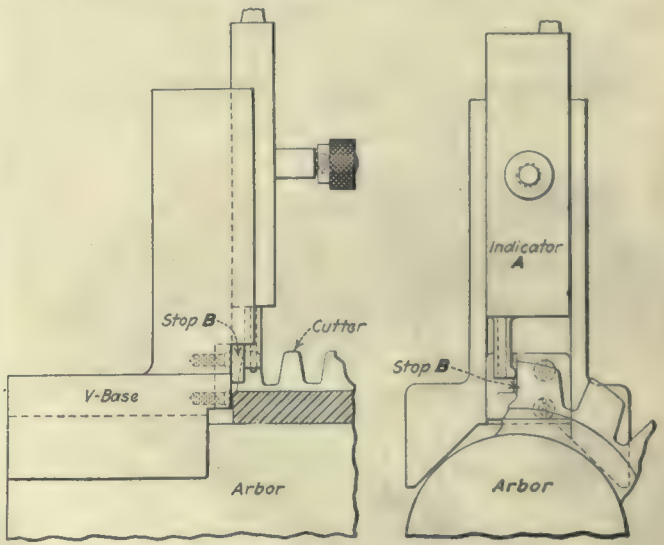


FIG. 2—DETAILS OF HOB TESTING-DEVICE

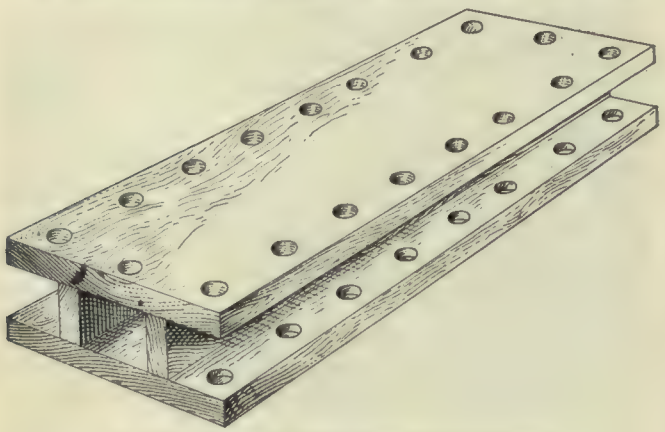
zero without variation when sliding it from the top to the bottom of the tooth face. The indicator registers 0.005 in. either side of zero, giving a total reading of 0.010 in. The device will check hobs of from six to twelve pitch and will be found a time saver for rapid checking, as it is not necessary to remove the hob from either the machine or arbor in order to check it. Bushings may be placed on the arbor for the V base to rest on for checking hobs of larger diameter. Fig. 1 shows the device in use and Fig. 2 shows it in detail.

Rack for Motor Valves

By I. B. Rich

Too many garages neglect to take proper care of the parts of the motor as it is disassembled. This is particularly true of the valves, which are in many cases strewn around promiscuously either on the running board or some other equally convenient place.

In the automobile repair department of the Oppor-



RACK FOR HOLDING MOTOR VALVES

tunity School in Denver, Col., the instructor, Victor England, uses a rack as shown in the accompanying sketch. This, as can be seen, is very easily made from four pieces of board, the two central pieces simply holding the main boards the correct distance apart.

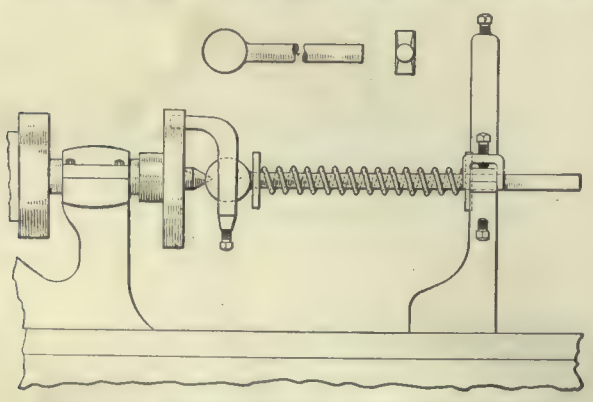
There are eight holes sufficiently large to hold any size valve stem. The holes go clear through the upper board, but only half way through the lower board, so that the ends of the valve stems may be always protected. The rack is also provided with a hole at each end, so that it can be hung on a rail when out of use.

Holding Work Against the Live Center

By H. H. Knabe

Having a number of forged pieces to be centered, I adopted the method here described.

The ends with the heads were centered first by chucking the small ends in a 3-jawed chuck and back resting



HOLDING WORK AGAINST THE LIVE CENTER

the other ends close to the head, but the small ends could not be done by chucking the heads because the heads, being rough forgings, were not alike and truing each one up would have been too much trouble.

To use the headstock center with the regular holdback strap would have been too slow, so I devised the expedient illustrated by the accompanying sketch. After putting the driving dog on the work I put on two washers with a fairly stiff coil spring between them. One washer rested against the head of the piece and the other against the jaws of the steadyrest, the spring having plenty of compression to hold the work firmly against the live center.

Two Ways of Making a Core—Discussion

By M. E. Duggan

Sometime ago F. C. Edwards, residing in England, expressed great surprise after reading the article by the writer under the above title on page 735, Vol. 57, of the *American Machinist*. In fact Mr. Edwards came very near furnishing work for the undertaker when he came to the part in this article where I made mention that "there is no standard to be followed in the construction of patterns and core boxes." There is nothing in this statement that should bring about this upset condition in my brother pattern maker over in England.

In the sketch herewith there is shown a cast sheave wheel for a chain. How would you make the pattern for this wheel? Split through the middle as shown, the whole pattern to be molded in green sand? Sure. Nine out of ten pattern makers would make it in the same way. That's the way I made my pattern, pre-

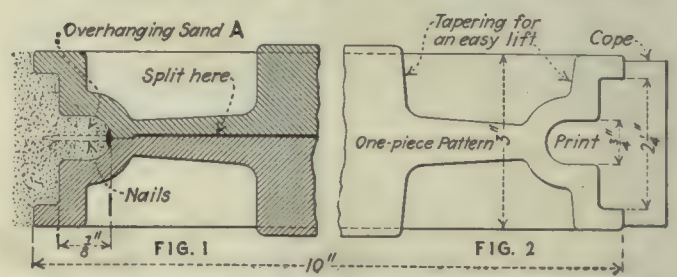


FIG. 1—SPLIT PATTERNS TO BE MOLDED IN GREEN SAND.
FIG. 2—SOLID PATTERN ARRANGED FOR A DRY SAND CORE

determining a green sand molding job. When the molder saw my pattern he said, "Mike, you're wrong. Why construct your sheave pattern in such a way that will require thirty or thirty-five minutes of the molder's time in making the mold when the same job, if correctly made, could be molded in ten or twelve minutes?"

In other words the overhanging ring *A* of green sand is not wide enough to support itself nor resist the pressure of the rising molten metal in the mold. In order to secure this ring of overhanging sand the molder was obliged to use nails spaced about ½ in. around the inside as shown in Fig. 1. If this ring were 1 in. or 1¼ in. thick, the use of nails would not be necessary. For this job the molder suggested a dry sand core as shown in Fig. 2.

Only four castings were wanted. Why split the pattern? Splitting only tends to weaken the pattern and with a core, splitting is unnecessary as the whole pattern can be molded in the drag. If the pattern maker were asked the reason why many patterns are made as they are, he could not give a satisfactory answer. When a split pattern is returned from the foundry with the sections nailed together, the molder must have had a reason for doing the nailing.

Inexpensive Tools for an Odd-Shaped Piece

By Donald A. Hampson

A cutting tool that has to be machined from the rough in quantities varying from a score to a hundred, is shown in Fig. 1. It is one of those jobs that cannot be put on a production basis, yet are supposed to run through at a profit to the shop and a reasonable cost to the customer. Making up a year's quantity at one time is out of the question for the customer will send in only such pieces as are needed, when they are needed.

Under such circumstances no great outlay for tools is justified, though tools there must be if the work is to be done at a price that is not prohibitive. Figs. 2 and 3 show two fixtures that were made at a nominal cost and that answer very satisfactorily for the quantities named.

The blanks are received just as forged. They are made of 0.90 carbon, ½-in. round steel. They are first bent (hot) and then shaped to form under dies in a hammer.

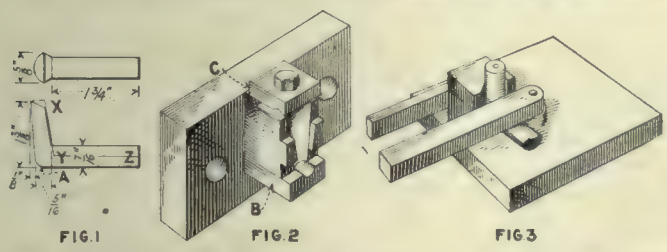


FIG. 1 FIG. 2 FIG 3

FIG. 1—THE TOOL TO BE MACHINED. FIG. 2—FIXTURE FOR DRIVING THE WORK FOR TURNING. FIG. 3—HOLDING THE WORK FOR CENTERING

The dies are made with opposing faces along the line *X Y Z*, which leaves very little cleaning up to do in the finishing operation. Finishing consists of turning the shanks to size, removal of fire scale from the blades, and shaping the points.

The points as forged fill out the corner at *X*, from which material has to be ground to form a cutting edge. Turning the shank is the part of the work that was found most difficult because of the angle and flare of the blade, which made chucking commercially impossible, and the fact that the corner at *A* does not usually fill up enough to get in a center readily—a small center being permissible though under protest, for hardening reasons.

The actual turning time was 3 min. from piece to piece. The forgings were held between the tailstock center and the casting shown in Fig. 2, which served as a driver, socket, and clamp. A projecting part of the casting is hollowed out to fit the half round back of the blade and side lugs are used to do the driving. A steel piece *B* is screwed to one end of the projection and has a cut-out of ¼-in. radius so placed as to bring the blank on the center line of the lathe. The cap *C* is used to clamp the blade against its seat.

With this arrangement, the pieces are located in the lathe without delay and without requiring skilled labor to center them. They are positively held and driven, despite the rounded section of constantly changing size, and there is ample clearance for the turning tool. Two bolts are used to attach the fixture to the face plate of the lathe.

To put the center hole in the free end of the shank, the fixture shown in Fig. 3 was made, and in use is held on the drilling machine table by two C-clamps. The simple method of holding the forgings for center drilling is apparent. No center punching or centering is required.

Surfacing Large Base Plates on a Small Planer

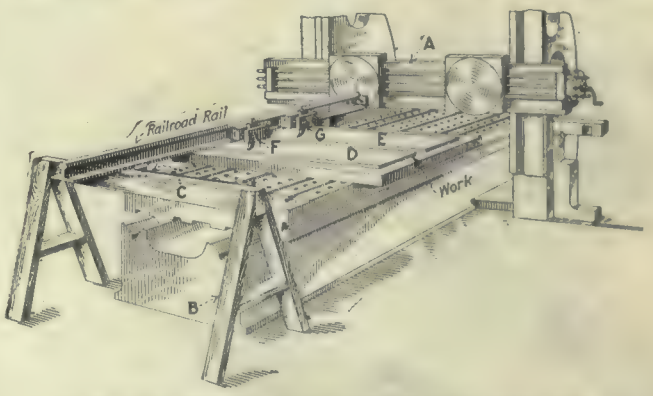
By Frank C. Hudson

There is always something interesting about handling a job that is too big for any machine in the shop—in doing the job that can't be done, and there are probably more such jobs today in the shops in the far West than anywhere else.

Here is an interesting planer job I found in the shop of the Helser Machine Works Co., Portland, Ore. The job itself had been done sometime before but there were enough of the parts in existence to rebuild it on paper, and it's a different solution of the problem than we usually find.

The job was to place a number of base plates, for ship-yard machines I believe, the plates being about a foot wider than the planer would pass between the housings. They were also too long to plane by the usual extension tool post method, so the foreman got a railway rail about 12 ft. long and fastened one end to the saddle on the cross-rail as at *A*, after removing the clapper box and tool clamps. The outer end of the rail was supported on a substantial wooden horse as at *B*, which was carefully lined up so as to hold the rail level and finally fastened to the floor. A feed screw was provided at *C* by which the end of the rail could be moved along the top of the horse.

The surface of the work was not continuous but consisted of two raised portions as *D* and *E*, so in order to save time two tools were fastened to the long rail, as at *F* and *G*, and the table travel cut in half. The work was so located on the planer bed that there was plenty of clearance in front of the housings at the end of the stroke. The cross feeds at both ends



HOW THE PLANER WAS RIGGED FOR THE JOB

of the rail were operated by hand and were entirely indpendent of each other as it wasn't especially important that the rail remain square with the cross-rail. In fact it probably never was square, but it held the tools and a goodly number of the plates were planed in fairly good time.

The method described isn't exactly the one we would choose to plane up surface plates but it was plenty good enough for the work done, and the method may help others who have work to do that is larger than the machines were originally intended for.

American Machinist

Established 1877

KENNETH H. CONDIT AND FRED H. COLVIN
Editors

July 5, 1923

The American Machinist Starts its Fifty-ninth Volume

WITH this issue the *American Machinist* commences its fifty-ninth volume. Established in 1877, the paper has forged steadily ahead, a mirror of the progress in the mechanical arts and a leader in the thought of the metal-working industry. During its nearly forty-six years, the *American Machinist* has not changed its name nor has it absorbed any other papers or combined with any.

The present editorial staff consists of Kenneth H. Condit and Fred H. Colvin, editors; A. L. DeLeeuw, consulting editor; L. C. Morrow, managing editor, and S. A. Hand, Ethan Viall, Ellsworth Sheldon, Howard Campbell and C. J. Priebe, associate editors.

The Ocean Speed Record Returns to America

THE SPEED records made by the Leviathan on her trial trip are very gratifying for several reasons. But once since the days of our famous old clipper ships have speed records for big ships been held by boats flying the American flag. When the Leviathan gets broken in on the transatlantic run we may expect record trips that will appeal not only to our self-esteem and sporting instincts but will also attract business to American passenger ships.

The pride of our merchant marine was built by Germans in a German shipyard, but she was also pretty thoroughly wrecked mechanically by her German crew. The achievement of repairing the damage by applying American shop methods and the final refitting in an American shipyard at a total expense not far short of ten million dollars give us good cause to consider her an American ship and to be proud of our shops, their men and their workmanship.

As to the much-discussed trial trip the opposition seems to have been entirely of a partisan political nature and its motives beneath contempt. We have heard that one of the noisiest objectors was unable to secure accommodations for his wife on the trip.

We were not fortunate enough to secure an invitation to go on the five-day cruise but we have at least had the pleasure each day since its conclusion of looking out of our window at the ship herself as she lies, a picture of grace and potential power, at her pier.

First-hand impressions of the trip have come to us through one of our colleagues, Fred. R. Low, editor of *Power*, who was one of the lucky guests. Mr. Low says, "No country can be great with a world's greatness without a merchant marine. No country can maintain a great merchant marine without passenger traffic. To wrest the passenger traffic from lines which have a prestige founded upon years of successful operation, a clientele attached by habitude, vogue and pleasant associations it is necessary that one offers something superlatively better. Hence the Leviathan.

"It was necessary before putting such a ship into commission to give her a thorough trial under seagoing conditions and those in charge considered it, if not as essential, at least as desirable that the personnel of the boat, stewards, culinary department, etc., should have a chance to accustom themselves to the boat and organize their service under the conditions of an actual passage. Accordingly some 400 guests were invited to supply the passenger list. It was a wise provision, for notwithstanding the service as a whole went very smoothly, a number of little oversights developed under the conditions of actual use and opportunity was afforded for daily fire drills, boat drills and the handling of signals and passengers under such emergencies."

The Salesman vs. the Engineer

ONE of the points brought out in the discussion of four-wheel brakes at the S.A.E. convention was the danger of engineers being stampeded by the sales department into putting out new devices before they had been thoroughly tested. This situation applies to so many businesses that it is worth considering from several different angles.

The increasing numbers of cars on the roads make better braking equipment a necessity, and when we know that four-wheel brakes have been in use by foreign builders for a number of years, there seems to be no reason why they cannot be adapted to American cars. The very fact that they have not been seriously considered here except by a few builders, is on the face of it, not altogether creditable to the progressiveness of our engineers. Their alibi would probably be that there have been so many other things demanded by the sales department that there has been no time for four-wheel brakes.

There can be no doubt as to the desirability of the four-wheel brake and it is undoubtedly coming in this country, as well as abroad. The problem is however, not so simple as it seems, for it involves new stresses on the front axle, more unsprung weight and numerous other problems. For a front wheel brake may be a source of danger instead of safety unless all the effects of its use are carefully considered.

The broad question, however, is how far the sales department should go in forcing the adoption of new devices. Neither the engineer nor the sales department can be trusted to have final decision in these matters. That is where the real manager comes in. But the manager who succeeds in the long run is the one who can carefully weigh the arguments on both sides and decide which is best for the company and its customers. In too many cases the sales department receives undue consideration, and while the immediate cash returns come from this source, reputation, or its lack, is much more important in the long run. If the engineer is not competent, get one that is. But it is a great mistake to consider the engineering department, as seems to be the case in too many instances, as a necessary evil, to be tolerated, but of little account.

Shop Equipment News

Automatic Machine Co. Frog and Switch Grinding Machine

The machine here illustrated and described was designed and built by the Automatic Machine Co., 113 E. Washington Ave., Bridgeport, Conn., for the purpose of machining frogs, cross-overs and other elements of railroad track work that are made up of, or surfaced with, manganese steel castings and cannot, therefore, be worked by any tool other than a grinding wheel. It is distinctly a manufacturing machine, intended to be permanently erected in the shop of the builders of this class of material, and is not in any sense a portable track grinding or resurfacing machine to be used upon track already laid.

The machine when ready for service runs upon a permanent narrow-gage track that is supported upon concrete pedestals of sufficient height to allow the necessary clearance under the grinding wheels. For the purpose of holding the work, a bed, or floor plate, also set in concrete, is placed adjacent to the supporting track and under the grinding wheels.

The entire machine is traversed by power along the track, the length of traverse being limited only by the length of track. Power for the traversing movement is supplied by a 15 hp. electric motor mounted on top of the machine and is transmitted to the driving mechanism by means of open and crossed belts.

This movement is analogous to that of a traversing head planer and it may be set to any desired length within the limits of the track. It is controlled by the lever shown at the extreme left of the machine in Fig. 1, which is the operating position. The disk immediately behind the control lever rotates slowly with the traverse of the machine, and the amplitude of the movement is determined by the setting of the adjustable dogs in the annular T-slot in the face of the disk.

The grinding heads, of which there are two, have a transverse movement along the box-sectioned beam projecting at right angle to the body of the machine, which beam serves the same purpose as the cross-rail of a planer. The heads are separate and capable of movement along the beam independently or in unison. Independent vertical adjustment is also provided. The heads may be moved quickly by hand for positioning, or by power for the feeding movement.

The machine swings a pair of grinding wheels 14 in. in diameter by 3 in. face, driven by independent 10 hp. electric motors mounted directly upon the heads. Power is transmitted to the wheel spindles by belts.

In Fig. 2 the body of the machine is shown inverted, and from this cut an idea may be gained as to the method of transmitting power to the traversing movement and also of

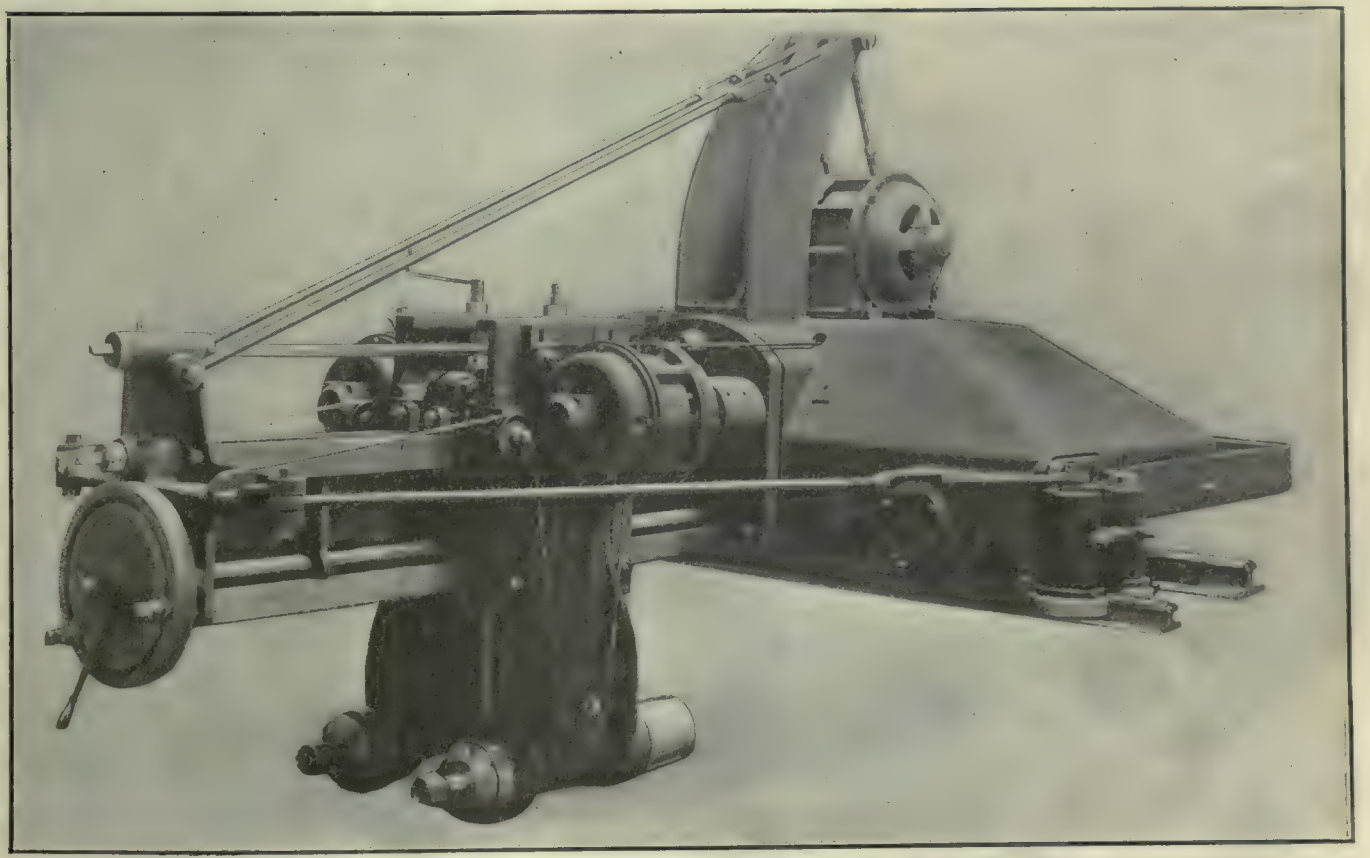


FIG. 1—AUTOMATIC MACHINE CO. FROG AND SWITCH GRINDING MACHINE

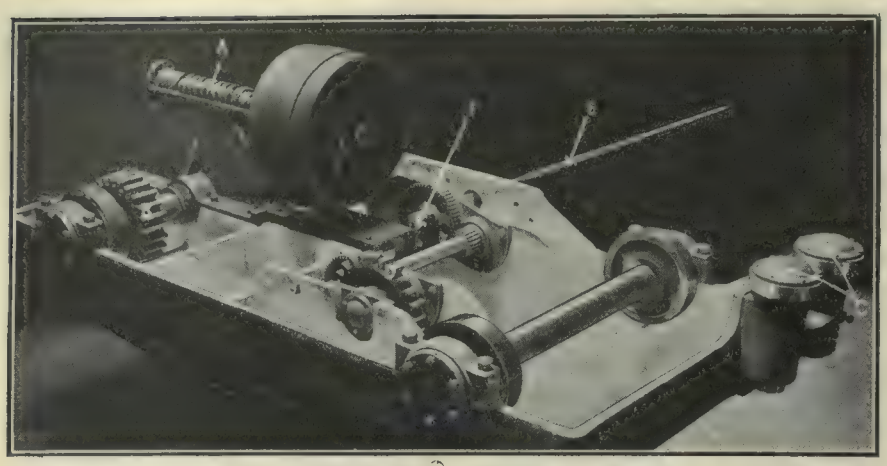


FIG. 2—BODY OF MACHINE INVERTED

the mechanism for controlling the amplitude of the movement. The belts from the motor drive the nest of pulleys in opposite directions, the same as in any shifting belt planer. The two outer pulleys are idlers while the middle one is keyed to the shaft of the worm *A*, which meshes with a corresponding worm-wheel upon the drive shaft.

The weight of the machine is borne by four track wheels, running free upon roller bearings, and power is applied to the traverse through the spur gear *B*, meshing with a rack that is bracketed to one of the track rails. Guide rolls *C*, of which there is a pair at each end of the machine, serve to keep the latter in alignment as it moves along the track.

The spur gear *D* also meshes with the rack and transmits movement through reduction gearing to the reversing dial at the outer end of the beam upon which the grinding heads move. The shaft *E* is double, the dial being mounted upon the quill, which is driven by the gearing, while the control lever and the crank-arm *F* are keyed to opposite ends of the inner member. Crank-arm *F* connects directly to the shipper plate so that any movement of the control lever is transmitted to the shifting belts.

All rotating parts turn upon ball or roller bearings that are enclosed to protect them as far as possible from the cloud of abrasive dust in which the machine must work; for in the class of work to which this machine is adapted no water or grinding compound is used.

The weight of the overhanging beam and grinding heads is counterbalanced by means of truss rods running from the outer end of the beam to the bracket on top of the machine and thence to a rail on the opposite side from which suitable counter weights are suspended, so that the machine is in stable equilibrium. The weight of the machine exclusive of track and bed or floor-plate is 20,000 pounds.

Clark Flexible Coupling

A flexible coupling for power transmission shafts that combines both strength, durability, flexibility and adaptability to a wide range of work has recently been placed on the market by Charles H. Clark, 60 Grand St., New York, N. Y. The main feature of the coupling, which is shown assembled in Fig. 1, is its simplicity. The parts can be seen

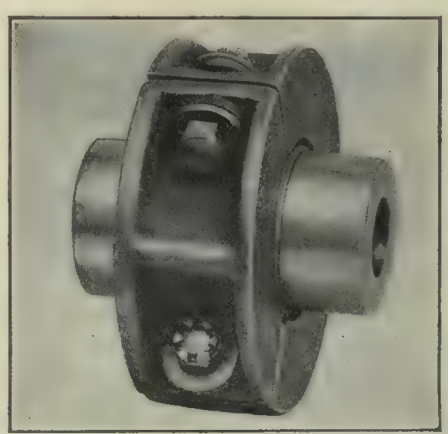


FIG. 1—CLARK FLEXIBLE COUPLING

in the view of the disassembled coupling in Fig. 2.

The hubs are fitted to the shafts by keys in the usual manner. Each hub is finished all over and has a triangular shaped face to form three projections or teeth. A housing made in three pieces incloses the teeth and serves to transmit the power from one hub to the other somewhat after the manner of an internal gear. The joint between each housing is made by means of a bolt fitted with a locknut and carrying leather washers at each end to provide flexibility. A dowel pin is also provided at each joint.

The degree of flexibility depends to some extent upon the tightness with which the bolts are fitted, although the shocks are absorbed by the ability of the housing to expand. Further flexibility is given by the insertion of a piece of steel-faced automobile brake lining in each housing to cover the acting portion of the tooth. The lining takes the shock and makes the action of the coupling noiseless.

End play is permitted by making the inside of the coupling somewhat wider than the width of the two teeth. Both angular and parallel misalignments of the center lines of the shafts are permissible. The coupling is intended to operate under practically any conditions of speed or of duty, to transmit power up to the capacity of the shafting. The teeth surfaces are lubricated by grease, which the action of centrifugal force tends to throw to the tops of them. The housing is dust and grease proof, because of the packing which is placed at each joint of the housing and at each side of it next to the hubs.

The coupling can be furnished in practically all sizes required for power transmission. For small work, such as motor-driven machines and automotive purposes, the advantage of simplicity and interchangeability should be noted. Both the hubs are duplicates, and the three parts of the housing are alike, so that the parts can very easily be kept in stock. The coupling is also adapted to very heavy drives where shafts, say, 12 in. in diameter are required.

Ordinarily, the hubs are made of steel and the housing of cast iron, although the material can be varied to suit the conditions. A coupling having a bore 1 in. in diameter has an outside diameter of 5 in., an overall length of 3½ in. without considering the end play, which is ¼ in., and the weight is 6 pounds.

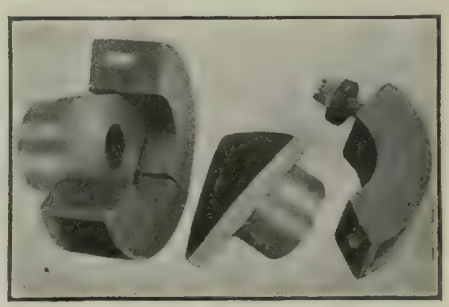


FIG. 2—CLARK COUPLING DISASSEMBLED

Kingsbury Semi-Automatic Sensitive Drilling Machines

The automatic sensitive horizontal-spindle drilling machine No. 8 made by the Kingsbury Manufacturing Co., Keene, N. H., was described on page 666, Vol. 57 of the *American Machinist*. This automatic unit has been mounted on stands, in conjunction with other apparatus, to form high-speed machines for special purposes. The machine shown in Fig. 1 carries two opposed automatic drilling heads to form a semi-automatic unit. The heads are fitted with automatic feeding devices by which the rate of feed is retarded or increased to suit the resistance encountered by the drill. Thus, the operator need only handle work, and not feed the spindles.

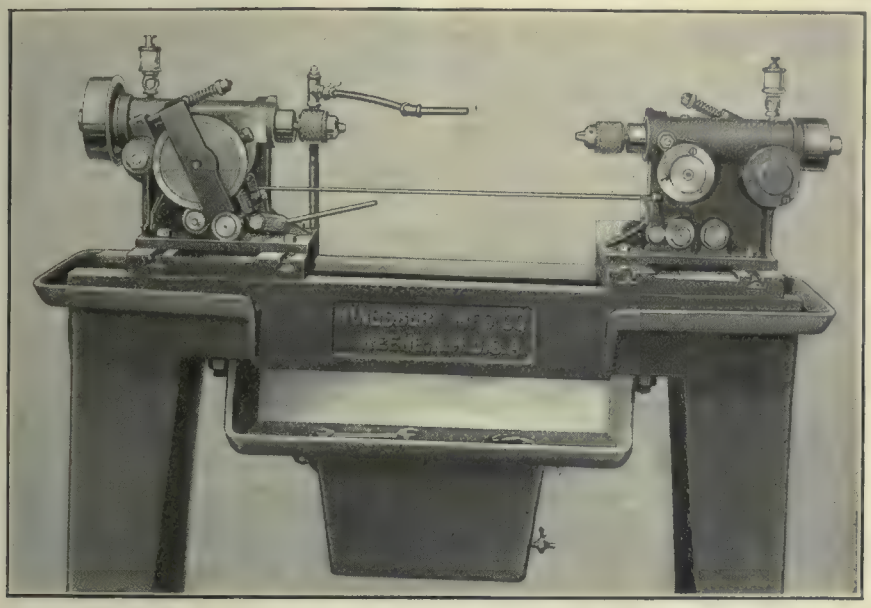


FIG. 1—KINGSBURY OPPOSED-SPINDLE SENSITIVE DRILLING MACHINE

The arrangement illustrated can be employed for drilling two holes simultaneously, or for drilling and reaming through holes. For the latter work, the drill head at the left is used for drilling and the one at the right for reaming. After the work is clamped in the fixture, the operator presses the trip lever. When the drill spindle reaches the forward end of its stroke, the opposed spindle is automatically tripped, and the reamer enters the work as the drill is withdrawn. Due to the fact that the operator can often handle more than one pair of units, the stand can be furnished with as many as five pairs of spindles.

The capacity of the unit equipped with No. 8 drill heads is $\frac{1}{4}$ in., while it is $\frac{3}{8}$ in. for the No. 8½ head when drilling steel and $\frac{1}{2}$ in. when drilling brass. The standard stroke is 1 in., with a spindle adjustment of 2 in. The maximum distance between the chucks in the open position is 18 in. The stand is 43½ x 15 x 36 in. high, and weighs about 500 lb. when equipped with the oil tank. A countershaft can be provided.

In Fig. 2 is shown a multiple-spindle type of machine for drilling small holes on a production basis. Here again the feed is automatic and each spindle is independent of the others in its action. The outfit consists of the drilling head, table, stand and chip pan. Either single- or three-speed countershaft drives can be furnished. Either No. 8 or No. 8½ heads can be used, and either two, three or four spindle machines can be furnished. For the four spindle machine shown the length is 45 in., the height of the spindle 42 in., the spindle centers are 8 in. apart and the weight is about 800 lbs.

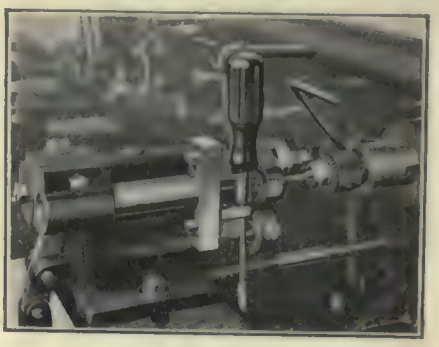


FIG. 3—KINGSBURY AUTOMATIC FIXTURE NO. 60

The arrangement is particularly adapted for the use of automatic work holding and clamping fixtures. The horizontal position of the spindles allows the chips to drop directly into the pan beneath the

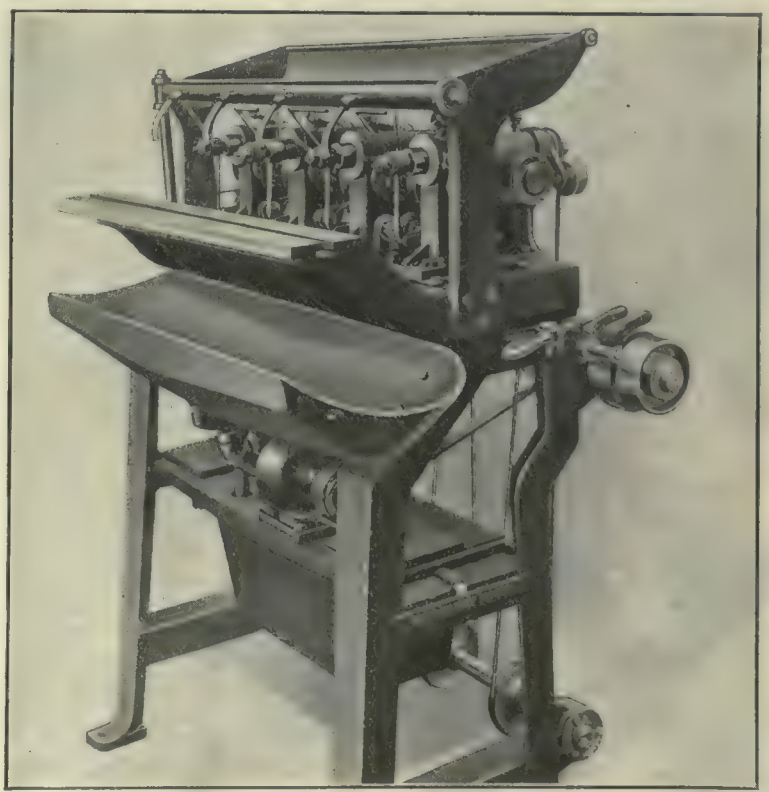


FIG. 2—KINGSBURY MULTIPLE-SPINDLE SENSITIVE DRILLING MACHINE

table. One of the fixtures which can be mounted is the No. 60 fixture shown in Fig. 3. This device is regularly equipped with V-blocks for cross drilling pins, but can be adapted for centering and other work.

The front vise jaw is adjustable longitudinally, and rigidly backs up the work. The rear jaw is mounted on a plunger operated by a stiff spring, and it contains the drill guide bushing. It is automatically opened by the drill head at the completion of the cycle. The only motion necessary for the operator is placing the work against the gages and tripping the spindle drive mechanism. As soon as the spindle is tripped, the work is automatically clamped, drilled and then ejected.

The average time for a complete cycle on brass work is only 2 sec., while a $\frac{1}{8}$-in. hole drilled through $\frac{3}{8}$-in. cold-rolled steel would require about 6 sec. The fixture takes work up to $\frac{3}{4}$ in. in diameter, while for centering, work up to 4 in. long and $1\frac{1}{2}$ in. in diameter can be held. The No. 58 fixture is similar, but is equipped with an attachment for removing the burr.

Osterholm Duplex Rotary Surface Grinder

Another adaptation of the grinding machine principles employed by W. C. Osterholm as described in the *American Machinist*, Vol. 58, No. 25, has just been introduced by Williams, White & Co., Moline, Ill. The machine is known as the duplex rotary grinder and was designed by Mr. Osterholm for automatic surface grinding of such parts as thrust washers, clutch disks, bearing races, etc. It is primarily a production machine for work that can be chucked individually or collectively within a diameter of 12 in. and a height of 4 in. The height may be increased to a maximum of 8 in. as the wheel wears.

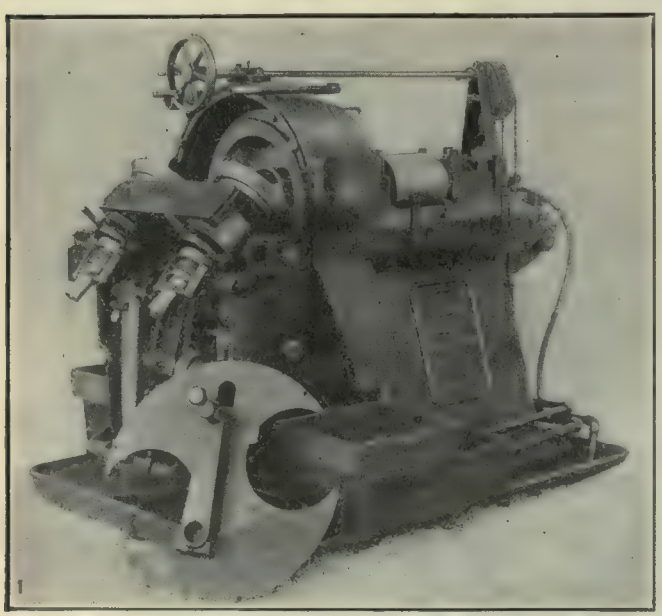
In Fig. 1 the machine is shown in the loading position with the rotary chucks at rest. As the machine is started the first fractional rotation of the cam seen at the left causes the chucks to be raised so that their faces are parallel to the grinding wheel face, and locks them in this position as shown in Fig. 2. Further rotation of the cam advances the wheel towards the work, the rate of advance being governed by the shape of the cam. The heavy cutting can be done during the early part of the cycle leaving ample time for the wheel to produce the desired finish before the chucks return to the loading position and complete the cycle. The chucks automatically drop to the loading position and the machine stops for replacement of the work.

Because of the automatic features of the design relatively unskilled operators may be employed. Where loading time is short compared with the duration of the operating cycle, it is economical to have one man operate more than one machine. Careful provision has been made for an ample supply and disposal of coolant. It is pumped through the wheel spindle and through both work spindles to flush the wheel and reduce the temperature of the work. The work chamber is practically water tight when the guards are in place and the machine is operating.

Either mechanically or magnetically operated chucks can be used. Expanding or contracting collets are operated through toggle links by the handles shown in the illustrations. Means are provided for rapidly changing the work, to minimize idle time of the machine.

Cylinder grinding wheels 20 in. in diameter are used, depth and rim thickness being varied to suit the parts to be ground. The handle on top of the water guard serves to advance the wheel to compensate for wear. Graduations on the handwheel are in thousandths of an inch. The wheel dresser as shown in Fig. 2 is always in position and is mechanically driven.

The operating cycle of the machine can be varied between 20 seconds and 2 minutes by means of the change gears shown at the left in Fig. 2. A three-step change gear is also fitted to vary the work spindle speeds from 8 to 12 r.p.m. The wheel spindle speed is from 900 to 1,000 r.p.m. Standard equipment includes pump with piping and slush pans. Also chucks as specified, countershaft and special wrenches.



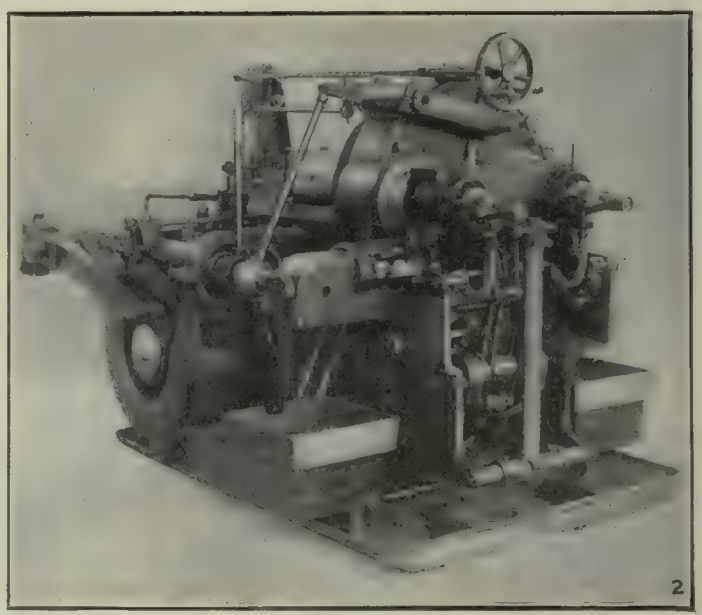


FIG. 1—OSTERHOLM DUPLEX GRINDER IN LOADING POSITION WITH WHEEL GUARD PLATE OFF.
FIG. 2—OSTERHOLM GRINDER IN WORKING POSITION.

News Section

Enthusiasm Displayed at Meeting of Society For Testing Materials

OPENING with a large registration on Monday, June 25, the American Society for Testing Materials enjoyed five days of splendid weather at Atlantic City. The meetings were some of the best ever held by the society, at times being so productive of ready discussion that they ran far over the time allowance. Several of the papers and committee reports will be printed in full or abstracted in the *American Machinist*.

At the first session the following offices for the ensuing year were announced: President, Guilliaem Aertsen, Bethlehem Steel Co., Chicago, Ill.; vice-president, W. H. Fulweiler, United Gas Improvement Co., Philadelphia, Pa. Members of Executive Committee: J. H. Chubb, Universal Portland Cement Co., Chicago, Ill.; T. G. Delbridge, Atlantic Refining Co., Philadelphia, Pa.; P. H. Walker, Bureau of Standards, Washington, D. C.; H. L. Scott, H. L. Scott & Co., Providence, R. I.

Interesting Sessions

The first session was devoted to the subject, "Non-Ferrous Metals and Alloys," and of interest to the machinery industries was the report of committee B-2 which included a statement of progress on the study of proportions and methods of casting test specimens for casting. E. H. Dix, Jr., read a paper on methods of casting test specimens of gun metal, and John R. Freeman, Jr., and Paul F. Brandt presented a paper on the influence of the ratio of length to diameter in the compression testing of babbitt metals.

"Corrosion, Fatigue of Metals and Magnetic Analysis" was the subject of the second session. J. H. Gibboney read the report of Committee A-5 on the corrosion of iron and steel, and E. C. Lathrop read the report of Committee B-3 on the corrosion of nonferrous metals and alloys. In his paper on the endurance properties of steel, D. F. McAdam, Jr., described an extensive series of tests to determine the "endurance limit" of various carbon and alloy steels at 10,000,000 repetitions of alternating tension-compression and alternating torsion stress. Consideration was given to the relationship of endurance properties to impact properties, influence of chemical composition and heat treatment, influence of non-metallic inclusions, and influence of form and surface finish of a machinery part. Types of steel best adapted for various kinds of service were discussed. R. R. Moore gave a paper on the resistance of manganese bronze, duralumin and electron metal to alternating stresses. F. P. Fahy read the report of Committee A-8 on magnetic analysis and A. V. deForest described an apparatus suitable for the inspection of finished or semi-finished steel products in the mill.

As a part of the third session reports from the committees on wrought iron and cast iron were read. A discussion on the topic, "Is It Desirable to Include Chemical Requirements in Specifications for Cast Iron?" was led by Robert Job for the affirmative and Richard Moldenke for the negative. The decision of the society did not favor the general inclusion of chemical requirements. That they are desirable in special cases was admitted.

In their paper on the significance of tool temperatures as a function of the cutting resistance of metals, H. A. Schwartz and W. W. Flagle described an instrument for recording the changes of temperature of a drill or other cutting tool in action. It was believed that the temperature under given cutting conditions in various metals is an indication of their machine ability or cutting hardness. Data concerning typical ferrous alloys were given, including some relations between energy per cubic inch of metal removed, temperature and rate of removal of metal. The third session closed with the report of Committee A-4 on heat treatment of iron and steel.

The annual address by the president was given at the fourth session by George K. Burgess. Mr. Burgess' subject was "The Trend of Standardization." He told of the work on standardization accomplished by the A.S.T.M. and spoke of the number of A.S.T.M. standards accepted by the A.E.S.C. He referred to the limits accepted in the liberal arts and raised the question of why standardization should be opposed by industries if it is found applicable in the arts? Mr. Burgess also emphasized the importance of research and explained its relation to standardization.

Over-diversification

In a popular talk, with lantern slides, Wm. A. Durgin, of the Department of Commerce, gave examples of over-diversification. He told how it was found that there were 20,000 sizes and styles of pickle bottles, a possible variety of 994,840 single-bit axes, 298 sizes of the American flag and gave other equally illuminating figures. He gave as a conservative estimate that the loss in industry amounting to ten billions per year, due to waste, is 20 time the total annual loss of fire.

Past-President Arthur N. Talbot, Professor of Municipal and Sanitary Engineering, University of Illinois, received, at this session, honorary membership in the society.

The fifth session was devoted to the subject, "Steel and Methods of Testing." The reports of several committees were accepted and several papers were read.

Sessions six to thirteen dealt with subjects not of immediate interest to the machinery industries.

Show Large Shipments of Locomotives

The Department of Commerce announces May shipments of railroad locomotives from the principal manufacturing plants, based on reports received by the Bureau of the Census from the individual establishments.

The following table compares the May, 1923, figures with the previous month and with the corresponding month last year, as well as totals for the year to date, compared with a year ago, in number of locomotives:

LOCOMOTIVES

	May 1923	April 1923	May 1922
Shipments:			
Domestic	228	201	54
Foreign	10	16	16
	238	217	70
Unfilled orders: (end of month)			
Domestic	2,045	2,111	497
Foreign	105	93	124
Total	2,150	2,204	621

B. & O. Sells Two Branch Railroads

The Baltimore & Ohio Railroad has announced the sale of the Sandy Valley & Elkhorn and Miller's Creek Railroads to the Consolidated Coal Company and the sale of the Long Fork Railway to the Chesapeake & Ohio Railroad. The two transactions involve approximately $8,000,000, of which $6,000,000 is said to have been paid for the Sandy Valley & Elkhorn and Miller's Creek Railroads and $2,000,000 for the Long Fork Railway.

Officials of the Baltimore & Ohio said the contract was closed pending approval of the Interstate Commerce Commission. Funds from the sale, it was stated, would be used to develop Baltimore & Ohio property in West Virginia.

There will be little effect in the handling of freight developed in the Kentucky coal districts as a result of the change, it was said.

Claim I. C. C. Overstepped Authority

Officials of the Virginian Railway will ask for a rehearing of the Guyandot River Branch case, in which the Interstate Commerce Commission refused to grant permission for an extension, on the ground that coal development on this branch was unnecessary, it was stated by officials of the road. The petition now is being prepared and will be presented to the Interstate Commerce Commission next week.

While the amount of trackage is only 1.19 miles, the decision is considered of far-reaching importance by railroad men, coal land owners, and manufacturers, who assert that the Interstate Commerce Commission has exceeded its power.

Six Months Record for New York Business

Summing up the machine tool business in the Metropolitan district for the first six months of the year, reports show that it has been highly satisfactory and in many cases more than doubled the amount of business that was transacted during the first six months of last year. Several dealers report that this period has also passed any former six months in their histories both in the number of orders and the amount of money involved.

Comparing June with other months of 1923 shows that business has been slightly ahead of most of them and about 60 per cent that of May, which proved to be a banner month despite a bad start and predictions of all kinds of trouble from the pessimists.

One of the factors that, while apparently designed to be a hindrance to business will undoubtedly prove a boon, is the demand of labor for more pay. While viewed with alarm by the short-sighted, the more progressive manufacturers have merely taken the past for a precedent and have put the engineering department to work on new machinery which with greater speed and labor-saving devices will balance any demands that may be made for either shorter hours or more pay on the part of the workmen.

New England machine tool makers are well employed and most of them are optimistic as to the future. Some of the opinions from this section of the country are flavored with a seasoning of caution, but there is none of that over cautious spirit which was prevalent a few short months ago. The sensible manufacturers are looking to July and August as quiet months and are preparing their plans to meet this condition in much the same manner that they have every Summer since they began business. If a good average is maintained it will be considered highly satisfactory.

There is every indication that the Fall business will open early and brisk. Warehouses are not filled, business in all lines is progressing steadily and there is every reason to be hopeful.

In the used tool field reports have it that buying is not difficult, but that selling, except in certain sections of the country, takes additional effort.

Buffalo Business Shows Substantial Gain

Machine shops in the Buffalo district report that business is very satisfactory, although none of them seem to be rushed and one or two spoke frankly of a shortage of work as compared with the first five months of the year. However, most machine shops experience a seasonal slackening at this time of the year and even those who are not as busy as usual at this time have had enough business already this year to make them feel prosperous. There seems to be very little call for new equipment among the Buffalo machine shops and only a slightly stronger demand for used.

In the pump manufacturing line there seems to be a definite slackening, although occasional spurts during the last month or two have produced sufficient business to keep the plants running comfortably and there are many active inquiries for future large installations.

One firm making hack saws reports that its domestic business, which has been exceptionally heavy all the year thus far, is holding up and even increasing at this time.

Manufacturers of electrical apparatus and automobile parts manufacturers are buying considerable sheet metal working machinery at this time, but the automobile manufacturers do not appear to be as busy as earlier in the year and Buffalo manufacturers of light and heavy equipment for such work, who have been depending largely on the automobile industry, are experiencing somewhat of a let-down.

A representative of one of Buffalo's largest manufacturers of heavy machinery and power plant equipment reported that business was very strong, the shop was full of work and there were orders enough ahead to keep them running full time for some time in advance.

A few weeks ago this same plant reported that business had fallen off materially and while plenty of orders were being figured on there was little real prospective business in sight. This sudden reversal is just another indication of the present state of the machinery trade. The business appears to be subject and very sensitive to manufacturing vagaries that, when analyzed, seem to be little more than a state of mind. These transitory slack periods have come rather frequently since the latter part of April and are always followed almost immediately by a rush of business sufficient to make up for the slackness.

Milwaukee Business is Brisk and Steady

The machinery market in Milwaukee is assuming an aspect of increased activity, which is noticeable merely because there was an inclination in demand during May and June to slow down so far as forward orders were concerned. Now that various industries have charted their requirements for the last half of this year, orders are developing more encouragingly. In the meantime, the metal trades shops have had no occasion to reduce their production schedules; in fact, the effort to engage more men remains strong and a great many shops keep orders standing with employment agencies, public and private. In the case of the larger employers, so-called scouts are constantly on the move from one industrial center to another in the search for skilled workers, and it is true as well that other centers are doing likewise in the Milwaukee market.

Buying of floor equipment by metal trades shops still has appreciable limitations growing out of the caution exercised to prevent over-expansion of production facilities, at a time when the maximum use of these is not guaranteed for a long time ahead, and when the labor problem is a paramount one. Nevertheless, the needs appearing from time to time, despite scattering sources and confinement to replacement necessities, form a fair volume which is again showing a tendency to increase.

So relatively little railroad equipment business has come to this machinery market that disappointment is expressed, although it is recognized that the process of actually getting orders from this source on the books is rendered slow and difficult by the uncertainty surrounding the railroad situation as a whole, and particularly with regard to financing. The belief is expressed that in the coming year the situation will have clarified to the extent that a generous aggregate of machinery business is likely to find lodgment.

Demand from automobile shops is of a moderate volume, although in the big passenger car producing centers the main demand seems to be for equipment of body shops to offset the shortage of enclosed type bodies rather than to bring vehicle production upward. At the same time a number of manufacturers of units and parts in Milwaukee are steady buyers of machinery. A conspicuous example is the A. O. Smith Corp. of Milwaukee, which continues to increase its equipment for producing pressed steel frames, stampings, forgings, etc. The expectancy is that so far as the passenger automobile industry as a whole is concerned, major needs for this year have been filled and demand will be of a piecemeal character until after December.

Pittsburgh Cheerful as to Future

A feeling of optimism is present in the machinery and machine tool industry in the Pittsburgh district, notwithstanding the fact that there is a tendency in the machine tool and equipment market to hold back on purchases of material that is likely to be needed in the near future. There are several reasons for this backwardness, the chief of which is the labor shortage in the mills and plants that are good customers of machine tool jobbers and builders. Yet a number of transactions have been recorded by sellers of equipment, showing that a good inquiry is current, giving the industry a feeling of stability and sound hopes for the future.

While no very heavy orders have been placed, it is announced that the Westinghouse Electric & Manufacturing Co. at its Sharon plant has purchased hand shears, plate machinery, lathes, shapers and milling machines, while some local jobbers are still bidding on a number of items, including presses for transformer work. The Pennsylvania R.R. has deferred action on the purchase of six lathes wanted for its Conway yards. As regards used machinery, an active market has developed here lately, although prospective buyers are hesitating to close, evidently expecting lower prices in a short time. Word from Wheeling says that the Wheeling Steel Corp. has been buying some equipment in the past week or two, and in that district the purchases include shears, two or three drilling machines, a light four-foot radial drilling machine keyseaters and small lathes.

The month of July is always a slow month in steel mill operations, but as the general repairs are made at that time, it seems to augur the placing of many orders for new machinery and machine tools to replace those worn out or broken in the heavy grind of almost capacity operation which the mills have enjoyed in the past ten months .

All plants are viewing the Fall with cautious optimism and anticipate record or near record business. No labor trouble is expected in this district as the workmen appear satisfied.

Business Brightens in Britain

Better condition obtain and the future is a trifle more cheerful than it has been—English commercial motor vehicle no match for those from the United States and competing companies fail

BY OUR LONDON CORRESPONDENT

THE official returns of overseas trading just issued suggest an improvement and again we are being told that the trade slump has reached its limit. Comparisons are, however, a little difficult. The Irish Free State now being a separate entity British imports from and exports to that area are, therefore, entered, while other overseas trading to or from Southern Ireland is excluded.

Taking the figures for the five months of the present year and comparing them with the corresponding figures of last year, an increase in imports amounting to about 11.5 per cent is shown, with an increase in exports of British produce of more than 6.5 per cent; or taking all exports, that is including re-exports, the increase is 7.5 per cent. The imports last month, amounting in value to about 89½ million pounds, showed an increase of more than 3 millions. Similarly, exports were valued at about 71½ million pounds, an increase during the month of 8½ million pounds. Re-exports showed a small decline during the month and amounted to about 11¾ million pounds. It is to be remembered that May had 2 more working days than April.

The machine tool exports for the five months were worth £667,411, as compared with £762,863 during the corresponding period of 1922. Of the various classes into which machinery exports are divided the chief decline is in textile machinery, the difference so far this year amounting to more than 1½ million pounds.

Then, while the value of commercial vehicles imported shows but a slight increase, touring cars so far entering Great Britain this year have nearly doubled the value of those of 1922, namely, £1,598,000 as against £839,000, the total in the motor car and parts class being £3,450,331 against £2,565,580 for 1922. The total motor car and parts exports amounted similarly to £1,377,634 compared with £1,232,351 in 1922. Rubber tires were brought in to the value of £1,848,000 as compared with £1,945,000 in the same period of 1922, while the corresponding exports amounted to £881,586 and £920,908 respectively.

Hold Out Little Hope

Figures given above suggest that the prospects of manufacturers of textile machinery are not quite so hopeful as they have been. Certainly it is no longer necessary to quote delivery in three years. In fact some members of the trade may be regarded as slack. More than a year ago it was recognized that the export side was declining, but expectation was confident that in due time this would be off-set by the receipt of home orders. It may be yet. In any case for the present this branch of British industry is without undue anxiety.

Looked at generally, conditions in the engineering industry cannot be regarded as much easier. The shipbuilding industry has been handicapped by a lock-out of the boiler makers, and as a whole the branches of the industry concerned with transport have of late met varying experiences. For the locomotive shops continue slack and, incidentally, the machine tool people concerned are complaining that the amalgamation of the railway lines into four combinations has led to the concentration of purchasing power at the London offices so that the engineer in the works is not liable to order direct. To return, one well-known Glasgow locomotive works has had to close for the time being and others are hard pushed.

On the lighter side of transport, however, the motor car firms and motor cycle and ordinary pedal cycle makers have been for the most part busy, the demand having kept up beyond the usual season. Quite possibly the condition of the ordinary cycle trade has during the current year been better than in any year since the war. More than one million pounds worth of push cycles and parts has been exported so far. It has been estimated, in fact, that, with the home trade satisfactory, exports have been at the rate of 80,000 cycles per annum. Some of the firms are behind in output.

Motorcycle Conditions

The motor cycle section is hardly so optimistic, but appears to be having at least a satisfactory season, though the experiences of firms vary somewhat. The export trade in this section too is improving, amounting for cycles and parts to £457,000, but the ground lost in Europe has not yet been recovered, though Italy has ordered. Scandinavia has, it is asserted, a large number of American machines in stock, to act as a handicap. South Africa and India seem more hopeful areas and machines have been sent to the Near East. Some Midland firms have been exporting about 40 per cent of their output. Cycle makers have reduced prices—that is, wholesale prices—despite the fact that a number of raw materials employed have definitely risen in price, and the increase in turnover will not bear a corresponding increase in profits.

Taking general conditions into account the motor car industry has little cause for complaint and certain makers of lighter cars are quite fully engaged. The commercial vehicle side remains badly employed. Recently in parliament it was stated that of the 16 fair-sized British manufacturers of commercial motor vehicles, 4 last year went into liquidation and the remaining 12 between them lost more than 2½ million pounds. Later figures suggest that 5 firms have gone into liquidation and that, while all have sustained heavy losses, two of the remaining firms have given up this particular branch of manufacture. Consequently an industry which had employed 20,000 cannot find sufficient work for 5,000.

The sale of after-war surplus is the leading cause, and many members of the industry are trying to obtain the same protection that the pleasure car has, namely, a duty of 33⅓ per cent. But this duty, imposed originally purely for war purposes, is quite insufficient to keep out foreign cars.

It is extremely difficult from the official figures to discover the exact value of imports of pleasure vehicles as compared with commercial vehicles. According to one estimate, of the total imports of this kind during 1920, amounting to nearly 23½ million pounds worth, some 36 per cent was on account of commercial vehicles, the percentage rising to 50 in 1921, when the total imports were rather more than 5¾ million pounds, and being about 30 in 1922, when the total imports were rather less than 6 million pounds. Of course the United States is regarded as the most important competitor in this particular line and, although it is pointed out that whether as to wages paid or exchange rates the advantage is not on the side of America, the gain that accrues from the home market being completely protected is held to be overwhelming.

It may perhaps be added too that the rubber tire industry has been passing through rather critical times. While many tires are being imported, employment could be found for but a relatively small proportion of the 65,000 workpeople ordinarily engaged in an industry in which £25,000,000 to £30,000,000 has been invested.

Little change is discernible in the machine tool trade and although claims are occasionally made of improvement it is certainly not marked. Of late some districts have reported a decreasing number of enquiries, but this in itself is of no moment as the practice has grown during the past few years of inquiring merely to determine present values.

Steel Production This Year Nears Record

The American Iron and Steel Institute has issued its statement covering the operations of steel mills of the country for the full year 1922. This report showed that a total of 34,568,418 tons of steel ingots were produced last year, against 19,224,084 tons in 1921; 40,881,392 tons in 1920 and 43,619,200 tons in 1917, the latter being the record year in the history of the industry. The record total for 1917 was due to the activity of the mills in meeting the demands of the United States shortly after it entered the World War, together with the demands of its allies.

In some quarters the belief prevails that the record total for 1917 will be exceeded this year, especially if the rate of production witnessed since the beginning of 1923 is maintained during the remainder of the year. The April production this year was at an annual rate of more than 49,000,000 tons, while the May production was at the rate of 48,440,000 tons.

News of Washington Activities

By PAUL WOOTON

TWO letters of unusual importance were received by the U. S. Coal Commission last week. One was from the President urging the importance of an agreement being reached in the anthracite field. The other was from the Attorney General pointing out that it would be in violation of our statutes if the alleged agreement exists whereby British coal diggers would not mine coal for shipment to the United States during a strike here and whereby the American union would conduct itself similarly during a strike in the British Isles and coal was needed very badly.

It is very apparent that the Commission made no mistake in the appraisal of the value of the two propositions. The daily press attached great news value to the Attorney General's letter, but gave only incidental attention to the letter of President Harding. The President's letter undoubtedly was prompted by the election of Rinaldo Capellini to the presidency of District No. 1 of the United Mine Workers of America. This victory for the radicals among the workers in the anthracite region reaffirms the presence of a dangerous unrest among them, which had its first outbreak in the demand for nationalization. The fact that the radicals are in the saddle in District No. 1 increases greatly the difficulties which must be overcome before a settlement is reached. The President very evidently caught the true significance of Mr. Capellini's election. The Coal Commission is even in a better position to know its important portent. That is why its members apparently attached so much importance to the letter from the White House and seemingly dismissed the letter from the Department of Justice with the statement that they have no information as to such a contract. Chairman Hammond stated positively that John L. Lewis on appearing before the Commission, after his return from Europe, gave no intimation of having negotiated any such agreement.

Change from a coal consuming to an oil burning basis in the heating plant of a Federal Government institution in the District of Columbia is opposed in a report by the Mechanical Engineering Division of the United States Bureau of Mines, which recently conducted efficiency tests at the plant, on the ground that consideration of conservation of national resources leads to the conclusion that oil should not be used in stationary plants which show so small computed savings over coal.

By a slight change in the furnace, the Bureau of Mines engineers pointed the way to fuel economies at this plant. The tests showed variations in efficiency among the three shifts in the fireroom.

The question of changing the plant from a coal burning basis to an oil burning basis is treated in the report in two phases, the first being the economic phase covering the present and immediate future of the plant. On this phase, the report states that the plant could be changed to an oil burner at a cost of $33,500, to be amortized in five years. Assuming that oil could be contracted for at 3.5 cents per gallon, as contrasted with New River coal at $8.18 per ton, it is estimated the plant could save only $2,400 a year by changing to oil.

The second phase of the question, the broader one of the conservation of national resources, is declared by the report to be subject to the personal opinions of authorities on the matter. Regarding this, the report concludes:

"The second phase of the question, which is not concerned with the present or the immediate future, militates against the use of fuel oil in a stationary plant. Oil is one of our national resources which is limited in extent and must be conserved for military, naval, merchant marine and lubricating needs. To use it extensively in stationary plants brings nearer the time when the supply will be exhausted and the above needs for its best use will have to seek supplies in some other form.

"At present oil prices are low, and therefore favorable to plants desiring to change from solid to liquid fuels, but no one can predict how long such conditions will exist. It is certainly true that a plant changing from coal to oil now will have to revert to coal again in the not too distant future. It seems advisable from a national resource standpoint that this plant continue on a coal burning basis and bend their energies toward improvement in coal efficiency rather than seek a change to fuel oil."

Recommendations for the elimination of a number of sizes of structural and partition units made of concrete were endorsed by committees representing the Concrete Products Association and the American Concrete Institute at a preliminary meeting held June 21 with the Division of Simplified Practice of the Department of Commerce. The committees expressed a desire for a general meeting of all interests concerned in the subject next October to consider adoption of the recommendations.

The tentative recommendations are the result of a survey made under the direction of Wallace R. Harris, chairman of the committee on standard building units of the American Concrete Institute. This survey showed concrete blocks made in 30 different lengths, 20 widths and 26 heights.

The tentative recommendations for foundation units are height 7⅝ in., length 15⅝ in. with wall thicknesses of 8 and 12 in. For load bearing wall units the recommendations are height 7⅝ in., length 15⅝ in. and wall thicknesses of 6, 8, 10 and 12 in. For load bearing concrete structural tile the recommendations are for height 5 in., length 11⅝ in. and wall thicknesses of 4, 8 and 12 in. For concrete partition tile (non-load bearing), the recommendations are height 7⅝ in., length 16, 18 and 24 in. and width 3, 4, 6 and 8 in.

Attending the preliminary conference were: Herbert A. Davis, representing both the Concrete Products Association and the American Concrete Institute; C. E. Lindsley, American Concrete Institute; L. L. Wagner and John L. Miner, Concrete Products Association; P. E. Holden and E. W. McCullough, Chamber of Commerce of the United States; and R. M. Hudson, assistant chief of the Division of Simplified Practice, Dept. of Commerce.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb....	$0.034	$0.034	$0.0231
Cold finished shafting.....	per lb....	0.042	0.042	0.0034
Brass rods.....	per lb....	0.1825	0.1913	0.1783
Solder (½ and ½)	per lb....	0.2862	0.2812	0.22
Cotton waste...	per lb....	0.1231	0.1231	0.101
Washers, cast iron (½ in.)...	per 100 lb.	4.66	4.66	4.00
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100...	3.08	2.96	3.11
Lard cutting oil	per gal...	0.608	0.592	0.575
Machine oil....	per gal...	0.349	0.349	0.356
Belting, leather, medium.....	off list....	42½%	42½%	46⅔%
Machine bolts up to 1x30 in.	off list....	44¼%	44¼%	58%

F. A. E. S. Protests Davis Dismissal by Work

Protest by the Federated Engineering Society, representing 50,000 members in the United States, was made to Secretary Work against the summary dismissal recently of Arthur P. Davis as director of the Reclamation Service, and the appointment of a business man without technical knowledge of irrigation or constructive work connected with it.

The protest was presented by L. W. Wallace, executive secretary of the Society, to the Assistant Secretary of the Interior in the absence of Secretary Work, en route to Alaska.

The society intends to demand a thorough investigation and explanation of Secretary Work upon his return. This investigation, the officers of the society say, is not expected to bring about the reinstatement of Mr. Davis, but is aimed to call attention of the public to a changed policy, which if continued would discourage technical men entering the Government service and in the end cripple the efficiency of public activities.

Other engineering societies are expected to join the formal protest lodged by the Federated Society. The nation-wide agitation against the action of Secretary Work set in motion by technical men will, in the opinion of members of Congress now here, lead to a thorough investigation by Congress early next December.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THE hysteria of alarm by which Wall St. has recently been afflicted reached the climax of absurdity on June 26, when a professional prophet who sells his predictions announced that "we now advise clients who are unwilling to carry their stocks through a possible year of lower prices to sell immediately on every rally."

Inasmuch as the author of this rather startling advice had been predicting higher prices ever since March 6, when the market was an average of 10 points higher, it was assumed that his sudden change of front indicated a preknowledge of some very importance and unfavorable development. If this does not prove to be the case he should be severely censured for unnecessarily aggravating the mistrust caused by the failures of the previous week, and the unfortunate "clients" who sold on his advice will have just cause to complain of his bad judgment as expressed in his bulletins during the last two and a half months.

Certainly there is nothing to be discerned that justifies pessimism at present, and if one must speculate in the stock market, which is always hazardous, it would seem to be far wiser to buy than to sell.

In support of this view reference is made to the following facts:

1. The large business indicated by the unprecedented railway traffic and increased net earnings of the roads, which are still gaining.

2. The fact that practically everyone who is willing to work is employed at good wages.

3. The large sales reported by the department stores who are doing a much bigger business than a year ago.

4. The abundant supply of credit assured by the reserve ratio of 76.9 per cent reported by the Federal Reserve System last week. The percentage of reserves to liabilities has apparently been but little affected by a loss of nearly $19,000,000 in the gold held. The reduction is presumably due to continued disbursement of "yellow backs" by the banks who are trying to conceal our plethora of gold by getting it into circulation.

5. The gradual subsidence of the scare caused by the failure of two moribund banking firms and the wild rumors deliberately circulated about others of unquestioned standing.

6. The decline in the stock market recorded since early in March. It runs all the way from 5 to 25 per cent and justifies the expectation of a recovery.

Those who can interpret the foregoing bearishly are welcome to make the most of it, but it is highly improbable that the hard-headed business men who are outside the environment of Wall Street will be driven into a panic by the outgivings of those who would not need to sell their advice if it was infallible.

The wise man will of course make allowance for accidents in appraising every situation, but the recent decline in the stock market seems to have discounted nearly everything but a world wide cataclysm and we had so many cataclysms during the seven years ending with 1921 that humanity is tired of them and will be on guard against any more such happenings in the near future.

This may explain the recent nervousness of the speculative markets, but it is also a guarantee against dangerous expansion and the peril of a sudden collapse.

> "If it were possible to make a balance sheet of the world's condition today and compare it with a similar statement made up six months ago, we should probably find that the sum total of human wealth had been substantially increased in the interval. . . We are reducing our national debt rapidly, the government is a little more economical, there is a faint hope of lower taxes and we can be thankful that we are not going backward."

Restrained by this cautionary spirit prices swung within narrow limits last week. In the steel industry the extreme heat compelled some short time, but the mills are well sold ahead and leading manufacturers say that they will be fully employed to the end of the year. The weakness of copper, which is attributed to the diminished purchasing power of Europe, is in fact the only unsatisfactory feature of the metal market, as the relatively low price of wheat is about the only thing of which the farmer can now complain with reason.

They are both due to the economic disorder and impotence of Europe, which time alone will remedy.

Corn and cotton are both selling at prices which will pay the industrious farmer a comfortable profit unless there is a serious crop failure. As to corn, it is too early to speak positively, but cotton appears to have stabilized itself at between 20 and 25 cents for the next crop, with a possibility of substantially higher prices if current crop estimates averaging probably 10,750,000 bales are not greatly exceeded.

Coffee and sugar are not much changed. The price of coffee depends upon the Brazilian Government and opinions of its intention and ability to sustain prices vary from day to day.

Sugar is not cheap but it is not dear and with care the unsold portion of the Cuban crop can probably be marketed around present prices.

There is a conflict in my opinion about wool. Prices in London show a declining tendency, but Mr. Wood of the American Woolen Co., who is the world's largest buyer, says that trade is good and that there is no reason for any decline.

The cotton goods market is hesitant and will probably remain in that condition until buyers know what the next crop will be.

The news from Europe lacks sensationalism, but does not indicate that much progress is being made toward finding a key for the Franco-German deadlock. With marks selling at 150,000 for a dollar and over thirteen trillions in circulation they can not any longer be considered as a medium of exchange. They are of interest chiefly as an example of Germany's ingenuity in marketing the product of its paper factories.

The trade reports received from England, and especially Lancashire, are characteristically lugubrious, but Great Britain is nevertheless muddling through and the buoyancy of the London stock market seems to indicate that some Englishmen are making money.

Private advices from Russia are surprisingly encouraging and indicate a distinct renaissance of industrial activity now that the capitalistic regime has been re-established.

If it were possible to make a balance sheet of the world's condition today and compare it with a similar statement made up six months ago we should probably find that the sum total of human wealth had been substantially increased in the interval. Some items would be larger and some smaller, but on the whole the comparison would show progress.

This is all we can ask and though "man never is but always to be blest" there is some satisfaction in the thought that the world in general and America in particular is better off at the end of the half year than they were six months ago.

We are reducing our national debt rapidly, the government is a little more economical, there is a faint hope of lower taxes, and while we have still a good many things to complain of we can at least be thankful that we are not going backward as we resolve to go forward more rapidly in the future.

Costly to Test New Coal

Only thorough trial on a large scale and at great cost can determine the worth of Henry Ford's project for low temperature carbonization of coal on a commercial basis, according to Dr. Jerome J. Morgan, member of the American Chemical Society, and professor of chemical engineering in the School of Mines, Columbia University.

Germany and Her Export Trade

Radical changes have taken place in the foreign business of Germany since the war—Speculative buying by neighboring countries—Heavy machinery still the rule

BY OUR BERLIN CORRESPONDENT

THE year 1923 opened under unfavorable auspices for the foreign machinery trade. During the last months of the past year actual shipments on foreign orders were still strong, running up to the record figure of 13,574 tons in December, but a certain weakening of the market was unmistakable. It may be assumed that, even if normal conditions had continued, the export business would have shown a marked drop.

The Ruhr occupation has certainly reduced the credit, which the German machine building industry enjoyed abroad, and, by plunging the country into a series of adverse conditions, which viewed from outside assume even a graver aspect than actual experience warrants, has proved almost fatal to the export business. If this does not find stronger expression in the foreign trade returns of the German machine building industry for the first three months of the year, it is for the reason that the shipments of these months constitute in the main deliveries on orders booked for in advance.

From the following figures, giving the German machine export for January, February and March, with the monthly average of 1922 and 1913 attached for the sake of comparison, a gradual drop is, however, clearly visible.

TABLE I

	January	February	March	Monthly Average	
	Metric Tons			1922	1913
Machinery total	34,682	26,115	29,279	40,910	46,226
Textile machinery	3,879	2,939	3,862	3,554	5,702
Locomotives and tenders	3,429	1,572	1,037	8,438	4,844
Machine Tools	5,485	4,555	4,303	6,514	6,195
Agricultural machinery	3,032	2,334	2,657	2,868	3,392
Electric machinery	2,153	2,456	2,321	1,975	3,101
Motor vehicles	1,478	1,391	1,134	1,634	1,274
Cycles	1,551	1,189	1,392	1,344	811

The subdivision of these exports into main groups visible in Table I shows that the various branches of machine building were affected rather unequally. The general downward tendency can, however, be clearly recognized, especially in comparison with the monthly average of 1913. If remembering, however, that beginning with February the whole German west, as far as it is occupied, is practically eliminated from the export business, which in consideration of the size of the industry in these parts would lead to expect much graver effects, the above quoted figures give an excellent illustration of the power of resistance inherent in the German industry.

Only in the locomotive industry can a serious drop be observed, especially in comparison with last year's record business, as a direct consequence of the strangling of the Rhenish-Westphalian export. As far as the machine tool industry is concerned, the occupied parts contribute to the production and consequently to the export a by far smaller percentage than in the matter of heavy machinery.

In the Ruhr district proper there is only a small number of works of minor size. The Rhenish machine tool industry is located in the main in and near Düsseldorf and Cologne. These works, although faced with a great deal of difficulties, have found an outlet for their production at least in part, which makes their situation less precarious than it would seem viewed from outside. The machine tool production in the occupied parts constitute no more than about 15 per cent of the German total. The main centres in Saxony, Greater Berlin and South Germany are removed from the abnormal conditions prevailing in the occupied zones. The decline of the machine tool export, exhibited in the figures in Table I, is therefore attributable in the main to market conditions. A clear insight into these conditions can be gained from Table II, which shows machine tool exports during the first three months of the year, grouped with regard to countries of destination, with the corresponding exports of the first quarter of the three preceeding years and of 1913 attached.

TABLE II

		Jan.	Febr.	March	January–March 1923	1922	1921	1920	1919
Alienated German territory		287	126	197	653	737	228	518	....
Belgium		295	51	40	386	2,397	2.961	1,779	1,323
Denmark		127	77	83	287	395	266	577	284
France		570	888	89	1,547	1,574	1,910	2,915	3,971
Great Britain		181	298	198	677	683	416	375	755
Italy		177	117	160	453	3,155	1,101	1,544	1,286
Netherlands		320	159	163	641	1,311	1,359	3,971	1,351
Norway		28	53	34	115	81	128	343	241
Roumania		53	94	30	177	283	164	50	133
Sweden		48	36	60	144	393	241	1,278	346
Switzerland		201	139	167	507	539	574	2,489	703
Spain		77	115	98	290	423	372	700	286
Former Austria		280	205	234	719	1,017			
Former Austria Hungary		50	43	29	122	60			
Austria Hungary Czechoslovakia		62	137	130	289	770	1,642	1,786	2,936
Former Austria Hungary Jugoslavia		6	25	11	42	163			
Former Russian Empire Russia		33	16	46	95	23			
Former Russian Empire Poland		154	191	146	491	95			
Former Russian Empire Lettonia		19	20	33	72	136	212	213	2,191
Former Russian Empire Finnland		40	61	12	113	72			
Egypt		4	10	24	38	25	...	...	...
British India		72	13	7	92	63	...	...	...
Japan		53	29	201	283	188	57	25	137
Dutch Indies		132	8	19	159	206	195	276	421
Argentine		163	60	118	341	401	170	223	422
Brazil		90	94	75	259	194	...	...	...
U. S. A.		138	132	196	466	305	97	97	239
All others		444	273	346	1,065	994	1,096	843	827
Total		5,485	4,555	4,303	10,377	16,593	13,089	19,992	17,852

Close reading of the figures in Table II lays bare the astounding history of the post-war German machine tool trade in comparison to pre-war times, whereby it has to be remembered, that the year 1913, to which the figures in Table II make comparison, was one of a record business. From the total of the figures it can be seen that the year 1920 has in actual volume of business surpassed all others. Reaction followed in the subsequent year, superseded by a partial recovery in 1922. In comparison with that year, the drop of this year's export is rather striking, in fact the export of the first 3 months of 1923 constitutes the low-water mark of all post-war years with the exception of the year immediately following the end of the war.

The most interesting feature in the German machine tool export of previous years is the part played by the surrounding neutral countries, Holland, Norway, Sweden, Switzerland, which alone in 1920 have purchased considerably more German machine tools than ever before and evidently much beyond their own needs, exhibiting the speculative character of a great part of such purchases.

In the subsequent years these exports have dwindled down to a normal state and even below. This fact explains in a large degree the decrease of the German machine tool exports since 1920. Another feature is the steady increase of exports to Italy and Belgium to far above the pre-war average. The drop visible in comparison to last year in both cases is rather marked. While in the case of Belgium it has certainly been caused in a measure by the economic war, it can in that of Italy be solely due to changed market conditions.

Of further interest is the size of exports to the states of the former Russian Empire. The purchases of the

TABLE III

	Jan.	Feb.	Mar.	January–March 1923	1922	1921	1920	1913
Netherlands	2	4	..	6	54	...	...	....
Austria	1	2	1	4	45	27	50	37
Switzerland	5	2	5	12	15	32	18	146
U. S. A.	8	22	..	30	82	13	17	1,195
All others	22	8	33	63	112	56	147	395
Total	38	38	39	115	308	128	252	1,773
Number	70	52	44	166	397	...	...	2,473

Soviet Republic appear insignificant and far below expectation. If exports to Poland seem considerably increased in comparison to last year, it must be remembered, that the increase is chiefly due to the fact that the supply to alienated parts of Upper Silesia is now listed as exports.

The number of machine tools exported during the first three months of the current year is 27,058, the average weight per tool therefore is 383 kg. This average weight last year was 600 kg. and in pre-war years about 700 kg. The decrease in average weight is no mere chance or due to reduction of weight, but to the preference given to lighter types. German machine tool makers have with few exceptions so far done nothing to economize in weight, but are still dimensioning their designs in the old overgenerous way.

In comparison to exports, machine tool imports still play an insignificant part, as can be seen from the figures in Table III.

While in the first three months of 1913, 2,473 tools weighing 1,773 tons were imported, the corresponding amount in the first three months of the current year was only 166 tools weighing 115 tons or not more than from 6 to 7 per cent. The main countries of origin are the U. S. A., Switzerland, Austria and Holland.

Personals

HOWARD ADT, president, the Geometric Tool Co., New Haven, Conn., has taken his family with him on a two month's business trip to Europe. He sailed June 23 on the George Washington.

ROBERT CRAMER, vice-president and chief engineer of the Cramer Mfg. Co., pumps and accessories, Milwaukee, has been appointed a member of the Sewerage Commission of the City of Milwaukee.

C. M. KNIGHT, general manager of the Burlington (Wis.) plant of the Universal Can Co., has also been appointed general manager of the Burlington branch of the Nestle Food Co. The Universal company is a subsidiary of the Nestle interests.

W. D. LEGGE, since 1917 master mechanic and tool designer for the Four Wheel Drive Automobile Co., Clintonville, Wis., has resigned to accept a position with the Tuttle Press Co., Appleton, Wis.

FRANKLIN S. TERRY, co-manager of the National Lamp Works, Cleveland, Ohio, was elected vice-president of the General Electric Co., and B. G. Tremaine, also co-manager of the National Lamp Works, was elected a director of the same company at a meeting of the board of directors held June 22 in New York City.

COL. D. H. SAWYER has been appointed secretary of the Associated General Contractors of America effective July 1, according to announcement by Gen. R. C. Marshall, Jr., manager of the Association. He will succeed Eugene Young, who recently resigned the office to enter private business in Minneapolis.

NOAH W. ELLIOTT has been elected president of the Elliott-Blair Steel Co., New Castle, Pa., succeeding George D. Blair, who sold his interest in the company and retired April 30. Mr. Elliott has been engaged in the iron and steel business for more than 40 years, chiefly in the manufacture of cold rolled strip steel.

RALPH B. ROSE, assistant general agent in charge of the bureau of bars and hoops, order and shipping department, Carnegie Steel Co., has resigned on account of ill health. He was formerly with the Carbon Steel Company.

CRAIG GEDDIS has been appointed assistant sales manager of the Monongahela Tube Co., Armco ingot iron department, Pittsburgh.

M. O. GUMBALL, formerly with the Detroit Lubricator Co., Detroit, has organized the Geometric Metal Products Co., Hawthorne, Calif., and will specialize in screw machine products.

JOHN BERGSTEN, until recently with the Standard Oil Co. has organized the Standard Tool & Supply Co. at Torrance, Calif.

THOMAS CROWTHER, a well known machine tool selling agent of Lawrence, Mass., has retired from active business and will move to Brattleboro, Vt., shortly. Mr. Crowther has spent a large portion of his 70 years in the machine tool industry.

M. A. SCHENK of the Royal Dutch Petroleum Co., The Hague, Holland, sailed June 26 on the Berengaria after a four months' visit at the Asiatic Petroleum Co. offices in New York.

JULIUS J. GOETZ has been appointed trustee of the bankrupt estate of the American Metal Parts Mfg. Co., Milwaukee, that on June 12 was adjudicated bankrupt.

J. R. VIETS, for many years in charge of the shipping department of the Lynn Works of the General Electric Co., and more recently traffic representative for the New England district, has been appointed assistant traffic manager with headquarters at River Works, West Lynn, Mass.

CHARLES T. BUSH, of C. A. Strelinger & Co., Detroit, sailed with his family on the George Washington, June 23, for a two months trip to Europe.

Business Items

Announcement is made that the Electric Furnace Co. plant at Salem, Ohio, has been purchased by F. A. Holles and R. F. Benzinger, both of Alliance, Ohio, and F. T. Cope of Salem. The plant has been inactive since last March. Improvements will be made and new machinery installed.

Incorporation of the Canton Metal Products Co., Canton, Ohio, is announced, with a capitalization of $200,000. It will engage in the manufacture of general metal products, mostly for the automotive industry. Harry Nusbaum and Frank A. Zink are the incorporators.

Stockholders of the Defiance Machine Works of Defiance, Ohio, have voted for refinancing and reorganizing the plant. The plans call for a $600,000 bond issue and the appointment of a new board consisting of S. O. Richardson, Jr., of the Libby Glass Co., Toledo, Ohio, Henry L. Thompson, president of the Boswick-Braun Hardware Co., Toledo, and Bingham Co. of Cleveland, and chairman of the board of directors of the Willys-Overland Corp., Charles E. Bunting, president of the Bunting Bronze Co., Toledo, Ohio, Edward S. Marshall, attorney of the law firm of Marshall & Frazer, Toledo, Ohio, and E. M. Hummer, present receiver of Defiance Machine Works, Defiance, Ohio.

The Connecticut Blower Co., Hartford, Conn., has been incorporated in Delaware with a capitalization of $250,000. M. E. Keeney is president, C. H. Keeney is treasurer and C. E. Keeney is secretary.

The Foss Machinery Co., Montreal, Canada, has been appointed exclusive representatives for the Rockford Tool Co., Rockford, Ill.

The Central Sales office, Navy Yard, Washington, D. C., announces a sale of hand tools including many varieties, bids to be opened at 11 a.m. July 11.

The Blakely Manufacturing Co. of Detroit has purchased the stamping machinery and equipment of the Liberty Stamping & Manufacturing Co. which it is removing to its new factory at Fullerton Ave. and Monnier Road.

The yearly gathering of representatives and salesmen of the Goddard & Goddard Co. was held at the home office in Detroit, June 14 and 15, under the supervision of C. S. Goddard, sales manager.

The Elk Manufacturing Co. of New York City has been taken over by the Elk Machine Tool Corp. with increased capitalization.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Cotton-gin. Vera Cruz, Mexico. Purchase. Reference No. 6892.

Grinding machines. Copenhagen, Denmark. Agency. Reference No. 6890.

Labor-saving tools and machinery. London, England. Agency. Reference No. 6880.

Lathes. Copenhagen, Denmark. Agency. Reference No. 6897.

Machine tools and technical articles. Copenhagen, Denmark. Agency. Reference No. 6884.

Sawmill machinery equipment. Mazatlan, Mexico. Purchase. Reference No. 6895.

Textile machinery. Ghent, Belgium. Purchase. Reference No. 6930.

Wood and metal turning machinery. Warsaw, Poland. Agency. Reference No. 6919.

Woodworking machinery and machine tools. Liege, Belgium. Agency. Reference No. 6938.

Forthcoming Meetings

Association of Iron and Steel Electrical Engineers. Iron and steel exposition, Buffalo, Sept. 24 to 28. John F. Kelly, secretary, Association of Iron & Steel Electrical Engineers, 708 Empire Building, Pittsburgh, Pa.

New Haven Branch of the American Society of Mechanical Engineers. Third annual machine tool exhibit Sept. 18, 19, 20 and 21. Mason Laboratory, New Haven, Conn. A. C. Jewett, chairman.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Steel—General price level remains unchanged. Bars still quoted at $2.40 per 100 lb., with plates and shapes at $2.50, on new contracts. Price tendency on structurals has been slightly lower recently; inquiries, however, have improved, during the last week. Steel mill operations at about 89 per cent of capacity, against 94 per cent eight weeks ago. Considerable improvement in new plate business, mostly in small lots. Car material still holds lead for demand with tank plates next.

Advances—Price of gray iron machinery castings advanced in New York, Cleveland and Detroit, due to higher labor costs. Antimony advanced ¼c. per lb. in New York during week, owing to improvement in demand.

Declines—Recent declines in pig iron due mostly to increased production and unusually large old-material supply; present market, however, trifle steadier. Non-ferrous metals market generally weaker. Copper, tin, lead and zinc all tending downward. Fabricated brass and copper also lower due to drop in metals. Raw linseed oil quoted at $1.13 per gal. (5 bbl. lots) f.o.b. New York, against $1.16, one week ago.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$31.05
Northern Basic	29.77
Southern Ohio No. 2	30.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	36 25
BIRMINGHAM	
No. 2 Foundry	27.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	30.76
Virginia No. 2	34.17
Basic	28.26
Grey Forge	28 76
CHICAGO	
No. 2 Foundry local	31.61
No. 2 Foundry, Southern (silicon 2.25@2.75)	32.51
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	29.77
Basic	28.77
Bessemer	30.27

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	6.75
New York	5.50@7.00
Chicago	4.00@5.00

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.95	4.45	4.85
Nos. 22 and 24.	3.75	5.00	4.50	4.85
Nos. 25 and 26.	3.80	5.05	4.55	4.90
No. 28	3.85	5.15	4.65	5.00

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00	5.15	4.70	5.10
Nos. 12 and 14.	4.10	5.25	4.80	5.20
Nos. 17 and 21.	4.40	5.55	5.10	....
Nos. 22 and 24.	4.55	5.70	5.25	5.65
No. 26	4.70	5.85	5.50	5.80
No. 28	5.00	6.15	5.80	6.10

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	62	50½	⅜ to 1¼	30	13
		LAP WELD			
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	26	11
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	60	49½	⅜ to 1¼	30	14
2 and 3	61	50½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded.	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅛	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	5.00	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	7.50@8.00	8.00	7.35
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.40	3.90	4.30
Cold finished flats, squares	4.90	4.40	4.80
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.32½
Soft steel bar shapes (base)	3.54	3.36	3.32½
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.71	3.40
Bar iron (3.25 at mill)	3.54	3.36	3.32½
Carbon tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, $\frac{3}{32}$, 8½c.; ⅛, 7.85c.; $\frac{5}{32}$ to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.25
Tin, 5-ton lots, New York			39.75
Lead (up to carlots), St. Louis	6.70	New York	7.37½
Zinc (up to carlots), St. Louis	5.80	New York	6.25

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.20	27.00	27.50
Antimony (Chinese), ton spot	8.00	10.50	8.25
Copper sheets, base	25.25	23.75@24.00	23.00
Copper wire (l.c.l.)	18.12½	21.00	16.25
Copper bars (l.c.l.)	22.00	24.25	19.50
Copper tubing (l.c.l.)	27.00	29.25	23.00
Brass sheets (l.c.l.)	19 75	24.25	18.75
Brass tubing (l.c.l.)	25.50	29.75	20.50
Brass rods (l. c. l.)	18.00	21.00	15.75
Brass wire (l. c. l.)	20.25	22.00	.....
Zinc sheets (casks)	10.25	10.10	.....
Solder (½ and ½), (caselots)	31.50	29.50@31.50	20.00
Babbitt metal (83% tin)	56.00	51.00	40.00
Babbitt metal (35% tin)	30.00	17.50	16.00
Nickel (ingot and shot), Bayonne, N. J.	29.00	.....	35.00
Nickel (electrolytic), Bayonne, N. J.	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	55
Hot rolled rods, Grade "A" (base)	50
Cold drawn rods, Grade "A" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled rods "E"—low manganese (base)	54
Manganese nickel hot rolled rods "D"—high manganese (base)	57

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	46.00
Hot rolled sheets (base)			45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	13.50@14.00	12.75	12.00
Copper, heavy, and wire	13.25@13.75	11.75	11 00
Copper, light, and bottoms	11.25@11.75	10.00	10.00
Lead, heavy	5.00@ 5.50	5.00	5.75
Lead, tea	4.50@ 4.75	4.00	4.75
Brass, heavy, yellow	7.50@ 7.75	....	7.50
Brass, heavy, red	11.00@11.50	10.00	9.50
Brass, light	6.00@ 6.50	5.50	6.50
No. 1 yellow brass turnings	7.50@ 7.75	6.50	7.00
Zinc	3.75@ 4.25	3.50	3.50

TIN PLATES—American Charcoal—Bright—Per box.

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 20x28, 112 sheets	$23.50	$19.50	$18.50
"A" Grade:			
IC, 20x28, 112 sheets	21.00	17.00	17.00
Coke Plates—Primes, 20x28 in.:			
100-lb., 112 sheets	14.00	12.60	14.50
Terne Plates—Small lots, 8-lb. Coating			
IC, 14x20	8.25	6.55	7 40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11¼
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13¼x13¼, per lb.	11.25	36.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	1.13	1.27	1.28
White lead, dry or in oil	100 lb. kegs.	New York, 14.50	
Red lead, dry	100 lb. kegs.	New York, 14 50	
Red lead, in oil	100 lb. kegs.	New York, 16.00	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.50@5.25	
Coke, prompt foundry, Connellsville	per net ton	5.75@6.25	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	30%	50-10%	45-5%
1⅛ and 1¼x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	15%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	20%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	30%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	25%	45%	40-5%
Bolt ends, with hot pressed nuts	30%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 7/16 and smaller	60%	.....	..
Semi-finished nuts, ⅜ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅜ in., per 100 lb. (net)	5.50	4.00	3 50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	List net	2.75	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	40%	50-10%	60%
Rivets, tinned	40%	50-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅜ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30-10%	30-10%	30-10%
Heavy grade	20-5-2½	30%	20-5-2½%
Rubber and duck:			
First grade	50-10-5%	50-10%	40-10%
Second grade	60-10%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1 49	1.24	1 40
Cloth	3.38	2.67	3.20

New and Enlarged Shops

Machine Tools Wanted

Ark., Searcy—Kelly Lumber Co.—lumber mill machinery and equipment, including saws, planers, etc.; machine shop equipment, including lathe, press, drill, machine tools, etc.

D. C., Wash.—Maculson Co., Inc., 2103 14th St., N. W.—buffing and polishing machine, drill press and cylinder grinder.

D. C., Wash.—Peevles Motor Co., 1501 14th St., N. W.—buffing and polishing machine, drill press and bench tools.

Fla., Tampa—Tampa Bay Fertilizer Co., S. W. Allen, Pres.—machine shop equipment, including lathe, drill, press, machine tools, etc.

Ill., Danville—Modern Machine Shop, 22 Harrison St.—complete equipment, including lathes, presses, welders, drills, grinders, etc. for 2 story plant.

Kan., Sterling—Daenzer Motor Co., C. H. Daenzer, Purch. Agt.—power metal drill press, power metal lathe, emery stand, hangers, belting, pulleys, bearings, shafting, cylinder grinder and small hand tools.

La., New Orleans—Todd Eng. Dry Dock & Repair Co., South Peters and Howard Sts.—$300,000 worth of machine tools for ship and other repair work.

Mich., Detroit—Bd. Educ., 1354 Bway. Ave., C. A. Gadd, Business Mgr.—eight Worcester semi-quick change lathes, swing 14 in., bed 8 ft., single back gear, cone pulley, standard Worcester front and rear bearings; one face plate, centers, Morse feed No. 2; carriage equipped with power feed and cross feed compound; tool block, travel not less than 4 in.; one 8 in. four jaw chuck.

Mich., Detroit—Fruehauf Trailer Co., 1094 Harper Ave.—machine shop equipment for plant expansion.

N. Y., Buffalo — J. M. Navadel, 3205 Bailey Ave.—additional machinery, tools and equipment for garage and repair shop.

N. Y., Jamestown—K. Ingerson, c/o Cold Springs Garage, R. 75—small machine tools and equipment for automobile repair.

N. Y., Jamestown—Jamestown Regulator Co., Wellman Bldg., F. H. Garfield, Dir.—machine shop equipment.

N. Y., New York—Columbia Button Wks., 49 West 27th St.—plating dynamo and automatic drop hammer.

N. Y., New York—Standard Oil Co. of New York 26 Bway., A. E. Carr, 1001 Stowell St., Elmira, Local Mgr.—complete equipment, including lathe, press, drill and small tools, for proposed $55,000 machine shop at Elmira.

N. Y., Olean — Meiers-Barrett Co., West State St.—tinshop and hardware repair shop equipment.

N. Y., Rochester—Manufacturer's Tool & Die Corp., South Water St., A. W. Fromani, Pres.—machine tools, also die plant machinery and equipment, to replace that which was destroyed by fire.

N. Y., Rochester—Powertown Tire Sales Corp., 253 East Ave.—machinery, tools and equipment for tire repair and service station.

N. Y., Salamanca—West End Service Sta.—garage, repair shop and service station machinery, tools and equipment, including air compressor, lathe, machine tools, etc.

O., Kenmore—Ohio Gear & Machine Co., H. H. Johns, Dir.—machine shop and gear works machinery and equipment.

Pa., Canonsburg—J. Hoxworth—complete garage and repair shop machinery and equipment, including lathe, drill, press, air compressor, small machine tools, grinder, etc.

Pa., Columbia—Gibbs Metal Container Co.—metal working machinery and equipment for plant for the manufacture of metal cans, etc., on 10th and Blunston Sts.

Pa., Erie—Northwestern Motor Sales Co., 21st and State Sts.—garage, repair and machine shop machinery, tools and equipment, including lathe, drill, press, air compressor, grinder and small tools.

Pa., Hamburg—Hamburg Boiler Wks., Inc.—plate bending roll, 62 in. between housings to bend ¼ in. plate to a 10 in. circle.

Pa., Youngsville—M. C. McClure—lathe, press, drill, air compressor, small machine tools, grinder, etc., for garage, repair and machine shop.

Tex., Whitewright—L. O. Lackey (tinner)—8 ft. cornice brake.

Va., Ashland—Fuqua & Stone—Small lathe, electric hand drill and drill press for automobile repair work.

Va., Ashland—Rawlings Motor Co., A. Rawlings, Purch. Agt.—small lathe and welding outfit.

Va., Richmond—W. B. Aikinson, 322 West Broad St. (automobile repair work)—lathe for metal work, also grinding in machine.

Va., Richmond—Amer. Garage, 311 North Henry St.—lathe for metal work.

Va., Richmond—Bittner Motor Car Shop, 301 North Gilmer St.—arbor press and small lathe.

Va., Richmond—Broad St. Bicycle Wks., 506 West Broad St.—lathe and air compressor.

Va., Richmond—Carr Auto Spring Co., 920 West Broad St.—drill press, power shears for metal, also grinder.

Va., Richmond—Chaddick Motor Supply Co., 713 West Broad St.—power suction vacuum cleaner, also drill press.

Va., Richmond—Cornice Repair Shop, 313 North Smith St.—drill press for automobile repairs.

Va., Richmond—Evans & Kramer, 932 West Broad St.—18 in. lathe, power saw for metal work, dividing head, with vertical milling attachment.

Va., Richmond—D. A. Heath, 522 West Broad St.—drill press for automobile repairs.

Va., Richmond—Night & Day Service Co., 30 Graham St. (automobile repairs)—drill press.

Va., Richmond—J. E. Quarles, 510 West Broad St. (bicycle repair shop)—drill press, compressed air pump, emery wheel and stand.

Va., Richmond—Radiator Repair Shop, 712 West Broad St.—small lathe, bench tools and air compressor.

Va., Richmond—F. D. Schluter Auto Welding Co., 922 West Broad St.—drill press and lathe.

Va., Richmond—Service Co., 820 West Broad St.—grinder, medium size lathe and bench tools for automobile repair work.

Va., Richmond—C. H. Swink, 910 West Broad St.—compressed air drill.

Va., Winchester—Shade Motor Co.—welding outfit and lathe for metal work.

Va., Winchester—Winchester Automotive Machine Wks.—die making machine and welding outfit.

W. Va., Wheeling—Kerr Portland Cement Co.—machine shop equipment, including lathe, press, drill, etc.

Wis., Milwaukee — Frankenburg Refrigeration Mchy. Co., c/o G. A. Gessner, 97 Wisconsin St.—machinery and tools for the manufacture of ice machines.

Wis., Racine—Luedtke Bros., 1202 North Main St.—small power drill press, air compressor, emery stands and hand tools for automobile repairs.

Que., Berthierville—J. Salvas, William St.—equipment for automobile repair shop.

Que., Grand Mere—S. Mailhiot, 16 Laing St.—machine and blacksmith shop equipment.

Machinery Wanted

Del., Wilmington — Wilmington Leather Co., 2nd and Greenhill Sts.—machinery and equipment for plant, capacity 1,000 hides per day.

Fla., Clearwater—Bd. Educ.—vocational equipment, including lathes, drill, press, saw, etc., for $160,000 school.

Fla., Tampa — United States Export Chemical Co., c/o Bd. of Trade—machinery and equipment for $1,000,000 plant for the development and manufacture of superphosphate.

Ill., Chicago—H. J. Delson Co., 749 North Western Ave. (job printer and advertising agent)—job press for printing color work.

Ill., Chicago—Wanner Mchy. Co., 716 South Dearborn St., (job printing equipment)—roller proof press.

Ind., Indianapolis—F. W. Young Material Co., 1025 Lewis St.—planing mill, woodworking, transmission and conveying machinery.

Ind., St. Paul—St. Paul Tire & Rubber Co.—tire building machinery and equipment for $200,000 plant.

Ind., Washington—Leonard Range Co., Columbia and Roosevelt Aves.—foundry, assembling, transmission and conveying machinery and equipment.

Ia., Hamburg—L. R. Sims—complete newspaper equipment, including press, belting, hangers, pulleys and shafting.

Ia., Ottumwa—F. O. Parks Scale Co.—electric floor drill, also round stencil machine.

Kan., Seneca—A. Ellis—linotype, newspaper press, metal cutter, etc. (used).

Kan., Topeka—Merit Printing Co., 234 Kansas St., F. B. Brown, Purch. Agt.—newspaper press, linotypes, metal cutter and stereotype outfit.

Ky., Ashland—Ford Block Co.—concrete block making machinery and equipment for $35,000 branch plant near Huntington, W. Va.

Ky., Ivel—Camp Branch Coal Corp., S R. Jennings, Purch. Agt.—coal mining equipment, including cutting machine, shaker, screens, etc.

Ky., Princeton — Bd. Educ. — vocational equipment, including lathe, drill, press, machine tools, etc., for $110,000 school.

Me., Belfast—School Comn.—machinery for manual training department of proposed $150,000 high school.

Md., Baltimore—M. J. Beach, Calvert Bldg.—machinery and equipment for the manufacture of hollow tile and products.

Mass., Somerville — Fresh Pond Ice Co., 321 Washington St.—conveyors, also ice manufacturing and handling equipment, electrically operated.

Mich., Detroit—F. DeWolf, 1575 Taft Pl.—master woodworking machine or similar outfit and equipment for small shop.

Mich., Paw Paw—Bd. Educ.—complete vocational equipment for $175,000 school.

Mo., Grandin—The Print Shop, Box 27—power job press.

Mo., St. Louis—W. J. Kennedy Stationery Co., 212 North 4th St.—one 14½ x 22 in. job press with complete equipment.

N. J., Matawan—Bd. Educ.—vocational equipment for $130,000 school.

N. J., Peapack—L. A. Zwiller—machinery and equipment for the manufacture of paper products.

N. Y., Ashford—L. Romer—butter and cheese making machinery and equipment.

N. Y., Brockport—Dailey Produce Co.—machinery and equipment for cooperage plant, to replace that which was destroyed by fire.

N. Y., Buffalo—Central Star Laundry, Northland and Masten Sts.—machinery and equipment for addition to laundry.

N. Y., Buffalo—W. H. Ryan, 7 South Ryan St.—acetylene welding outfit.

N. Y., Falconer—Amer. Mfg. Concern—woodworking machinery for proposed $50,000 factory for the manufacture of novelties.

N. Y., Jamestown—Jamestown Chair Co., 20 Winsor St.—additional woodworking machinery and equipment.

N. Y., Jamestown—Jamestown Malleable Products Co., Tiffany Ave.—cast iron and malleable iron foundry equipment, including trip hammers, forges, etc., for addition to plant.

N. Y., Jamestown—Jamestown Wood Finishing Co., East End (manufacturer of paints, fillers, etc.)—machinery and equipment for addition to plant.

N. Y., Johnstown—H. W. Topp Leather Mill—leather dressing machinery and equipment, to replace that which was destroyed by $400,000 fire.

N. Y., Penn Yan—Penn Yan Boat Co., C. Sutherland, Pres.—machinery and equipment for boat factory, to replace that which was destroyed by fire.

N. Y., Rochester — Bliss Plumbing & Supply Co., 47 Andrews St.—complete machinery, tools and equipment for proposed plant at 300 Andrews St.

N. Y., Rochester—Ideal Wet Wash Laundry Co., 13-23 South Water St.—machinery and equipment for laundry, to replace that which was destroyed by fire.

N. Y., Rochester—B. F. Moore, 81 Ellison St.—carpet looms.

N. Y., Rochester—Wegman-Walsh Printing Co., 23 South Water St., E. J. Walsh, Pres.—printing press and equipment.

N. Y., Sinclairville—J. Trusler—blower, forge, drill and other blacksmith shop equipment.

N. Y., Tuxedo (Tuxedo Park P. O.)——R. McCready Co. (woodworking)—saw with movable teeth to cut not less than 6 in., also planer, jointer and variety machine combined.

N. C., Belmont—Art Cloth Mills—looms, spindles and other textile machinery and equipment for $1,000,000 plant.

O., Columbus—Henderson Tire & Rubber Co., Goodall Blvd. along tracks of Hocking Valley Ry., W. O. Henderson, Pres.—tire making equipment, including two vulcanizers, several moulding machines, etc.

O., Columbus—Mechlin Stone Co., Clinton Bldg., M. Mechlin, Pres.—elevating and loading equipment for plant on McKinley Ave.

O., Tiffin—Tiffin Bronze & Brass Co.—foundry equipment.

O., Youngstown—Mahoning Fixtures, 566 Mahoning Ave.—cooling machine.

O., Zanesville—Hubbell Rubber Co., C. C. Hubbell, Pres.—tire making machinery, including vulcanizers, moulders and furnaces.

Okla., Blackwell—Blackwell Job Printing Co.—job folder, 6 x 6 in. to 22 x 30 in., also other printing equipment.

Okla., Picher—Leader Printing Co.—10 x 15 in. power job printing press.

Pa., Allentown—Kerschner Pretzel Bakery, 218 East Susquehanna St.—machinery and equipment for the manufacture of pretzels, to replace that which was destroyed by fire.

Pa., Brownsville—Ehrenpries Tire Sales Co.—repair machinery and equipment for $40,000 tire sales plant.

Pa., Farrell—Pulaski Brewing Co., c/o C. B. Carroll, Mgr.—machinery and equipment for bottling mineral water, also for the manufacture of ginger ale and other soft drink products.

Pa., Farrell—Roccapalumba & Marine, 615 Idaho St.—mechanical refrigeration equipment for wholesale fruit and produce plant at 602 Idaho St.

Pa., Huntingdon—Boyle Ice Co.—ice manufacturing machinery and refrigeration equipment for $85,000 plant.

Pa., Lucinda—Lucinda Refining Co.—machinery, tools and equipment, including transmission and conveying machinery, for proposed $75,000 refinery.

Pa., New Castle—Consumers Ice Co.—ice manufacturing machinery and refrigeration equipment for proposed large plant.

Pa., Reading—Penn Planing Mill, Grape and 2nd Sts.—complete planing mill machinery and equipment.

Pa., Scranton—B. Mardossian, 110 Penn Ave.—Hoffman pressing machines.

Pa., Warren—Newell Press, 244 Pennsylvania Ave.—printing presses, controllers, transmission and conveying machinery, etc., for proposed $50,000 printing plant.

Pa., Wilkes-Barre—Lehigh & Wilkes-Barre Coal Co., Lehigh & Wilkes-Barre Bldg.—machinery and equipment for development of extensive coal lands near Green Mountain.

Tex., Copperas Cove—J. Downey—power paper cutter, paper perforator and job printing press.

Tex., Fort Worth—United States Government, Wash., or c/o A. G. Olson, Commander, Decatur Rd.—machinery for additions to helium plant.

Tex., Mineral Wells—Palo Pinto Oil & Refining Co.—machinery and equipment, including transmission and conveying machinery, etc., for $75,000 addition to oil refinery.

Tex., Paris—C. R. Walther (cabinet worker)—Universal woodworker.

Va., Ashland—Burgess Bros. (job printers)—cutting knife and large job press.

Va., Ashland—L. Jones—small lathe and drill press for woodworking.

Va., Richmond—MacCosby Auto Service Co., 15 West Grace St.—air compressor, also vulcanizing molds and plates.

Va., Richmond—M. Rosenthal Printing Co., 412 East Main St.—large cylinder printing press.

Va., Richmond—Younglove Body Wks., 310-12 Henry St.—bandsaw for woodwork.

Va., Winchester—J. H. Lockhart (lumber)—lathes and belting.

W. Va., Fairmont — Fairmont-Chicago Coal Co.—complete machinery and equipment for $100,000 coal tipple.

W. Va., Killarney—Killarney Smokeless Coal Co.—electric coal mining machinery and equipment, including transmission and conveying machinery.

Wis., Black River Falls—Jackson Box Co., c/o W. B. Schofield (manufacturer of boxes, also general woodworking)—20 to 30 in. bandsaw.

Wis., Columbus — Chisholm-Scott Viner Co.—special machinery, belting and shafting for proposed $45,000 factory for the manufacture of pea viners.

Wis., Evansville—H. F. Brunselle — coal handling machinery, cranes, hoists and conveyors for coal storage elevators.

Wis., Fond du Lac—J. Grebe, 22 Rees St.—gasoline storage tank and pump for proposed $40,000 garage.

Wis., Milwaukee—C. J. Harp, 965 35th St. (carpentry and millwork)—crosscut and rip saws, also planer, about 3 in.

Wis., New Diggings—Winrock Mining Co.—machinery and equipment for new seven cell wet mill, including crushers, conveyors, shafts and belting.

Wis., Racine—Amer. Skein & Fdry. Co., 23rd and Racine Sts.—equipment, including cupola and pouring ladles, for proposed $40,000 foundry.

Wis., Sheboygan—J. Herziger, 1326 Superior Ave.—grinding and cutting machinery, belting, shafting, ice machine and refrigeration equipment for proposed sausage factory.

Wis., Waupaca—Rasmussen-Eble Gravel Co., J. P. Rasmussen, Purch. Agt.—heavy duty stone crushing and loading machinery.

Wis., Wauwatosa—C. Lutzen, 227 Harvey Ave. (carpentry and woodworking)—medium size planer, also band saw, about 20 in.

Wyo., Casper—White Eagle Oil & Refining Co.—machinery and equipment for proposed $55,000 refinery.

Ont., Bothwell—Tunks Bros., Ltd., R. H. Tunks, Purch. Agt.—complete equipment for basket making plant.

Ont., Pembroke — Edwards Lumber & Pulp Co., Ltd., W. R. Beatty, Secy.—equipment to increase capacity of sawmill from 20,000,000-25,000,000 ft. to 35,000,000-40,000,000 ft. per year; later, machinery for pulp and paper mill.

Ont., Schumacher — McIntyre-Porcupine Mines—hoisting equipment, crushers, tube and ball mills, also cyanide apparatus, electric power.

Ont., Timmins — McIntyre-Porcupine Mines, Ltd.—machinery and equipment for proposed ore mill near Pearl Lake.

Que., Grand Mere—J. Rhault, Ste. Flore St.—additional machinery for the manufacture of sash and doors.

Que., Montreal—Hanley Clarke Lumber Co., Ltd., c/o B. Robinson, 120 St. James St.—equipment for sawmill and shingle mill.

Que., Montreal—Mulhollin Co., Ltd., 786 St. Catherine St., W., R. Mulhollin, Purch. Agt.—machine for burning carbon and soldering.

Que., Ste. Thecle—O. Cossette—additional forges and other blacksmith shop equipment.

Que., Three Rivers—Bellefeuille & Freres, 277 Notre Dame St., A. Bellefeuille, Purch. Agt.—foundry equipment.

Metal Working Shops

Calif., Merced—The Merced Union High School Dist. is having plans prepared for the construction of a 40 x 120 ft. machine shop and auditorium, 1,000 seating capacity. Cost will exceed $50,000. Allison & Allison, Hibernian Bldg., Los Angeles, Archts.

Calif., Oakland—The California Fdrys., Inc., 950 19th Ave., is having plans prepared for the construction of an addition to its foundry. Estimated cost $6,000. R. V. Woods, 505 17th St., Oakland, Archt.

Calif., Redwood City—The Gogle Hand-Forged Tool Co., 1941 Polk St., San Francisco, awarded the contract for the construction of a 1 story factory, here. Estimated cost $12,000. Noted June 14.

Conn., East Hartford (Hartford P. O.)—McKinley Bros., 809 Main St., are having plans prepared for the construction of a 1 story, 100 x 200 ft. garage and show room on Main and Gaivan Sts. Estimated cost $50,000. W. F. Brooks, Lewis and Gold Sts., Hartford, Archt.

Conn., West Hartford (Hartford P. O.)—Prospect Garage, Prospect Ave., is having plans prepared for the construction of a 1 story, 100 x 100 ft. garage. Estimated cost $40,000. B. A. Sellew, 721 Main St., Hartford, Archt.

Ill., Chicago—L. G. Hallberg & Co., Archts., 116 South Michigan Ave., are receiving bids for the construction of a 6 story, 217 x 241 ft. addition to factory on Lincoln and George Sts. for the Stewart-Warner Speedometer Co., 1312 South Michigan Ave. Estimated cost $750,000.

Ill., Chicago — C. Mothan, 1316 South Troy St., awarded the contract for the construction of a 1 story, 100 x 125 ft. garage on 48th St. and Cottage Grove Ave. Estimated cost $40,000.

Ill., Chicago—The Olson Cartage Co., 525 West Chicago Ave., awarded the contract for the construction of a 1 story, 95 x 125 ft. garage at 417-21 West Chicago Ave. Estimated cost $40,000.

Ill., Chicago—The Yellow Cab Mfg. Co., 5801 Dickens Ave., awarded the contract for the construction of a 3 story, 200 x 347 ft. factory at 5918-48 Armitage Ave. Estimated cost $300,000.

Kan., Kansas City — The Darby Boiler Wks. Co., 923 North 3rd St., has had plans prepared for the construction of Part B, 1 story, 400 x 600 ft. factory. Estimated cost $100,000. Private plans.

Ky., Louisville—The Standard Sanitary Mfg. Co., 6th and A Sts., manufacturer of plumbers' supplies, awarded the contract for the construction of two 1 story, 102 x 150 ft. and 56 x 75 ft. foundry buildings on 6th and Shipp Sts. Estimated cost $70,000.

Mass., Cambridge — The Essex Brass Fdry. Co. plans to build a 2 story brass foundry on 1st St. Estimated cost $100,000. A. Morang, Mgr. Engineer or architect not selected.

Mass., Lowell—The Saco-Lowell Co., Dutton St., awarded the contract for the construction of a 1 story, 40 x 100 ft. forge shop. Estimated cost $30,000. Noted May 24.

Mass., Ware—The Ware Fdry. Co. plans to rebuild the part of its foundry which was destroyed by fire. Estimated cost, including equipment, $20,000. F. G. Quinn, Mgr.

Mass., Worcester—Rice, Barton & Fales Machine & Iron Co., Taintor St., awarded the contract for the construction of a 1 story, 40 x 140 ft. foundry. Estimated cost $40,000.

Mich., Detroit—The Detroit Motorbus Co., Terminal and Edlie Aves., awarded the contract for the construction of a 1 story garage on Tireman Ave. Estimated cost $75,000.

Mich., Menominee—The Lloyd Mfg. Co., North State St., awarded the contract for the construction of a 3 story, 100 x 400 ft. factory for the manufacture of baby carriages. Estimated cost $75,000. Noted June 7.

Minn., Minneapolis—C. F. Haglin & Sons Co., 226 Lumber Exchange, will build a 2 story, 135 x 170 ft. warehouse and a 1 story, 100 x 170 ft. garage on Laurel Ave. near Bryant Ave.

Minn., Minneapolis—G. Lindley, 622 Nicollet Ave., awarded the contract for the construction of a 1 story garage at 1415 Hennepin Ave. Estimated cost $45,000.

Mo., Kansas City—The W. Jewell Realty Co., 227 Rialto Bldg., will build a 2 story, 110 x 132 ft. garage at 912-922 Cherry St. Estimated cost $65,000.

Mo., St. Louis—The Tate Motor Co., Inc., 3111 Locust St., has purchased site and plans to build a 3 story, 125 x 165 ft. garage and automobile showroom, including repair and parts departments, on Washington St. Estimated cost $300,000. Engineer or architect not announced.

N. Y., Brooklyn—H. Beskin, c/o B. W. Dorfman, Engr. and Archt., 26 Court St., will build a garage on East 15th St. Estimated cost $35,000.

N. Y., Brooklyn—M. Catalbiano, c/o T. Goldstone, Engr. and Archt., 50 Graham Ave., is having plans prepared for the construction of a 1 story, 100 x 100 ft. garage on DeKalb Ave. Estimated cost $60,000.

N. Y., Brooklyn—P. Cleary, c/o L. A. Sheinert, Engr. and Archt., 194 Bowery, New York City, is having plans prepared for the construction of a 1 story, 100 x 125 ft. garage on Coney Island Ave., here. Estimated cost $70,000.

N. Y., Brooklyn—The Esthetic Realty Co., c/o Seelig & Fenkelstein, Engrs. and Archts., 44 Court St., will build a 1 story, 100 x 120 ft. garage on 6th St. Estimated cost $35,000.

N. Y., Brooklyn—S. Holland, c/o E. M. Adelsohn, Engr. and Archt., 1778 Pitkin Ave., has had plans prepared for the construction of a 1 story, 100 x 200 ft. garage on Liberty Ave. and Wyona St. Estimated cost $50,000.

N. Y., Elmira—The Standard Oil Co. of New York City, 26 Bway., has purchased site and plans to build a garage, machine shop and service station on Lake, 5th and William Sts., here. Estimated cost $50,000. A. E. Carr, 1001 Stowell St., Local Mgr.

N. Y., Fonda—The Standard Oil Co. of New York, 26 Bway., New York City, has purchased site and plans to build a garage, warehouse, tanks, pipe lines and office building on West Main St., here. Estimated cost $250,000.

N. Y., Jamestown—The Jamestown Metal Desk Co., Blackstone Ave., awarded the contract for the construction of a 1 story addition to its factory. Estimated cost $50,000. Noted May 10.

N. Y., New York—The Bd. Educ., 500 Park Ave., has had plans prepared for the construction of a 4 story garage on Brook Ave. Estimated cost $350,000. W. H. Gompert, Flatbush Ave. Extension and Concord St., Brooklyn, Engr. and Archt.

N. Y., New York—The Edes Garage, Inc., c/o L. A. Sheinart, Engr. and Archt., 194 Bowery, will build a 1 story garage on West Farms Rd. Estimated cost $60,000.

N. Y., New York—J. E. Eustis, c/o S. Rosenblum, Engr. and Archt., 51 Chambers St., will soon receive bids for the construction of a 2 story, 125 x 165 ft. garage on Fordham Rd. Estimated cost $85,000.

N. Y., New York—H. Mitchell, c/o J. J. Dunnigan, Engr. and Archt., 394 East 150th St., has had plans prepared for the construction of a 2 story, 115 x 120 ft. garage on East 172nd St. Estimated cost $85,000.

N. Y., New York—D. Salvato, c/o D. Clark, Engr. and Archt., 441 East Tremont Ave., has had plans prepared for the construction of a 1 story, 110 x 115 ft. garage on Morris Ave. Estimated cost $50,000.

N. Y., New York—The W. C. P. Realty Co., c/o W. Shary, Engr. and Archt., 41 Union Sq., will build a 2 story, 100 x 125 ft. garage at 418 East 48th St. Estimated cost $50,000.

N. Y., Rochester — The Genesee Bridge Co., 666 Plymouth Ave., plans to build a structural steel working plant on West Ave. Cost will exceed $55,000. D. Hershey, Mgr. Engineer or architect not announced.

O., Canton—The Canton Metal Products Co., c/o F. A. Zink, Renkert Bldg., plans to build a 1 story factory for the manufacture of metal products for automotive industries.

O., Cincinnati—The Hauser Stander Tank Co., Ammen St. along tracks of Baltimore and Ohio R.R., awarded the contract for the construction of a 1 story, 90 x 120 ft. addition to its factory. Estimated cost $50,000.

O., Cleveland—The Amer. Can Co., 1677 East 40th St., has had plans prepared for alterations and the construction of a 1 story, 42 x 55 x 127 ft. addition to its factory at 1588 East 40th St. Estimated cost $40,000. H. C. Meyer, Supt. C. G. Preis, 120 Bway., New York City, Archt.

O., Cleveland—Benesch, Federman & Co., 5432 Bway (furniture), awarded the contract for the construction of a 2 story, 50 x 60 ft. garage and warehouse at 5316 Barkwill Ave. Estimated cost $40,000.

O., Cleveland—The Brodhead-Garrett Co., 2835 East 51st St. (hardwood lumber), awarded the contract for the construction of a 1 story, 300 x 360 ft. warehouse, 40 x 40 ft. dry kiln, 40 x 50 ft. planing mill, boiler house, office and garage on East 71st St. along tracks of Belt Line R.R. Estimated cost $150,000. J. C. Rash, Asst. Secy. Noted May 3.

O., Cleveland—J. J. Klein and G. B. Harris, Engineers Bldg., will soon award the contract for the construction of two 2 story, 75 x 100 ft. and 80 x 110 ft. automobile sales and service buildings at 6604 Euclid Ave. Estimated cost $150,000. W. S. Longee, Marshall Bldg., Cleveland, Archt. Noted Apr. 19.

O., Cleveland — The Lees-Bradner Co., 6210 Carnegie Ave. (gear cutting), is having plans prepared for the construction of a 1 story, 55 x 100 ft. machine shop and a 30 x 100 ft. storage building. Estimated cost $60,000. E. J. Lees, Pres. W. J. Wefel, 225 Union Bldg., Cleveland, Archt.

O., Cleveland—J. Miller, 2701 East 55th St. (trucking), awarded the contract for the construction of a 1 story, 85 x 140 ft. garage at 2966 East 55th St. Estimated cost $45,000. Noted June 7.

O., Cleveland — The Surety Investment Co., 16112 Euclid Ave., awarded the contract for the construction of a 1 story, 75 x 120 ft garage at East 105th St. and Hampden Ave. Estimated cost $50,000. Rosen Garage Co., 5618 Woodland Ave., Cleveland, lessee.

O., Dayton—The Duro Pump & Mfg. Co., 537 East Monument St., is having plans prepared for the construction of a 5 story, 100 x 100 ft, factory for the manufacture of pumps. Estimated cost $175,000. Schenk & Williams, Mutual Home Bldg., Dayton, Archts. Noted Jan. 18.

O., Ironton—The Ironton Stove & Mfg. Co. plans to build two additions to its plant, to be used for foundry and enameling departments.

O., Massillon—The Central Steel Corp., c/o C. G. Herbruck, G. D. Harter Bank Bldg., plans to build blast furnaces and auxiliary steel plant units on Columbia Heights. Cost between $7,000,000 and $10,000,000. F. J. Griffiths, Genl. Mgr.

O., Toledo—The United States Malleable Iron Castings Co., Woodville St. along tracks of Bay Terminal Ry., is rebuilding its plant, which was destroyed by fire. Estimated cost less than $100,000.

Pa., Altoona—The Altoona Factories Co., c/o D. J. Howard, Chamber of Commerce, Secy., is having plans prepared for the construction of a 3 story, 90 x 120 ft. factory for the manufacturer of automobiles on Industrial Ave. Estimated cost $150,000. W. A. Hoyt, Hutchison Bldg., Altoona, Archt. Dixon Motor Truck Co., 2501 Beale Ave., Altoona, lessee.

Pa., Canonsburg—J. Hoxworth awarded the contract for the construction of a 1 story (ultimately 2 story), 65 x 138 ft. garage on Greenside and Pike Sts. Estimated cost $40,000.

Pa., Ferndale—The Trabold Motor Co., Railroad St., Johnstown, plans to build a 2 story, 90 x 220 ft. plant with power room, for the manufacture of automobile trucks, on Clay and Ferndale Sts., here. Estimated cost $100,000. A. Trabold, Pres.

Pa., Johnstown—E. Robinson, Pres. of the Robinson Motor Car Co., 212-218 Main St., is receiving bids for the construction of a 3 story, 66 x 140 ft. garage. Estimated cost $80,000. H. M. Rogers, Trust Bldg., Johnstown, Archt.

Pa., Pitcairn—The Pennsylvania R.R., Central Region, Broad St. Sta., Phila., awarded the contract for the construction of a 1 story, 42 x 90 ft. boiler, machine and transformer shop, here.

Tex., Dallas — Sutton, Steel & Steele, Forney Ave. ,awarded the contract for the construction of a 1 story, 40 x 80 ft., 30 x 100 ft. and 60 x 150 ft. foundry building. Estimated cost $125,000. Noted May 3.

Tex., San Angelo—R. P Amacker, South Chadbourne St., has had plans prepared for the construction of a 2 story garage. Estimated cost $40,000. A. R. Swartz, Trust Bldg., San Angelo, Archt.

Wis., Appleton—The Valley Automobile Co., 726 College Ave., plans to build a 4 story garage on Morrison St. Estimated cost $60,000. Engineer or architect not selected.

Wis., Fond du Lac—Stepnoski & Mehner, Archts., Forest Ave., are receiving bids for the construction of a 1 story, 56 x 100 ft. garage for J. Grebe, 22 Rees St. Estimated cost $40,000.

Wis., Gillett—Miller & Rehme, c/o E. Rehme, will build a 1 story, 50 x 100 ft. machine shop. Estimated cost $30,000.

Wis., Green Bay—Foeller, Schober & Stephenson, Archts., Nicollet Bldg., are receiving bids for the construction of a 1 and 2 story, 62 x 159 ft. garage on Main St. for the Beaumont Hotel, Main and Washington Sts. Estimated cost $45,000.

Wis., Hilbert—C. F. Lawler awarded the contract for the construction of a 1 and 2 story, 46 x 80 ft. garage and repair shop. Estimated cost $40,000.

Wis., Madison—W. Brueske, 2508 East Washington Ave., is receiving bids for the construction of a 2 story, 50 x 90 ft. garage and repair shop. Estimated cost $40,000. Private plans.

Wis., Madison—The Capitol City Garage, South Pinckney St., awarded the contract for the construction of a 2 story, 66 x 165 ft. garage on Washington St. Estimated cost $75,000. A. Hult, Pres. Noted May 24.

Wis., Madison — The Chicago & Northwestern Ry., 226 West Jackson St., Chicago, awarded the contract for the construction of a 1 story, 100 x 250 ft. roundhouse, repair pits, etc., here. Estimated cost $300,000.

Wis., Madison—The Madison Nash Co., 155 East Wilson St., is having plans prepared for the construction of a 2 story, 66 x 12 ft. garage and repair shop. Estimated cost $40,000. Claude & Starck, Badger Annex, Madison, Archts. Noted May 24.

Wis., Madison—Schmidt Bros. Co., c/o A. J. Schmidt, 2611 Monroe St., is receiving bids for the construction of a 1 story, 60 x 125 ft. garage and repair shop. Estimated cost $40,000. Private plans.

Wis., Milwaukee—The Milwaukee Lumber Co., 1271 Midland Ave., is having plans prepared for the construction of a 2 story, 30 x 100 ft. garage. Estimated cost $40,000. Gurda & Gurda, 448 Mitchell St., Milwaukee, Archts.

Wis., Racine—F. Applegate, 1043 Washington Ave., is having plans prepared for the construction of a 1 story, 60 x 105 ft. garage and repair shop. Estimated cost $55,000. Private plans.

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The Elements of Production Grinding

BY ELLSWORTH SHELDON
New England Editor, *American Machinist*

Grinding the oldest of arts—First grinding wheels natural stones—Sand and emery early grinding mediums—Artificial abrasives—Development of production grinding—The first of several articles

GRINDING as a means of shaping materials of a refractory nature is probably the oldest mechanical process in the world. Long before primitive man had learned the art of making cutting tools of metal, he had found that by rubbing one stone upon another he could fashion sharp points to tip the arrows upon which he depended for a supply of food, and could shape the crude stone axes that enabled him to hew down trees to provide shelter for his family, or, mayhap, to lop off the head of an unfriendly neighbor whose proximity rendered his continued existence a matter of conjecture.

Grinding by rubbing the object to be shaped upon a stationary grinding medium is, however, a tedious process and one in which the product is much more likely to be influenced by the operator's patience than by his skill. Though it is still practised for the purpose of removing minute quantities of materials (we now call it lapping) it was not until man discovered that by making his grinding stone round, mounting it upon a shaft and setting some one of his stalwart offspring to turning it by means of a crank, grinding could be considered more than a makeshift and time-consuming artifice.

Since the days of the first circular grindstone, which probably demonstrated its usefulness about the time that Tubal Cain set up his first forge "under the spreading chestnut tree" and proved that he could more easily fashion metals into shape by heating them red-hot and pounding them, grinding has been looked upon almost solely as a means of putting the finishing touches upon an article already carried as near to completion as possible by other arts, and it was not until comparatively recent years that the abrading process has received consideration as a means of removing amounts of metal larger than were necessary to provide a finished appearance or to make a sharp edge.

Something besides a round grindstone was necessary, however, to make possible the present day rapid production methods of grinding. Even had the machines been available, no stone, however hard and close grained or free from flaws, could withstand the speeds and pressures now common, and it was not until hundreds of years after artificial grinding wheels of a sort had become available, that the proper medium was forthcoming.

Sand, emery, corundum, and a few other miscellaneous materials have been known as abrasives from the earliest times, and up to no longer than thirty years ago were the basis of nearly all mediums used in the industries for grinding and polishing. In fact so recent have been the discoveries of artificial abrasives and so rapid the advance in the art of grinding that to most people not directly connected with our industry anything except a grindstone that is round and used for grinding is an "emery wheel," notwithstanding the fact that wheels of real emery are now seldom found outside of a museum.

Early grinding wheels were made by turning a disk of wood to about the right size, covering the periphery

ALTHOUGH the art of grinding is older than history, its development and application have been more rapid and extensive during the last thirty years than in all previous time. As a purely production process it could never have been developed to the extent to which it is now practiced without the extraordinarily hard mineral substances known as silicon carbide and aluminous oxide. Nor could these substances, even had they been known years earlier than they were, been produced in quantities and at a cost that would render them commercially possible without the electric furnace and the development of vast water powers to provide the electric energy necessary to operate it.

with a strip of leather stretched tightly around and nailed or pegged to the wood and affixing the grains of abrasive to the leather by means of glue or cement. Such wheels were the logical successors of the natural grindstone and in many industries they rapidly supplanted the latter for the reasons that they were inexpensive to make, easy to handle, capable of much higher speeds and consequently more rapid in production.

Another advantage was that the abrasive surface, when worn through, could be restored quickly and without difficulty by merely washing off the remaining grains with warm water and applying fresh abrasive. Many such wheels are now in every-day use, but the advent of the modern grinding wheel has relegated them to a class by themselves and they are of service only for *polishing;* an operation that is distinctly different from grinding.

Further Evolution of the Grinding Wheel

The next step in the evolution of the grinding wheel was the "solid" wheel, made by mixing glue, shellac, rubber, silicate of soda or other sticky materials with the abrasive grains and molding the pasty mass into the shape of wheels, which were then dried, baked or "cured" in accordance with the nature of the bonding medium. All of the above kinds of wheels are in use today, but, with the exception of the silicate wheel, their range of usefulness is confined to specific classes of work where the important desideratum is other than the rapid removal of metal, and they, also, can hardly be classed as "grinding" wheels.

Up to about fifty years ago, such wheels as we have



FIG. 1—SILICON CARBIDE FURNACE

enumerated above were the only kinds available for grinding purposes, and none of them would *grind* as we now understand the term. The art of production grinding was *not,* however, waiting for some one to invent a real grinding wheel—it had not itself been conceived. Practically all grinding was done by what we now call the "off-hand," or "free-hand" method, in which the work is held in the hands of the operator and manipulated in contact with the revolving wheel.

The originator of the grinding machine was probably some careless "jour" who found that after hardening a piece that he had already finished on the lathe it would not go into the place for which it was intended, so he took it to the "emery-wheel" and endeavored by turning it in his fingers before the wheel to reduce it to the proper dimensions before the boss found him out.

However it may have been, it was not until about 1860 that record is found of a machine built especially for the purpose of reducing the dimensions of hardened work to what were then considered to be exact sizes.



FIG. 2—PIGS OF ALUMINOUS OXIDE

This machine was, naturally, rather a make-shift affair, constructed in part from other machines, but it contained the germ of the grinding-machine idea.

At about the same time J. R. Brown & Sharpe, Providence, R. I., began experiments along the line of accurate grinding, and in 1864 there was in their shop a machine that embodied the principles of the now well-known universal grinding machine. To Brown & Sharpe then, belongs a great deal of the credit for the development of the modern art of grinding.

During the latter half of the nineteenth century the improvement in machines, the addition of features and the devising and adapting of mechanical movements to increase their field of usefulness were fairly continuous, but during that period the conception of the art of *grinding* did not change. Thirty years ago we were using cylindrical, surface, disk and universal grinding machines; but mainly for the purpose of correcting the warped and crooked surfaces left upon most of our tool-steel parts by our then somewhat crude methods of hardening, and then only because the grinding wheel was our sole means of working hardened steel.

The grinding machine was essentially a toolroom proposition, removing minute quantities of material in a slow and tedious manner. Rarely was a lubricant used to keep down the temperature of the work, and if an ambitious operator endeavored to make time in finishing a piece of work he was likely to find that his zeal had caused more damage than his efforts had accomplished good in the way of desirable results.

It is quite probable that had some genius conceived the idea about, let us say, 1890, of building a grinding machine for the sole purpose of removing metal that was quite soft enough to be *cut* with a steel tool, and had proposed to use such a machine as a substitute for the lathe, he would have been thought crazy. And it is more than probable that had he succeeded in building such a machine he would but have proved the conten-

tion of his critics, for the reason that there were no "emery wheels" capable of doing the work.

Up to this time the most commonly used abrasives were emery and corundum, two minerals—or rather, two forms of the same mineral—to be found in nature. Neither is, comparatively speaking, very hard, and what is of even greater importance, neither can be depended upon to preserve a uniform degree of hardness. Nor were the bonds used to hold the wheels together much more dependable. Before the grinding wheel could take its proper place in the mechanic arts as a true cutting tool possessing definite and controllable characteristics, two things were necessary: an extremely hard and uniform abrasive, obtainable in unlimited quantities; and a bond strong enough to withstand the bursting strains induced by rapid rotation, yet sufficiently porous and friable to allow the grains of abrasive to be torn away as soon as their cutting edges become dulled and of no further service.

In the last decade of the nineteenth century both these important requisites were on the way. Vitrified emery wheels, made by mixing the grains of emery with feldspar and various clays and firing the molded wheels in kilns similar to those used for firing pottery, had been on the market for some years. In the early nineties, Dr. Edward Acheson first succeeded in producing silicon carbide, a chemical compound of extra-

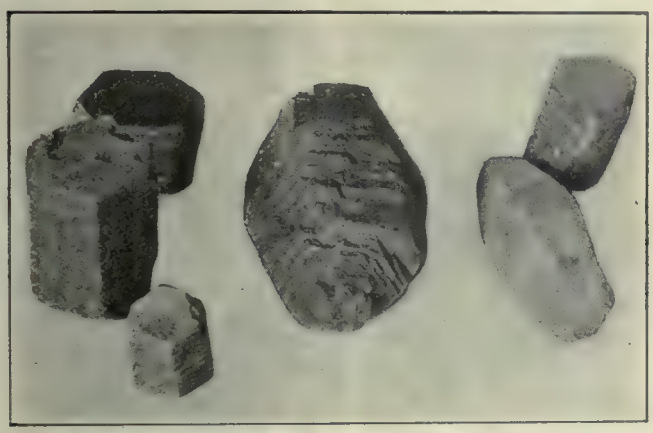


FIG. 3—CORUNDUM CRYSTALS (NATURAL ALUMINOUS OXIDE)

ordinary hardness, to be followed a few years later by the Electro-Chemical Co., whose experiments resulted in what is now known as the aluminous oxide abrasives, of very different chemical constituency but almost equally hard.

TRADE NAMES OF SILICON CARBIDE

Calcinite	Carbolite	Electrolon
Carbolon	Carbowalt	Lotens
Carbolox	Crevorundum	Natalon
Carbonoid	Corex	Silexon
Carbona	Cresolite	Staralon
Carborundum	Crystolon	Sterbon

TRADE NAMES OF ALUMINOUS OXIDE

Alowalt	Borolon	Oxaluma
Aloxite	Clevite	Oxylum
Aluminoid	Excelite	Rex
Alundum	Hytens	Rexite
Bathite	Natalite	Staralox
Boro-Carbone	Orelite	Sterlite

Though the names under which they are known to the trade are legion, these two artificial abrasives are the basis of practically all wheels used in the production grinding of metals. Corundum, the natural mineral, is still extensively used in other industries, particularly in the grinding of glass, to which its nature renders it peculiarly adaptable.

The raw materials of which silicon carbide is made are coke and sand, while aluminous oxide abrasives owe their existence to a soft clayey mineral called "bauxite," none of which materials would seem to the uninitiated to be a very promising basis from which to produce anything so hard. Though both are the product of the

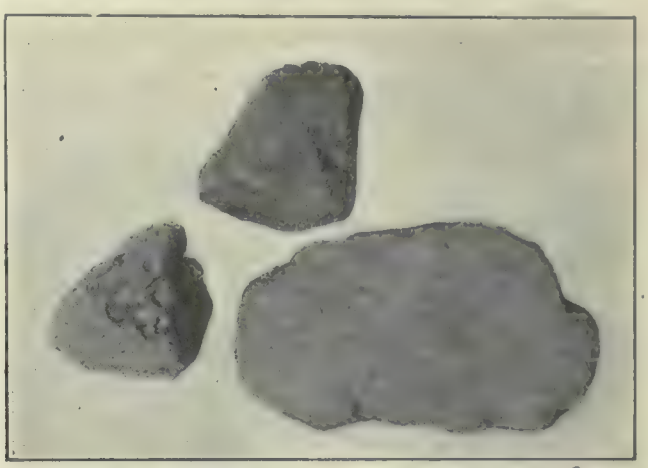


FIG. 4—ARTIFICIAL ALUMINOUS OXIDE

electric furnace, they are made by very different methods.

The silicon carbide furnace, Fig. 1, is of the resistance type, having heavy carbon electrodes permanently mounted in the end walls. When filling the furnace with the charge of raw material a core of granular carbon is laid through the center of the charge to conduct the current from one electrode to the other.

As it emerges from the furnace, the resultant mass is roughly cylindrical in shape and is composed of crystals of silicon carbide at the center, surrounded by material that has been but partially reduced. The

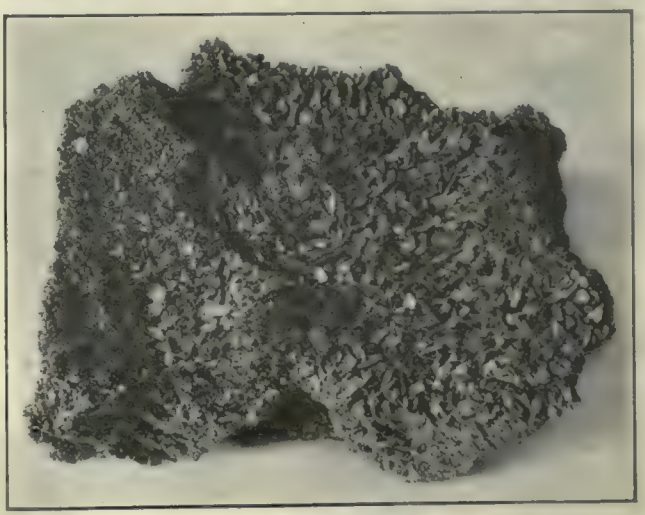


FIG. 5—SILICON CARBIDE CRYSTAL

action is less and less apparent as the radial distance from the central core increases, until at the outside the cylinder consists largely of unconverted material.

These cylinders exhibit comparatively little homogeneity and are easily broken up, after which the unconverted and partly converted material goes to other

furnaces for further treatment while the crystals of silicon carbide pass to the crushers to be reduced to grains.

Aluminous oxide is produced from the bauxite in cylindrical steel furnaces by the heat of the electric arc and the resulting mass is in the form of a single pig, very hard and tough and quite difficult to break in the preliminary stages of crushing. Fig. 2 shows the pigs as they are taken from the furnaces.

Crystals of corundum (the natural aluminous oxide) are shown in Fig. 3. As has previously been stated, large quantities of corundum are used in industries



FIG. 6—THE CRUSHING PLANT

that involve polishing and grinding operations upon materials other than metal, but as corundum does not properly enter into the field of production grinding as we are interested in it, we will give it no further consideration here.

The artificial aluminous oxide, Fig. 4, is of a reddish



FIG. 7—A VIEW IN THE GRADING ROOM

brown color, ranging to pure white in some of its modifications. To casual observation the crystal of silicon carbide, Fig. 5, will appear black, but close examination will show it to be a dark green, with sometimes a bluish cast, depending upon its origin.

A partial view of a crushing plant is shown in Fig. 6. It is automatic in its operation and though this particular plant occupies an equal space on the floor above the one shown in the picture, it requires the services of but one operator and a helper. The crystals of abrasive are fed first to a jaw crusher and from thence



FIG. 8—ONE OF THE GRADING MACHINES

forward the product of the various machines is transferred to the next succeeding one by belt conveyors until the granulated material is finally delivered by the same means to the washing and drying room.

The term "grading" is applied to the sorting of the abrasive grains in accordance with their size, but as the term bears no relation to the "grading" of the finished wheels (which is a matter almost wholly concerned with the bonding material) we will, in so far as it is necessary to refer to the process in this article. substitute the word "sorting" in order to avoid confusion in later chapters.

Figs. 7 and 8 are views in a sorting (grading) room. The grains are delivered to the sorting machines through a chute from the storage bins which contain the washed and dried product of the crushers. Each machine contains a series of screens placed at a slight angle of inclination, each screen overlapping the next succeeding one. The screens are given a continuous vibratory movement by means of cams, which causes a thin layer of the abrasive to flow over them from one end of the machine to the other.

The finest screen is, of course, at the incoming end, so that all grains larger than the mesh of this first screen pass over it to the screens beyond while the grains that correspond in size to the mesh drop through into receptacles beneath. Thus the grains are sorted out progressively; only the larger ones reaching the end of the machine, where they are transferred by belt conveyors to an adjoining machine upon which they enter a continuation of the sorting process.



FIG. 9—WASHING AND DRYING THE ABRASIVE

The screens from number 200 (200 threads to the inch, warp and woof) to number 40 are made of a very fine quality of hand-woven Swiss silk. The silk is stretched tightly over a wooden frame, made to fit in the machine, so that a screen may be changed or different sizes substituted without delay. Screens from No. 36 to 6 are of wire.

Grain size is an important factor in selecting wheels and fortunately it is a very arbitrary designation; quite unlike the "grade" designation, which is a factor of wheel hardness and will be discussed in a later chapter. As has been seen, the grain size is established by the screens, which have an arbitrary number of apertures to the inch and, though there may be slight variations in the weave of the silk or, particularly, in the diameter of the wires in the wire screens, the difference is so small as to be inappreciable.

There are sizes of abrasive grains finer than 200, most makers supplying three grades of "flours," designated as F, FF and FFF respectively. In the mulling process to which the crushed grains are subjected before drying, clear water is constantly flowing into the tubs to be seen in Fig. 8, and as constantly flowing over the sides and running to waste. This escaping water carries a percentage of abrasive in suspension, and as it flows through the tortuous passages to be seen in the foreground of Fig. 9 it is caught by riffles from whence it is taken periodically and sifted through silk of even finer weave than any of the screens of the sorting machine.

For the use of jewelers and others who require an extraordinary fine grain of abrasive it is further separated by flotation. A receptacle is filled with water having the abrasive in suspension, allowed to stand for a definite time and the liquid then decanted. The precipitate is designated as 5-, 10-, or 15-minute powder, according to the length of time allowed for the precipitation to take place.

Proposed Standards for Steel Castings

In the report of the Committee on Steel at the twenty-sixth annual meeting of the American Society for Testing Materials, held at Atlantic City, June 26 to 29, a number of revisions in the standards of the Society were proposed. These included structural steel for locomotives and cars, steel castings, welded- and seamless-steel pipes, structural nickel-steel, open-hearth steel girders and high T-rails, boiler and fire-box steel for locomotives, and boiler-rivet steel.

The sub-committee on commercial bar steel considered the question of the preparation and classification for cold-rolled finished shafting but, finding that this was largely a question of tolerances on the size of the shafting, came to the conclusion that this could best be handled by the Sectional Committee on Standardization of Shafting, which has been organized under the American Engineering Standards Committee.

A new sub-committee on plate tolerance has effected an organization with A. A. Stevenson, as chairman. This committee is at work on the subject of rolling tolerances for plates. It has appointed two sub-committees, one to collect data on plates up to 144 in. in width and the second to collect data toward the establishment of a table of overweight tolerances for plates 144 in. wide and over.

A committee on steel castings proposed tentative specifications for the purpose of eliciting criticism and it is understood that these have not yet become standards of the society, but are subject to revision. Specifications cover two classes of castings, as follows:

Class A, castings for which no physical requirements are specified. Class B, castings for which physical requirements are specified, these being of three grades, hard, medium and soft.

The steel is to be made by one or more of the following processes: open hearth, electric furnace, converter or crucible. Class A castings need not receive any heat treatment unless so specified, or unless the carbon contents exceed 0.30 per cent. Class B castings shall receive a proper heat treatment, depending upon design and chemical composition. Each treatment shall consist of annealing or normalizing.

The specifications concerning workmanship and finish require that:

The castings shall conform substantially to the shapes and sizes indicated by the patterns and drawings submitted by the purchaser, and shall be free from injurious defects.

Defects which do not impair the strength of the castings may be welded by an approved process. The defects shall be cleaned out to solid metal before welding, and when so required by the inspector, shall be submitted to him in this condition for his approval. When required by the inspector, important castings shall be heat treated after welding.

Physical properties and tests are specified for Class B castings only as follows:

The castings shall conform to the following minimum requirements as to tensile properties:

	Hard	Medium	Soft
Tensile strength, lb. per sq.in.	80,000	70,000	60,000
Yield point, lb per sq.in.	0.45 tens. str.	0.45 tens. str.	0.45 tens. str.
Elongation in 2 in., per cent.	17	20	24
Reduction of area, per cent.	25	30	35

No limit shall be placed on the tensile strength in any of the grades. The yield point shall be determined by the drop of the beam of the testing machine. Bend tests shall not be required for castings of the hard grade, and shall be required for castings of the medium and soft grades only when so specified in the order.

When a bend test is specified, the test specimen shall withstand being bent cold without cracking on the outside of the bent portion, around a pin 1 in. in diameter to the following angles:

	Hard	Medium	Soft
Angle of bend	No Bend Test	90 deg.	120 deg.

Exporting From An Inland City

To successfully move goods from interior ports to foreign customers, co-ordination of several different functions is required. All packing, marking and checking systems must be carefully worked out. Few of the men in the inland factories have ever seen tidewater. They do not visualize the handling which goods may receive when flung oversides in an open roadstead where an uncovered lighter rubs up and down alongside, perhaps shipping spray or receiving the tropical downpour until its bottom is awash. The impact of the package coming down with the bottom of the lighter coming up is usually sufficient to make the domestic type of package look very sick indeed.

TABLE XXVI

France—Exports of Machine Tools—"Machines-Outils"

Countries of Destination	1909 Q.M.	1909 Francs	1910 Q.M.	1910 Francs	1911 Q.M.	1911 Francs	1912 Q.M.	1912 Francs	1913 Q.M.	1913 Francs	*1914 Q.M.	*1914 Francs	1915 Q.M.	1915 Francs
Russia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,650	.....
Great Britain	3,771	.....	2,434	.....	3,640	.....	5,700	.....	4,226	.....	.....	.....	3,127	.....
Germany	3,572	.....	3,339	.....	5,117	.....	4,698	.....	2,995	.....	.....	.....	.....	.....
Belgium	19,413	.....	21,206	.....	13,780	.....	16,865	.....	17,376	.....	.....	.....	.....	.....
Greece	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	298	.....
Switzerland	9,585	.....	7,324	.....	4,771	.....	3,377	.....	4,837	.....	.....	.....	2,461	.....
Spain	2,876	.....	1,601	.....	1,885	.....	2,219	.....	3,525	.....	.....	.....	2,515	.....
Italy	8,580	.....	15,663	.....	7,952	.....	4,188	.....	2,904	.....	.....	.....	4,020	.....
Portugal	.....	.....	.....	.....	863	.....	1,199	.....	1,410	.....	.....	.....	406	.....
Morocco	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	207	.....
United States	1,545	.....	2,750	.....	8,203	.....	875	.....	.....	.....	.....	.....	803	.....
Mexico	.....	.....	.....	.....	.....	.....	.....	.....	1,207	.....	.....	.....	.....	.....
Brazil	2,520	.....	3,657	.....	4,418	.....	4,795	.....	9,357	.....	.....	.....	.....	.....
Argentina	5,242	.....	5,686	.....	8,222	.....	9,221	.....	6,784	.....	.....	.....	171	.....
Chile	.....	.....	1,852	.....	.....	.....	.....	.....	1,048	.....	.....	.....	.....	.....
Australia	.....	.....	.....	.....	1,144	.....	2,257	.....	.....	.....	.....	.....	.....	.....
Other foreign countries	5,949	.....	4,985	.....	4,704	.....	4,841	.....	5,820	.....	.....	.....	637	.....
Total foreign countries	63,053	12,925,865	71,497	14,656,885	64,699	13,263,295	60,235	12,348,175	61,489	12,605,245	.....	.....	16,295	10,021,425
Algeria	2,530	.....	3,033	.....	3,995	.....	4,001	.....	3,898	.....	.....	.....	1,464	.....
Tunis	1,416	.....	974	.....	1,515	.....	1,849	.....	3,623	.....	.....	.....	354	.....
Senegal	482	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	37	.....
Indo-China	793	.....	605	.....	686	.....	838	.....	856	.....	.....	.....	.....	.....
New Caledonia	318	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Madagascar and Dependencies	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	177	.....
French Guiana	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	41	.....
Other Colonies	850	.....	1,454	.....	1,360	.....	1,029	.....	1,686	.....	.....	.....	81	.....
Total Colonies	6,389	1,309,745	6,066	1,243,530	7,556	1,548,980	7,717	1,581,985	10,063	2,062,915	.....	.....	2,154	1,324,710
TOTAL	69,442	14,235,610	77,563	15,900,415	72,255	14,812,275	67,952	13,930,160	71,552	14,668,160	41,628	8,533,740	18,449	11,346,135
Average Exchange Rates		.193		.193		.193		.193		.193		.199†		.182
Value in U. S. Dollars		2,747,473		3,068,780		2,858,769		2,688,521		2,830,955		1,698,214		2,064,996

Countries of Destination	1916 Q.M.	1916 Francs	1917 Q.M.	1917 Francs	1918 Q.M.	1918 Francs	1919 Q.M.	1919 Francs	1920 Q.M.	1920 Francs	1921 Q.M.	1921 Francs	1922 Q.M.	1922 Francs
Russia	5,983	.....	1,584	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Norway	.....	.....	107	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Great Britain	3,649	.....	2,224	.....	2,088	.....	2,657	.....	8,727	.....	.....	.....	.....	.....
Germany	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Belgium	.....	.....	.....	.....	.....	.....	15,683	.....	21,448	.....	.....	.....	.....	.....
Greece	.....	.....	.....	.....	93	.....	.....	.....	787	.....	.....	.....	.....	.....
Switzerland	5,832	.....	9,574	.....	3,552	.....	3,550	.....	3,684	.....	.....	.....	.....	.....
Spain	1,339	.....	1,980	.....	832	.....	1,769	.....	8,853	.....	.....	.....	.....	.....
Italy	12,373	.....	15,572	.....	8,133	.....	4,973	.....	6,255	.....	.....	.....	.....	.....
Portugal	232	.....	61	.....	100	.....	.....	.....	1,513	.....	.....	.....	.....	.....
Morocco	352	.....	124	.....	919	.....	.....	.....	.....	.....	.....	.....	.....	.....
United States	194	.....	383	.....	109	.....	.....	.....	1,247	.....	.....	.....	.....	.....
Mexico	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Brazil	.....	.....	.....	.....	51	.....	.....	.....	1,014	.....	.....	.....	.....	.....
Argentina	130	.....	63	.....	540	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chile	122	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Egypt	459	.....	208	.....	70	.....	.....	.....	1,426	.....	.....	.....	.....	.....
Turkey	.....	.....	.....	.....	.....	.....	.....	.....	778	.....	.....	.....	.....	.....
Roumania	801	.....	.....	.....	.....	.....	.....	.....	8,823	.....	.....	.....	.....	.....
Luxemburg	.....	.....	.....	.....	.....	.....	.....	.....	1,336	.....	.....	.....	.....	.....
Australia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Other Foreign Countries	487	.....	250	.....	93	.....	3,012	.....	2,940	.....	.....	.....	.....	.....
Free Zones	102	.....	73	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total Foreign Countries	31,055	19,098,823	32,203	19,804,845	16,580	10,196,700	31,644	21,359,700	68,831	65,974,300	.....	.....	.....	.....
Algeria	894	.....	864	.....	1,470	.....	987	.....	8,007	.....	.....	.....	.....	.....
Tunis	479	.....	223	.....	391	.....	710	.....	1,943	.....	.....	.....	.....	.....
Senegal	.....	.....	.....	.....	42	.....	286	.....	650	.....	.....	.....	.....	.....
Indo-China	60	.....	118	.....	150	.....	897	.....	1,361	.....	.....	.....	.....	.....
New Caledonia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Madagascar and Dependencies	110	.....	245	.....	97	.....	.....	.....	436	.....	.....	.....	.....	.....
French Guiana	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Morocco	.....	.....	.....	.....	.....	.....	1,549	.....	4,446	.....	.....	.....	.....	.....
French Congo	.....	.....	.....	.....	.....	.....	174	.....	663	.....	.....	.....	.....	.....
Martinique	.....	.....	.....	.....	.....	.....	.....	.....	781	.....	.....	.....	.....	.....
Other Colonies	145	.....	253	.....	70	.....	466	.....	584	.....	.....	.....	.....	.....
Total Colonies	1,688	1,038,120	1,703	1,047,345	2,220	1,365,300	5,069	3,421,575	18,871	18,055,050	.....	.....	.....	.....
TOTAL	32,749	20,136,945	33,906	20,852,190	18,800	11,562,000	36,713	24,781,275	87,702	84,029,350	.....	.....	.....	.....
Av. Ex. Rate and Value, U. S. Dollars	.170	3,423,281	.173	3,607,429	.178	2,058,036	.135	3,345,472	.070	5,882,054				

* Detailed returns are not available. † Seven months' average. Q.M.=Metric quintal = 100 kilograms = 220.46 lb

The Sacramento Shop of the Southern Pacific Railway

By FRED H. COLVIN
Editor, *American Machinist*

A railway shop with its own rolling mill—Babbitt hub liners—Welding locomotive frames with oil burners and air hammers

THE MAIN SHOP of the Southern Pacific Railway is at Sacramento, Calif., and dates back something over 50 years. So far as concerns transportation, it was then many miles further from the eastern source of supply than it is at present, which probably accounts for the establishment of its own rolling mill about 40 years ago. This mill is still doing business, rolling much of the material used in car work and for other purposes. A new 6-ton Heroult electric furnace casts steel ingots and also makes such steel castings as driving boxes, truck members and sections of frames

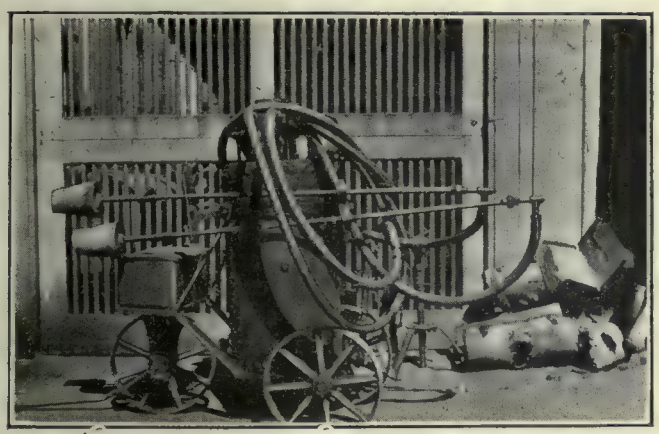


FIG. 1—PORTABLE OIL HEATING OUTFIT

for repair work. Lack of space on the molding floor prevents the casting of complete frames, most of them coming from a steel plant down on the peninsula below San Francisco.

New machine tools are to be found scattered in among the old as in nearly all railway shops. All know the need of newer and better equipment and some of it is on the way. There is a goodly array of Fox lathes, a few with turrets for handling the brass work instead of engine lathes.

Crosshead guides are ground on a ring-wheel machine but grinding has not been adopted for much work as yet. Piston rods and axle journals are finished by rolling.

Hub or lateral wear is taken mostly by heavy babbitt faces on the driving boxes. Care is being taken to use a good, hard babbitt for this purpose, as it apparently saves the wheel hubs, which are not often fitted with liners except after long service. Then both cast iron and bronze are used for hub liners. Bronze is largely used on trailer wheels. Records of over 180,000 miles between shoppings, on passenger locomotives speak well for the wear of the babbitt facings on the driving boxes. This mileage is, of course, above the average, from 40,000 to 60,000 being perhaps more common in freight service. But it must be remembered that this is largely a mountain road with numerous curves of short radius.

The flue welding practice differs from that of most roads. New flues are not welded in the sheet when the locomotive first goes into service. After the engine has run a little while and the oil and grease is thoroughly burned out, the flues are reset with the expanding tool, the heads turned over on the sheet once more, the sheet sand blasted and the flue welded to the sheet by the electric arc, using a small amount of metal in the process.

Neither arc or flame welding is used as extensively



FIG. 2—SPARE PARTS FOR MARINE ENGINES

as in some places. While the arc is commonly used for repairing frames in many shops, it does not find favor here. Instead the welds are made with an oil flame and the welding done with heavy hammers. In many cases a piece is cut out, a new piece made and held in position with a piece of plate steel between the original ends. Then a fire-brick muffle is built around the frame and a large blow torch is turned on each side of the frame and the metal brought to a high welding heat. A heavy air hammer on each side gives a kind

of blacksmith's forge weld which has proved very satisfactory. One of the oil heating outfits is shown in Fig. 1. It is portable and easily operated.

Some of the experiences with flame cutting have been unusual and unsatisfactory. In the case of one large forging where a piece was cut out by flame in order to save both forging and machining, cracks developed in service which made it necessary to replace the forging.

In addition to its locomotive work, and it builds locomotives occasionally as well as repairs them, the Sacramento shop takes care of a lot of marine work for ferry boats and smaller craft, involving considerable crankshaft work. In Fig. 2 is shown a spare shaft that was taken from a boat on account of a crack in one web. This web has been re-enforced by a heavy band which is shown more in detail in Fig. 3. The band is held together by a double lipped key and then tightened by the wedge key behind it.

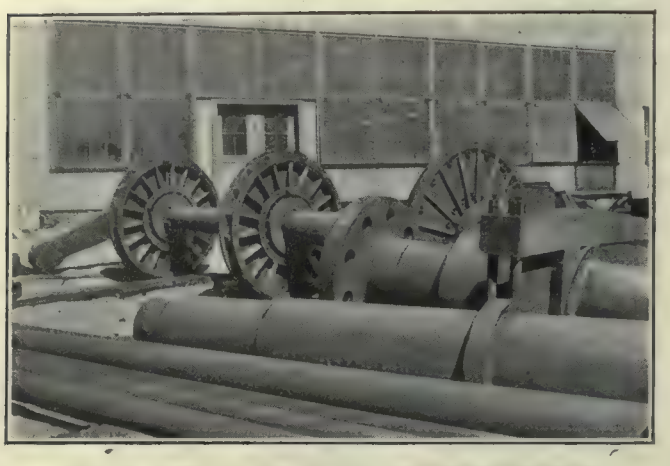


FIG. 3—DETAILS OF CRANK REINFORCEMENTS

Chemical Requirements in Cast-Iron Specification

Among the topical discussions at the 26th annual meeting of the American Society for Testing Materials held at Atlantic City, June 26 to 29, 1923, was one on the desirability of including chemical requirements in specifications for cast iron. The committee invited two members to open the discussion, Robert Job presenting the introductory argument for the affirmative, and Richard Moldenke, the argument for the negative. Mr. Job contended that in the case of steam-cylinder castings for locomotives, few consumers would have the hardihood to pin their faith merely to the physical tests, and that as a result of practical experience, it has been found desirable to hold the chemical composition within certain limits. As another example, he cited such castings as evaporating pans or grate bars, where an iron with a high melting point and heat resisting qualities is necessary. While physical tests, including the fusing point, could be made to give this information, he contended that the chemical analysis is simpler and more definite, as well as making it easier for the practical foundryman to meet the required properties.

Mr. Moldenke on the other hand contended that the chemical composition when specified in purchasing iron castings, serves no useful purpose, although there may be occasions when one or more injurious elements always present in cast iron, can be limited to a given maxima.

The first reason why the introduction of chemical requirements into the usual specifications for cast iron is undesirable, is that, wherever it has been tried in a general way, it has failed of its purpose. One prominent engineering society, which went into the subject very thoroughly, found that to include all the compositions of castings coming under each separate line of work for which actual specifications were to be prepared, would mean that the limit for the several elements in cast iron would have to be held so wide that no useful purpose would be served. The project was therefore abandoned.

Present Day Compositions Differ from Old

The second reason why chemical compositions at given figures should not be required of foundrymen in specifications they are to work under, is that the history of the development in foundry practice has shown that present-day compositions are considerably different from those considered necessary some years ago. Silicon is a good example of this. With more knowledge of the bad effects of dissolved iron-oxide in cast iron and definite information on the progression of cupola melting, the same grades of castings are now produced with much lower silicons than formerly.

Much of the trouble formerly attributed to sulphur is now known to have been caused by oxidation phenomena. Even phosphorus has come in for greater attention than formerly, though in the direction of limiting it more closely. For, with the better iron that can now be made, the phenomena of segregation had become more acute, as the metal remains fluid for a longer time.

Mr. Moldenke concluded that it is unwise to add to the troubles of the foundryman by imposing chemical requirements on him in addition to the physical ones. Either one or the other should be imposed, but not both. If the consumer wants a given composition the foundryman can furnish it, but then the consumer is responsible for the physical characteristics of the work. But if the consumer wants the castings for his service requirements, the foundryman should be unhindered in working out the problem as long as the service requirements are met.

Tractors in Logging Industry

Tractors are being used in increasing numbers in the mahogany industry in British Honduras, according to a report to the Department of Commerce from Consul Early, Belize. For over 200 years there has been a more or less successful exploitation of the mahogany and cedar forests by means of primitive although expensive methods, but with the depletion of easily accessible timber more modern methods of logging are required for profitable exploitation.

The result has been an increase in the use of tractors for hauling logs. The largest mahogany contractor in British Honduras has invested nearly $100,000 in tractors manufactured in the United States during the present mahogany season. With the use of about 70 tractors this operator expects to get out about 5,000,000 ft. board measure. Several other companies are also using tractors. It is estimated that about 75 tractors have been imported in the past twelve months for hauling logs. This report shows an example of the export opportunities for machinery.

A New Tool For Standardizers

By F. J. SCHLINK
Assistant Secretary, American Engineering Standards Committee

Preferred number series and their place in standardization —Systems adopted by German and French standards bodies —Inception of the idea in America and progress made

PRACTICALLY every article we use is associated in some way with a designation of size, whether specifically, as a two-inch pipe or a six-inch screw driver, or in the form of a rating as to capacity or performance, as a forty-watt lamp. In other cases the naming of the size is only by implication, as in the case of sewing needles or thread, where we refer to them as No. 4 or No. 60, for instance, in which the numbers have only an indirect and often ill-defined relation to any actual or controlling dimension of the article. In a few cases, objects are sized by the vague terms, "small," "medium" and "large." Such diverse objects as frying-pans, tent canvas, thimbles, desk tops, and fence wire are all subject to some sort of a size numbering system in commercial transactions and in technical use; yet there has never been a universal or agreed basis of such sizes, either as to units used (inches or feet, pounds, grains or ounces); the kind of dimension, whether length, weight, diameter, height, cost or some other characteristic, that is to be used as the basis of graduation or fundamental dimension of the successive sizes in the size series; or, third, the principle of law by which the dimension chosen should progress or increase in this series.

THE INVESTIGATION of the problem of preferred number series and their application to standardization was taken up by the American Engineering Standards Committee largely at the instance of Major Glen F. Jenks, Chief of the Artillery Division, Ordnance Department. Major Jenks has been a close student of preferred numbers and had this to say about them in a recent letter:

We know that too great variety has been demanded and unnecessary sizes asked for and carried in stock. If sizes are to be eliminated we must study the theory underlying sizes. This study brings us up to the discovery that the number of sizes fixed by the demand of the consumer really increases by certain definite laws.

The next question naturally is, can a definite law be found that underlies sizes of all products. If such a law can be found it will be of great assistance to all who develop new sizes, and to those who study standardization and simplification of sizes through elimination. The expression of such a law leads us to preferred numbers.

Within the past few months, the American Engineering Standards Committee has given careful study to certain proposals originating in Europe, for standardizing the methods by which such series of sizes are built up, and has brought this new idea to the attention of a large number of American engineering and industrial organizations.

The fundamental elements of the system called Preferred Numbers lie first in the proposal to arrange standard size series so that each succeeding model in the series shall be larger than the preceding size, not by a definite amount, but by a fixed percentage. Thus if fountain pens are to be graded by ink capacity (as they already are in a sense) each successive size of pen in a maker's line, instead of holding an additional fortieth of an ounce of ink, would hold say half again as much ink as the preceding size. This would obviously be a much better arrangement as one who wants a larger fountain pen is sure to think of the ink capacity of the new one in terms of the one he is using, rather than with reference to any fixed increment such as one-fortieth of an ounce. Very few people indeed would have any concrete idea as to the real writing significance of that amount of ink, but it means something to say that the new pen holds fifty per cent or one hundred per cent more ink than some other and familiar size of pen.

Similarly with sheets of letter paper, it is of little immediate practical use to refer to a new sheet as having an additional forty square inches of area, but to say it has fifty per cent more writing area carries very real and immediate significance.

Examining some of our more common size series in this simple way, Messrs. C. F. Hirshfeld and C. H. Berry in their paper on the subject before the A. S. M. E., the first public discussion of the question that has been given in the United States disclosed some very striking results. For instance in the case of wire nails, it was found that when the strength under the blows of the hammer was considered, successive standard sizes of nails show a quite irregular variation. The five-penny nail is only half as strong under the hammer as a four-penny nail, and the nine-penny nail is just about as strong as the four-penny nail; yet any purchaser would assume that as the nails got heavier and more costly the driving strength would increase progressively and not irregularly. It is apparent, therefore, that in any size system it is essential that the proper dimension or property be selected as the

basis of gradation. In this case the nails instead of being sized indirectly on the basis of weight, should probably be sized by driving strength, which is a function of length and wire diameter together. Customary size series thus may be faulty, not only in the spacing of sizes in the series, but in the choice of the property or dimension which determines the size designation.

This is a fair example of the way size series have grown up. Nail sizes actually originated in the cost in English pence of 100 nails, back in days when nails were made by hand smithing, and certainly at a price having no relation to the prices now current. The new size series idea seeks to base the size of such articles on some property or dimension bearing definitely on serviceability, rather than on some accident or practice, more or less shrouded in tradition, and long since invalid as a controlling factor.

1 to 10 mm.				10 to 100 mm.				100 to 1000 mm.			
5 Series	10 Series	20 Series	40 Series	5 Series	10 Series	20 Series	40 Series	5 Series	10 Series	20 Series	40 Series
1	1	1		10	10	10	10	100	100	100	100
							10,5				105
		1,1				11	11			112	112
							12				118
	1,2	1,2			12,5	12,5	12,5		125	125	125
							13				132
		1,4				14	14			140	140
							15				150
1,6	1,6	1,6		16	16	16	16	160	160	160	160
							17				170
		1,8				18	18			180	180
							19				190
	2	2			20	20	20		200	200	200
							21				210
		2,2				22	22			225	225
							24				235
2,5	2,5	2,5		25	25	25	25	250	250	250	250
							26				265
		2,8				28	28			280	280
							30				300
	3	3			32	32	32		320	320	320
							34				340
		3,5				36	36			360	360
							38				380
4	4	4		40	40	40	40	400	400	400	400
							42				425
		4,5				45	45			450	450
							48				475
	5	5			50	50	50		500	500	500
							52				530
		5,5				56	56			560	560
							60				600
6	6	6		64	64	64	64	640	640	640	640
							68				680
		7				72	72			720	720
							75				760
	8	8			80	80	80		800	800	800
							85				850
		9				90	90			900	900
							95				950
10	10	10		100	100	100	100	1000	1000	1000	1000

FIG. 1—TABULATION OF PREFERRED NUMBERS AS DEVELOPED FOR THE METRIC SYSTEM AND APPROVED BY THE GERMAN STANDARDS COMMITTEE. THE FRENCH HAVE ADOPTED A SIMILAR SERIES

This same important defect of existing series of sizes is of course characteristic of many other lines of commodities.

One man, chief engineer of a large machinery concern said of the product of his industry that "not only cylinder sizes, but the sizes of shafting, gears, drums, etc., follow no specified rule, but just simply happen. . . . Who actually determined these things, no one may know today, nor by what means they determined them, and yet the tenacity with which we stick to these things almost amounts to a form of ancestral worship." Continuing, he said that when sizes of parts of his product were re-selected on a preferred number basis, the machines "showed a fine, progressing uniformity, and strange as it may seem, the resulting load capacities were more suited to the requirements of this type of machinery than the existing series of designs . . . giving due consideration to all the factors that determine such capacities."

The War Department has requested the services of the American Engineering Standards Committee in working out on a national scale, a single system of preferred numbers as a basis of simplification of design practice, as it considers that the design of military ordnance is a problem in which some form of preferred numbers is coming to be essential, in order to reduce the large variety of parts and the quantities of special facilities now involved in the production of war material. In making this request the War Department says:

It will be appreciated that Ordnance covers an extremely wide field of design and a great multiplicity of sizes. Of course most of this material is of special design and is not made for commercial purposes. However, in time of war all of it must be manufactured in industrial plants.

It is, therefore, of the greatest importance that the design of Ordnance be simplified as far as practicable, and that it be standardized with industrial products. . . .

Of course considerable simplification . . . is possible through the adoption of commercial standards. There remains, however, a wide field in which commercial standards do not apply. For example, in the diameter of cylinders whose dimensions are greater say than 2 in., at present the designer is satisfied if he rounds off his dimensions to an even fraction of an inch. The result is of course, much multiplicity of sizes which may appear reasonably standard but which differ from each other by such insignificant amounts that they really represent special rather than standard sizes. . . .

It would be a great step in the simplification of design if a system of preferred numbers were used. . . .

If the design practice of Ordnance has been simplified in the same manner as the design practice of industrial products, naturally the war production problem would be correspondingly simplified.

It seems to the Department that some progressive manufacturers are going to apply systems of preferred numbers in the design of their products. If there is this demand on the part of the industry for such simplification of their product it would be highly advantageous to the Department if the different industries interested would combine in using the same fundamental system. . . .

It is therefore hoped that your Committee will permit the use of the mechanism of your organization for industrial manufacturers as well as Government organizations to attempt to work out a single system of preferred numbers as a basis of simplification of design practice.

Such a system should show large economies in the important and costly work of developing and revising designs of military ordnance—guns, gun-carriages, caissons, trucks, etc., in which the multiplicity of unstandardized parts and sizes of hinges, pins, bolts, wrenches, hand-wheels and the like, makes the ordinary uncorrelated methods of mechanical design slow and costly and calls urgently for a universal, broad and consistent scheme of sizes.

The economic loss involved in the haphazard and often unnecessarily numerous gradations of size that characterize many of our common commodities must in the aggregate amount to a huge sum, and a real survey of the more important commercial series of sizes would be very interesting and would probably pay large dividends in direct and indirect commercial savings.

Another essential of the new proposal, is that the numbers representing successive sizes shall not only lie in a series giving a uniform percentage increase,

but also that the actual size numbers used shall reappear in all series, so as to build up, as it were, a standard set of numbers which would be used constantly and almost universally in commercial transactions and in engineering design calculations. Such a series for instance is given by the numbers 10, 16, 25, 40, 64, 100 which by a simple shift of the decimal point gives us a new series 1.0, 1.6, 2.5, 4.0, 6.4, 10.0, or again 100, 160, 250, 400, 640, 1,000.

The first series might be used for grading the numbers of bolts or buttons in a package or carton, the number of lines in an apartment house telephone exchange, or the diameters of the telephone wires in thousandths of an inch. Obviously the shift of the decimal point enables the same basic numbers to be used for all sizes, from the very smallest to the largest for which there is any possible use. A freight car capacity of 64,000 pounds, or fence wire 64 thousandths of an inch in diameter would be preferred number sizes. Of course the series need not start with the first number given in the foregoing list. It can start with any number of the series which seems best suited to determine the smallest needed stock size, and can continue through any number of "decades" to the largest needed stock size.

These number series have been elaborated to provide another interesting and important property. If the five numbers just listed are not enough to give a satisfactory and economical series for a given line of material, let us say valves for water pipes, we can insert a new

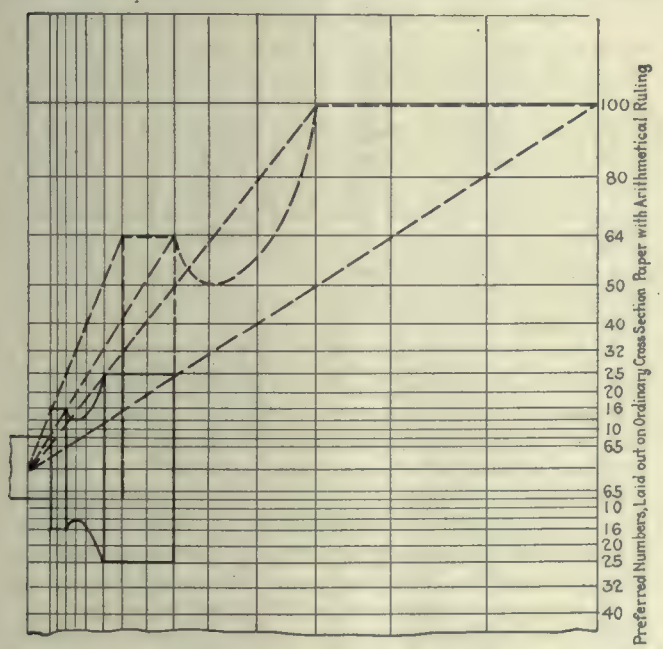


FIG. 2—A CONVENIENT METHOD OF REPRODUCING THE PROPORTIONS OF A GIVEN KNOB ON A LARGER OR SMALLER SCALE, THE NEW DIMENSIONS BEING PREFERRED NUMBERS ALSO. (AFTER C. von DOBBELER)

preferred number between each two of these already in the series, and we have a new series with twice as many terms, and with this important advantage, that sizes of the first series are all found in the second one, so that if in keeping up with developments in the trade it becomes necessary to increase the number of valves in a line, all of the old sizes stand, and we simply insert new sizes one at a time, or if desirable, two at a time, in such parts of the series as seem to demand extension. Thus the new series, comprising twice as many steps as the first, is as follows:

10, 12.5, 16, 20, 25, 32, 40, 50, 64, 80, 100

In the first series the successive terms are each 60 per cent larger than the preceding term, while in the second case the rate of growth is 25 per cent. By an extension of the same process new series can be built up, in the occasional cases where they are needed, hav-

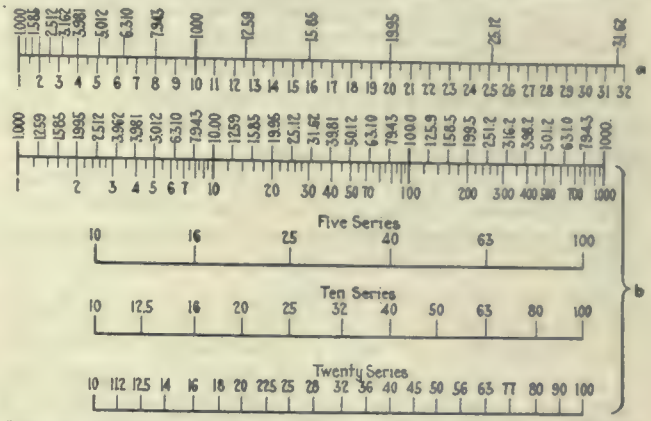


FIG. 3—SHOWING THE SPACING OF PREFERRED NUMBERS ($\sqrt[10]{10}$ BASIS) ON THE ORDINARY 1, 2, 3, 4, 5 ..... SCALE OF NOTATION (A) AND ON A LOGARITHMIC OR GEOMETRIC SCALE (B). NOTE THAT THE PREFERRED NUMBERS ARE UNIFORMLY SPACED ON THE LATTER SCALE AND THAT SUCCESSIVE SERIES (5, 10 AND 20 NUMBERS PER "DECADE") ARE PRODUCED BY SUCCESSIVE HALVING ON THE LOGARITHMIC SCALE. (AFTER RUEDENBERG)

ing 20, 40 or 80 terms, between 1 and 10, or between 10 and 100, corresponding to rates of increase of 12, 5, and 3 per cent respectively, and each of these series contains all of the terms of the preceding ones, a feature which has obvious and important advantages. Of course for the great majority of uses the 5-term and 10-term series will serve our purposes, and in these series the person who works with commercial products will rapidly learn all the numbers involved, so there will be little need for that constant reference to tables of dimensions which is now so necessary to the designer, engineer, draftsman, foreman, workman, the amateur scientist and the householder, whether the work concerns wire nails, screws, washers, sheet metal, pipe, drills, motors, paint brushes or any other line of materials which must be dealt with in a series of sizes.

It may be that on account of the simplicity of the preferred numbers and their arithmetical convenience, their use would extend in such a way as to displace our numerous mutually inconsistent and confusing so-called "gage" sizes, that is, the arbitrary numbers and names that are used in referring to such diverse commodities as corks, tubing, envelopes, nails, flags, artist's brushes, etc. Furthermore, the ease in designating a size which such a system affords may have an important reaction in the direction of standardization, by favoring the use of uniform size for uniform purposes. How important this point is may be judged from facts recently brought out by the Committee on Simplification of Paper Sizes appointed by the Bureau of Standards. For example, of 177 books printed by one concern 101 were actually of different sizes. Similarly, in 57 prominent magazines of national circulation, 27 different pages sizes are used. If preferred numbers can make the designation of such sizes simple, and avoid the use of arbitrary terms in so doing, it is quite likely that the idea of standardi-

zation, with the enormous economies in manufacture and in distribution which follow, may spread through many industries which it has as yet hardly touched. One maker of bolts was using 28 sizes of pasteboard cartons for packing his product. On changing to a new series of sizes, laid out on a percentage-increase basis, only half as many sizes were needed, and the uniformity of packing was more satisfactory than before. Similarly the number of wooden packing boxes was reduced from 50 to 23 by the same process. The resistance to the use of standard materials and sizes will be much decreased by any step which can unify the basis of standardization and give it a common and easily understood basis of reference.

Already, in Europe, notably in France and Germany, duly approved standards are being published by national standardizing bodies, on a preferred number basis, on such subjects as tools and toolholders, strips, sheets and tubes of aluminum, paper for books, etc., carbon brushes for street railway motors, etc. The simplifying effect of such standardization with regard to the last item can be judged when it is known that there are now in use over 6,000 different sizes of brushes for electrical motors. Putting the sizes of these on a uniform basis would, by favoring mass-production, reduce the costs of *all* such brushes.

A Very Important Development

There is no doubt that this is the most fundamental and far-reaching development which has as yet come before the American Engineering Standards Committee for investigation. The committee is studying the question of how the necessary extensive investigation of the subject on the part of the numerous branches of industry may best be brought about, in order to determine the relative advantages and disadvantages that would be involved in its adoption; to see whether such a scheme can be applied in a national way to the problems of American industry and trade; and to determine, moreover, just what detailed technical basis for the system, if one is adopted, will best serve the practical and theoretical requirements of the problem. A special committee appointed by A. W. Whitney, chairman of the A.E.S.C. and headed by Maj. Glen F. Jenks, Chief of the Artillery Division, Ordnance Department, U. S. A., recommended that the work on the subject including a study of the principles underlying the application of preferred numbers to size standardization, and the development of a recommended system of preferred numbers, should be carried out by a special committee of the A.E.S.C. as representing the National Engineering Societies, industrial organizations, and interested Government bureaus.

An important point that must be kept in mind in any practical consideration of such a proposal, is that its immediate application can only be in guiding new standardization work and in reformulation of old standards when for any reason such revision is undertaken. Many existing trade practices are as has been pointed out on such a dubious basis in respect to the fundamental ideas and practices involved, that a re-examination of such standards to put them on a definite and uniform basis can probably best be carried out with some such guide as the preferred number plan. This is probably the case with many of the items already mentioned, and with other items which are either unstandardized or of which the standards are uncertain or have been developed in a loose or unscientific manner. The correction of such conditions can only be done slowly and carefully and as opportunities for revision arise in the ordinary working out of improvements by trade and technical associations and other organizations that develop standards and specifications.

It is an interesting fact that some of our products that are most highly developed from the scientific and engineering point of view already fit the preferred number series quite closely. This has been found to be true of capacities of druggists' bottles, the diameters of electric wire, the wattage of incandescent electric lamps, the horsepower of certain types of electric motors and steam engines, the sizes of stay wires for airplanes, and even of the vibration frequency of the tones of the musical scale.

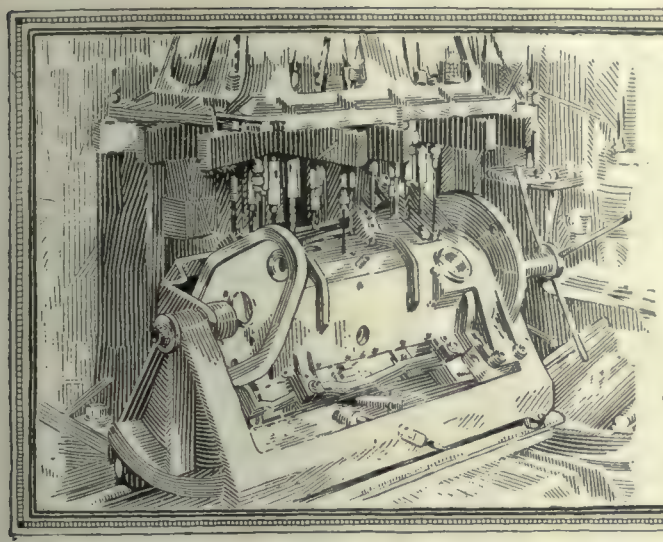
Factors Governing the Strength of Gear Teeth—Discussion

By Douglas T. Hamilton

The criticisms made by G. W. Drake on page 24, Vol. 59, of *American Machinist*, of my method of determining the tooth proportions of a helical gear on the normal plane, are perfectly logical if we consider that the gear has been produced by a regular spur gear cutter. But the writer was not dealing particularly with methods of cutting, rather with the factors that affected the strength of a helical gear tooth. It will be readily understood that if the gear were produced by a regular spur milling cutter, the thickness on the normal plane would be the same as on the diametral plane of a regular spur gear, and the thickness on the diametral plane would be greater. The problem was to find the thickness of the tooth, and as the gear shaper method is commonly used for cutting gears on a production basis, and one with which the writer is well familiar, this method was selected as an example to show the methods used in determining the normal tooth elements of a helical gear, the diametral tooth elements of which are the same as a regular spur gear of the same pitch.

The diametral plane method of figuring helical gears has several advantages. For instance, take the question alone of changing over from spur to helical gearing. By the normal pitch system, as Mr. Drake suggests, a compromise is always necessary, and if the same center distance and tooth ratio must be maintained, it is quite a problem for a man who is not experienced in gearing to work it out satisfactorily. The other method, figuring the tooth parts on the diametral plane, is a comparatively simple proposition.

Mr. Drake makes a rather broad statement when he says that it is the almost universal custom to cut helical gears with regular standard spur gear cutters. The writer does not want to get into a discussion here regarding the comparative merits of different methods of gear cutting; he simply wants to point out that there are two methods of calculating the tooth proportions of helical gears. The method outlined in his article is by far the simpler. Because it is common to one method of gear cutting only is nothing against it. The same tooth proportions can be obtained by other forms of gear cutting tools, provided they are made so as to cut standard diametral pitch helical gears, instead of cutting mongrel gears, which are not only difficult to measure and apply, but involve some rather technical calculations.



Tool Engineering

By
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Inspection gages—Important points of design—Value of indicating gages—Testing irregular contours—Gaging relation of holes to surfaces

GAGES used for determining the accuracy of work after it has been machined are usually referred to as inspection gages. This variety covers a wide field and, as previously mentioned, the line of demarcation between work and inspection gages is not very clearly defined, as the same types of gages are often used for both work and inspection. However, for our purposes it is only necessary to describe the types of inspection gages which are radically different from work gages.

In considering the matter as applied to the design of gages of this type, there are a number of points of importance to which attention must be paid.

(1) Inspection gages may be used either between operations or after all the operations are completed on a given piece of work. In the former case it may be necessary to test the accuracy of one or two surfaces only, while in the latter instance the requirements make it necessary to gage all the important dimensions on the work. It is often possible and even desirable in many cases to make a testing fixture for the final inspection. This fixture should be so designed that the work can be located in it in a fixed position and all surfaces tested at the same time. Progressive gages, which are so made that the work is passed through a number of gage points located on a plate or in some other convenient manner, are sometimes used for final inspection. When screw machine work of certain kinds is to be inspected and there are a number of different diameters on the work, this method has found favor with some manufacturers.

(2) In the final inspection it may be an advantage to allow slightly greater tolerances than those used for the work gages. This matter should be settled by the engineering department in conference with the factory management when planning a gaging system. The advantage of greater tolerances for final inspection lies in the possibility of saving work which would otherwise be "scrapped" or sent back to the machine shop for additional work. A decision on this matter should not be given without careful consideration. In many factories the tolerances are the same for both work and inspection gages.

(3) The number of pieces to be gaged always affects the design of gages to a considerable extent, particularly when considering those used for final inspection. When work must be kept within very close limits, the gages must be carefully designed and provided with means for adjustment to counteract the effects of wear.

(4) Periodical inspection of gages is of the greatest importance, and too much stress cannot be laid upon this feature. Any system of gaging which does not take this matter into consideration is greatly lacking in efficiency.

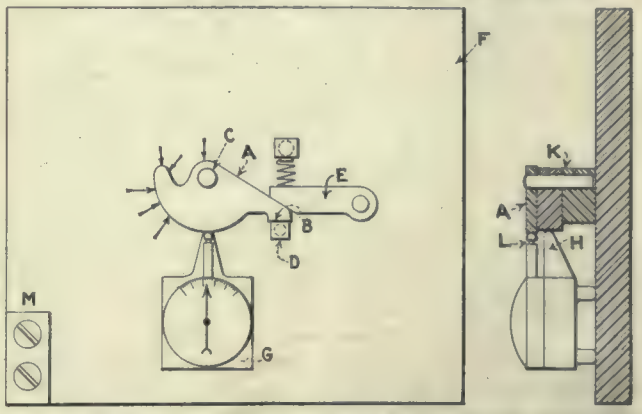


FIG. 545—METHOD OF GAGING AN IRREGULAR CONTOUR

The best results are obtained only by frequent inspection and the resetting of all gages used, to their correct sizes. Probably the best way of doing this is by the use of duplicate gages, one set being checked and adjusted while the other set is in use. In large factories a department can be established for this purpose, and the results obtained will fully repay the trouble taken.

(5) The type of gage best suited to the testing of various parts must be determined by several factors. The accuracy required in the work is an important one of these factors. The quantity to be inspected also affects the design strongly. When only a few parts are to be inspected the simpler forms of gages will prove satisfactory, but for high production refinements of various kinds are needed. Furthermore, the element of time taken for the inspection process is important and, therefore, the gages should be so designed that they can be rapidly used and easily read. Generally speaking, inspection gages should be so designed that they indicate the amount over or under size, as well as the required tolerances.

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(6) Standard measuring instruments for the final inspection can frequently be used to advantage, either as applied to a fixture or by themselves as separate units. There are a number of instruments on the market which are suitable for obtaining very accurate readings on different kinds of work. The designer should become familiar with these types, in order that he may not go to the expense of making up something special when a standard instrument will answer the purpose. We have previously mentioned dial indicators and other indicator types, and it is obvious that micrometer heads and verniers of different kinds can also be used. Johansson gage blocks can be readily adapted both for setting instruments to accurate sizes and also for making up standard dimensions within a very close limit of accuracy. The "Prestometer" or fluid gage can be applied to a number of inspection problems with excellent results. There are also very accurate measuring instruments which can be used for test purposes when required. We do not feel that it is necessary to mention

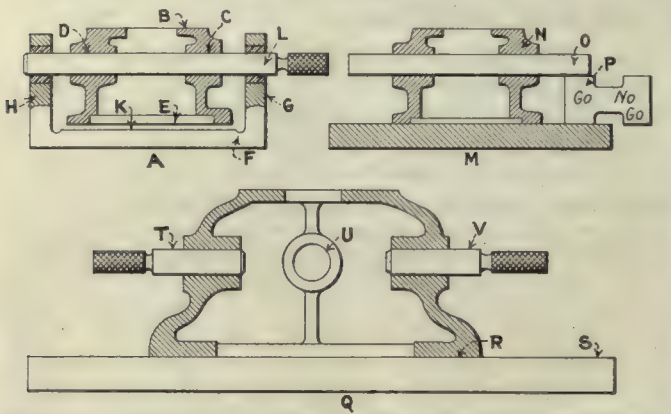


FIG. 546—PRINCIPLES USED IN TESTING RELATION OF HOLES TO SURFACES

these devices specifically, but we recommend that tool engineers who are interested in the design of gages become familiar with these instruments and understand thoroughly their application.

(7) The use of an instrument by means of which the shadow of a given piece of work can be projected at greatly magnified size on a screen for comparison with an accurate templet, has proved very successful in the inspection of threaded work, gear tooth shapes and similar forms. We shall take up this instrument later in the series in order to show the principles on which it is based.

In many kinds of work the entire contour or profile of a piece of work is important, and if this profile is irregular it is somewhat difficult to gage it by any of the methods which have previously been mentioned. The old method of testing work of irregular shape was by means of a receiver gage. The work would be placed in a gage of this sort and an inspection of the contact at various points would determine whether or not the accuracy was sufficiently close to fulfill the requirements.

In order to simplify the gaging of contours a dial indicator may often be used with gratifying results. Fig. 545 shows a piece of work *A* which has an irregular contour, some portions of which must be held accurately to size. The work has been machined all over, and the surface *B* determined in relation to the hole *C*. It is necessary to determine the correctness of the form at the points indicated by the arrows. This form must bear a certain relation to the hole *C*, and the portion *B* contacts with a plug *D*, against which it is held by the pressure of the arm *E*, which is spring controlled. The base plate *F* is scraped to a plane surface, and on this plate the indicator holder *G* is moved about as required.

Directly underneath the work *A* an accurately formed master plate *K* is positively located in such a position that the indicator holder *G* can be brought in contact with it through the point *H*. The indicator itself is mounted so that the contact point *L* is above the point *H* in a suitable position to contact with the edge of the work. In preparing to test the piece which has been placed in position the indicator holder is moved over until the pointer strikes against the set block *M*, and while it is held against it the dial is turned so that a zero reading is obtained. After this has been done, the holder is moved around the contour of the work with the point *H* in contact with the master plate, and any variations from the correct proportions can be readily noted by observing the fluctuations of the indicator pointer. This method of testing irregular forms has been found very successful, and it can be applied to many cases of a similar kind.

Gaging Relation of Holes to Surfaces

It is frequently necessary to test the relation of a hole to an adjacent surface. This surface may be parallel or at right angles to the hole, or it may be at a specified angle. When the hole and surface are at right angles there is no particular difficulty in testing their relation and the operation can be done by making use of some of the principles which have previously been described. When the surface is at an angle to or parallel with the hole more care is necessary, and as it is cases of this sort which are often troublesome to the gage designer, we shall illustrate graphically some of the difficulties encountered.

There are many gages made for the purpose of testing finished work which are incorrect in principle; and yet, they are often used in the factories with partial success due to careful handling on the part of the inspector. It is our belief, however, that a gage or testing fixture should be so made that it requires a minimum amount of judgment on the part of the inspector. In other words, the gage should show conclusively that a piece of work has been machined within the required limits or not. There are, of course, exceptions to this rule when parts are manufactured in small quantities, and when it would not pay to make up expensive testing fixtures on account of the limited production.

In Fig. 546 is shown at *A* a piece of work *B* which has been completely machined, and in which the cross holes *C* and *D* must be parallel with the lower surface of the casting *E*. The designer, being somewhat inexperienced, made up a testing fixture consisting of a base *F* at each end of which there is a lug as shown at *G* and *H*. In these lugs hardened bushings are placed, as indicated, at a fixed distance from the surface *K*. The intention is to place the work in the fixture so that surface *E* rests on surface *K*, and then pass through the two holes *C* and *D* the long cylindrical plug gage *L*, which will show whether or not the surface *E* is correctly located with respect to the two holes.

Let us examine this testing fixture and see what would happen in the event that the location of the hole should be a shorter distance from the surface *E* than required. In this case the plug would enter and pass through the holes without difficulty, but it would at the same time lift the work away from the surface *K*

an amount equal to the variation in the given dimensions. On the other hand, if the holes *C* and *D* were bored too far away from the surface *E*, it would not be possible to enter the plug at all. There would be no way of telling how much over or under size the work might be when using a gage of this sort, and yet the writers have seen a number of gages built on this principle in use in different factories. As a matter of fact, it can be readily seen that the principle here used is absolutely incorrect, and its use should never be tolerated.

The arguments which may be used are that the number of pieces required would not warrant any great expenditure for a testing fixture; and yet the problem in itself is a very simple one which can be readily solved by application of the principles shown at *M*. Here the work *M* is set up on a surface plate and a plug *O* is passed through both holes as shown. A simple type of limit gage as shown at *P* can be passed under each end of the plug, thus clearly showing whether the relation of the hole to the lower surface is within the tolerances specified or not. One could hardly imagine a much simpler method of gaging than this. The same principle can be used and a slightly more elaborate fixture made if desired, indicators being used in place of the limit gage in accordance with the designer's preference.

In another example, shown at *Q*, the work is of similar form but there are four holes, the relation of which must be gaged with respect to the lower surface *R*. When only a few pieces are required the work can be set up on a surface plate *S*. Then, by using plug gages at *T*, *U* and *V*, an indicator of the dial type suitably mounted can be passed over these plugs after it has previously been set to size by means of Johansson blocks or an end measuring gage. The fluctuations of the indicator will immediately show any variations over or under the specified sizes.

The same result can be obtained by mounting separate indicators in such locations on a fixture that the plugs will come in contact with them when entered in the holes. There are a number of applications of indicator gages which can be made to suit conditions of this sort, and a little ingenuity on the part of the designer will enable him to work out a design suited to the condition.

Use of Double-Acting Machines—Discussion

By Albert Clegg
Yorkshire, England

IN AN article under the above title on page 560, Vol. 57 of the *American Machinist*, Robert Grimshaw discusses the utility of various double-acting machines and proceeds to advocate the application of this principle to metal planing machines, by eliminating the idle return stroke and introducing in its place an extra cutting stroke. Mr. Grimshaw refers to a "jack-in-the-box" tool-holder occasionally come across in England and suggests that something of the sort should be worth more general adoption.

Now in view of the obvious advantages accruing from the cutting out of the non-productive return stroke of planers, it does seem rather surprising that more attention has not been given to the subject and that much greater efforts have not been made to introduce more generally so potent an improvement. We find, however, that very few of the world's planer builders attach any importance to the subject. Their whole efforts seem to be concentrated on the production of higher and still higher return speeds, the possibility of increasing the productive value of the machines by arranging for double-cutting being apparently ignored in the vast majority of cases. It is the return speed of the modern planer which determines the power consumption, and also the size of motor required to drive, and it is the return speed too which subjects the driving mechanism to its greatest loads and heaviest shocks. Surely then it should be worth while giving more attention to the possibilities of double-cutting, rather than so much time to the means whereby the return speed can be still further increased.

Buckton & Co.'s Machine

One of the firms who has devoted considerable time to the perfecting of a double-cutting tool-box and who has for years advocated the adoption of the principle for all classes of work is Joshua Buckton & Co., Leeds, England. For twenty years this company has been building planers arranged for double-cutting, and incidentally, it has, for a like period been building planers fitted with the now well-known Sellers' drive, in which a spiral pinion meshes into the rack. Whereas the original Sellers' drive had bevel gears to connect the pulley shaft to the spiral-pinion shaft, the Buckton firm uses spiral gears at this point, thus producing a machine which is completely driven by spiral gears, and, as a consequence, capable of running with practically no noise whatever. In spite of the fact that it is twenty years since this company supplied the first spiral geared planer—and it has supplied hundreds in the meantime—it has never yet had to replace a worn-out or broken spiral pinion. It should also be stated that the product is not confined to small planers; on the contrary, the company has a name and reputation for the heaviest classes of machine tools, and the spiral-geared planer is regularly made in sizes up to 10x10x30 ft., which proves that the system is applicable to the heaviest classes of drive.

Efforts to Popularize Cutting on Both Strokes

It was probably due to the efforts of J. Hartley Wicksteed, late managing director of the company, that so much has been done to popularize the idea of cutting on both strokes. Some eleven years ago Mr. Wicksteed read a paper before the British Institution of Mechanical Engineers, in which the design of high-speed, double-cutting planers was dealt with, and it is rather a significant fact that the balance of the arguments in the subsequent discussion were all in favor of the principle of double-cutting. The author's treatment of this phase of the subject was approximately as follows:

One of the arguments often advanced against the planer, shaper, slotter and other similar types of reciprocating tools, is that they are necessarily uneconomical by reason of the idle return stroke, and therefore such tools are not really as efficient as the continuous-cutting tools such as the lathe and milling machine. The reduction of the idle time is a problem which has exercised the minds of machine tool designers for a long time, their efforts usually being in the direction of faster and still faster return speeds. It is undoubtedly true that some remarkably good results have been achieved in the way of high-speed return strokes, but it is not so definitely certain that this method of solving the problem has been the one offering the best chances of success. In most high-speed planers it is the re-

turn speed and the shocks generated thereby which are the limiting factors of the design, since they are so very much greater in intensity than the stresses imposed by the comparatively slow cutting strokes. It is the return speed which is invariably the punishing element so far as the driving mechanism is concerned.

Now there is a limit to the magnitude of the return speed, and this limit is more or less determined by the size of the machine—the larger the machine, the less the return speed, and conversely, the smaller the machine the greater may be the return speed. In any case, no matter how high a return speed may be used, there is certainly no doubt that the return stroke is an idle one since no useful work is being done. Further, after a certain point has been reached, the advantages to be derived from a still further increase of speed are so small as to be practically negligible.

Cutting and Return Speeds

Take a planer operating at a cutting speed of 40 ft. and a return speed of 120 ft. the length of the stroke being 10 ft. The cutting stroke would take 10/40 min. and the return stroke 10/120 min., the complete cut and return cycle being made in 40/120 or 0.333 min. Now suppose the return speed was increased to 200 ft., the time taken for the return would then be 10/200 min., and since the cutting time would remain the same, the time for the cycle would be 0.300 min., or roughly 10 per cent less than the former time. If it were practicable to increase the return speed still further to, say 300 ft., the time for the cycle would then be 0.283 min., or a saving of about 16 per cent over the 120 ft. return speed, but of something under 6 per cent as compared with the 200 ft. return speed. The increased stresses on the machine and the increased amount of power required, not to mention the larger amount of time wasted at each end of the stroke, would all be to set off against the theoretical savings given by the above calculations. If the cutting speed were increased, and the extra output obtained in this way without having recourse to super-return speeds, the increase would only be quite a modest one, a mere 10 ft. a minute addition to the cutting speed combined with the lower return speed mentioned above, giving exactly the same rate of production as with the 40 ft. cutting speed and the 300 ft. return speed. It is quite obvious which method will be easiest on the machine.

Idle Time on Return Stroke

However, we must not lose sight of the fact that the return speed is wasted time. With an abnormally high return speed, the time lost will not be very much, but nevertheless it will be lost under ordinary circumstances and providing there is no alternative. We believe there is a practicable alternative, our contention being that on many classes of work, it is possible to entirely cut out the idle return stroke by the simple expedient of providing a special toolholder carrying two sets of tools so as to cut in both directions.

While it is admitted that double-cutting is no new idea, it is really only since the advent of the variable-speed, reversing-motor drive, that the double-cutting system has had a fair chance. Prior to this there was a serious objection to its adoption, since a machine made with equal forward and return speeds for double-cutting was working under a rather heavy handicap when a job came along which was not adapted to double-cutting. Under these conditions, since the return speed was only equal to the cutting speed, the loss of time was such that it discounted the advantages derived from the double-cutting on work where that system was possible. The variable-speed motor drive overcomes this difficulty, because the drive can be set either to reverse at equal speeds for double-cutting, or to give a higher return speed in one direction when the class of work requires a return to the more orthodox method of working.

Advantages of Double Cutting

In planing cast iron the advantages of double-cutting are two-fold; for, besides having two feeds to the tool for each cycle of the table, the back-to-back tools mutually assist each other by chipping away the scale in front of them in each direction, so that each tool has clean metal to enter at all edges of the casting with which it comes in contact. The tools are thus saved from so much wear that, instead of two tools requiring more fixing—as is sometimes argued—they require, on the whole, less fixing than a single tool, since they will do more work per tool because of the absence of contact with the hard skin of the casting.

Also, the first roughing cut is more uniform if made with two tools, because they get so much less worn between the first cut and the last, partly due to each tool taking alternate cuts and thus reducing the wear to half that of a single tool on any given job. It has been found in actual practice that turbine castings, for example, could be planed in less time by double-cutting than by single cutting, even if the time taken by the idle return stroke were eliminated altogether. The reverse position of the back tool also makes it particularly advantageous for taking broad finishing cuts; it does not require cranking back to prevent chatter marks, because it has no tendency whatever to dig in. For the same reason the back tool can also be used to advantage for cutting grooves with a parting tool. In work of this nature, although the double-cutting tool-holders are not changed, the back tool only is inserted and the back stroke can be driven at the desired cutting speed, with an idle return on what would ordinarily be the forward stroke. There are also many occasions where this feature might save turning the work round end for end by having a tool available for planing up an obstruction in either direction.

The manner of double-cutting is to fix both tools precisely back-to-back; in fact, the second tool is adjusted by simply dropping it into the furrow made by the first tool. The back tool follows in the furrow of the front tool until the end of the stroke is reached when it is traversed by the feed motion; it then cuts a further furrow in which its companion follows free, and thus, in a single cycle of the table, two furrows have been cut of equal width and depth.

No Material Results

The above is the substance of Mr. Wicksteed's arguments in favor of double-cutting; it does seem strange that nothing very material has resulted from his efforts in this direction. A big majority of planers made today being still of the old-type idle return-stroke design. It can of course be argued that the bulk of the planers made today are of the belt driven type, that is, not reversing-motor driven. So that in view of Mr. Wicksteed's statement that it is only in combination with the variable-speed reversing-motor drive that double cutting is really practicable, we can only assume that double cutting is dependent on the more general adoption of this particular form of drive.

A Special Planer

Smith, Barker & Willson, Ltd., Halifax, England, several years ago had a special planer built in which an extra set of standards, cross-rail and tool-boxes were provided, mounted opposite the ordinary set and facing them. The idea was to obtain the advantages of double cutting, insofar as the idle stroke was cut out altogether. The firm had the machine built primarily for planing lathe beds, two rows of which were mounted on the planer table at once. There were several combinations on which the planer could be operated. One row of beds, for example, could be planed on one stroke and the second row on the other stroke, the operation being almost exactly as if two separate machines were in use. On the other hand, if required, both sets of tool-boxes could be used on both sets of castings, but this method was not as convenient as the one mentioned where each row of beds was dealt with by its particular set of tools. The countershaft was arranged so that a high return speed could be used on odd-job work which did not lend itself to the double-cutting principle. So far as the writer knows, the machine was, and still is, highly successful and saves a substantial amount of time on the planing of lathe beds.

Industrial Cost Accounting for Executives

By PAUL M. ATKINS

The sixteenth article—Classification and recording of expense accounts—The controlling expense accounts—Operation of detail expense account card—Use of the expense ledger

IN THE preceding articles the composition and content of the various expense accounts have been discussed, but nothing has been said about how the charges are actually to be made to them. The question before us here, therefore, is to investigate some practical method by which the various costs may be accumulated both in the controlling and detailed expense accounts. If the control of the expense accounts is to be satisfactory, means must be provided for checking possible errors and for tying in these accounts with the other general ledger accounts.

We can classify the charge to be made to the expense accounts into four groups:

(1) Indirect material.
(2) Indirect labor.
(3) Outside services.
(4) Internal charges.

As we have already seen, there are many different accounts to which these items should be charged and to many accounts several sources may furnish the debits. It is necessary, therefore, to provide some systematic way to guide the posting of the various transactions which represent the cost of services rendered.

It will be remembered that in a preceding article it was pointed out in connection with the discussion of maintenance charges that all maintenance and repair work should be carried on only on the strength of an order authorizing it. The statement made in respect to such work should be amplified to include all the tasks involved in carrying on the various functions of the business. In relatively few cases it will be necessary to issue work orders except for repair work, but the system of standing orders described in the article referred to is usually employed. It will be recalled that standard practice instructions should be prepared for all the various routine tasks and included in these instructions or attached to them should be an indication of the account or accounts to which the costs of doing the work according to the instructions should be charged. With these instructions and the enacting orders as a basis it is pretty much a matter of routine to charge the proper expense accounts, for every voucher which carries a cost with it may be arranged to show the account symbol to which it is to be allocated.

Material is the first item on the list and is often one of the most important of the elements of the expense accounts. All indirect material like all direct material, should be withdrawn from the store-room only on the authority of a material issue. The material should always bear the expense account symbol to which it is to be charged in addition to any work order or other number of that sort. It should follow about the same routine as any other issue, going to the balance clerk who will enter it on the balance of stores card and price it, and from him to the materials journal clerk who will make the extension and enter it in the stores journal.

It is important to remember that there are several columns in the stores journal for expenses, one for each of the controlling expense accounts. The indirect material issues should be sorted according to this classification and entered in the appropriate column. At the end of an accounting period the columns should be totaled and debited to the several controlling expense accounts in the general ledger. The issues should be sorted daily according to the detailed expense account symbol and placed in a file prepared for the various expense account vouchers.

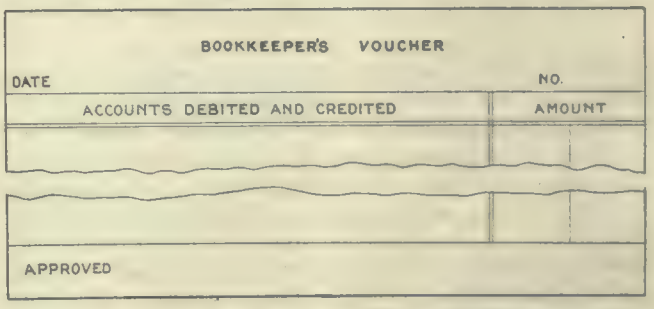


FIG. 45—BOOK-KEEPER'S VOUCHER

The allocation of the indirect labor is a little more complex but it does not present any serious difficulties. From the summary of the factory payroll, the entries to the controlling expense accounts may be obtained. Most of the workers on the payroll have time tickets on which are shown the order of account to be charged. For indirect labor this means, of course, the expense account symbol. It is often desirable to make out time tickets for all persons on the payroll whether they are needed for payroll or distribution purposes or not. For such individuals as the foremen and subforemen, inspectors, instructors and move-men, it would be perfectly possible to operate with only an in-and-out clock card record and without time tickets since all their time is charged to one account. It is a very simple matter, however, at the end of each pay period to make out a time ticket for the entire period for each of these workers, showing thereon the earnings and the expense account to be debited. This simplifies the allocation of the charges to the various expense accounts because sorting the time tickets will then accomplish the distribution.

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It must not be forgotten, however, that there is usually another payroll also, the office payroll, and sometimes a third—the private payroll for officers and the higher employees, such as department managers. The method for handling the two payrolls is substantially the same, except for the fact that the private payroll is kept by the chief accountant or some other confidential employee, while the regular office payroll is ordinarily kept by the payroll section of the cost department. Often, such payrolls are paid by check, and frequently, only once or twice a month so that, in general, they are much simpler and easier to operate than the factory payroll. A summary should be prepared in both cases, and from this summary the postings may be made directly to the controlling expense accounts. Instead

DETAIL EXPENSE ACCOUNT CARD — SYMBOL — MONTH

ITEM	AMOUNT
Stores	
Worked Material	
Payroll, Factory	
Payroll, Office	
Voucher Register	
General Journal	
TOTAL	

FIG. 46—DETAIL EXPENSE ACCOUNT CARD

of making out time tickets for each worker, as was proposed for the factory, it is usually much simpler to make use of another form often called a bookkeeper's voucher. The same form is employed in other ways also and will be referred to later. Its form is illustrated in Fig. 45. It is simply a convenient means of transferring values from one account to another within the accounting and cost department. In this case the total charge to each detailed expense account should be summed up on book-keeper's vouchers which can then be sorted into the expense account file referred to previously. In this way the indirect labor charges of all kinds can be allocated to the proper accounts.

The next consideration is the question of the outside charges, so called, such items as telephone and telegraph and electric light and power. They should be recorded in the voucher register and entered in the column for the controlling expense account to which they are to be charged. Ordinarily, there will be columns only for the controlling expense accounts, but if there are certain items which appear often enough to warrant it, special columns may be arranged. For all entries in the controlling account columns, the detailed expense account symbol should be entered also so that the items may be quickly analyzed and summarized at the end of the period.

When the time comes, the totals of the controlling account columns should be posted to the indicated controlling expense accounts. If certain detailed expense accounts have columns to themselves, care must be exercised to make sure that the totals of the columns are also posted to the controlling expense accounts for the group to which they belong. The detailed expense accounts should then be summarized at the foot of each column, and book-keeper's vouchers should be made out for the charge to each detailed expense account. The book-keeper's vouchers should then be sorted according to expense account symbol and filed like the others in the expense account file.

There remains now for our consideration only the fourth group of items which were classed as internal charges. The most conspicuous elements of the group are the fixed charges whose handling has been discussed somewhat fully in a preceding article. The entry in the controlling expense account is prepared in the general journal, it will be remembered, and the posting to the individual expense accounts should be made from the schedule sheets which serve as a sort of perpetual voucher.

There are, in addition, other items from time to time such as the charges for liability insurance, advertising and prepaid expenses of various costs which are charged first to suspense accounts and are then written off by being debited to expense accounts over several accounting periods.

All of these items should be entered in the general journal and from there posted to the controlling expense accounts. Book-keeper's vouchers should be made out for each sum allocated to a separate individual expense account and they should then be filed like the others in the expense account file.

Before going on to a discussion of the detailed expense account file and the methods for dealing with the records which come therefrom, it will be helpful to see how the controlling expense accounts appear after the entries described above have been made to them. They are all substantially alike in form, and so only one of them is shown here. Because of the variety of the entries to it, the auxiliary manufacturing expense account has been selected.

Auxiliary Manufacturing Expense Account

Stores journal (value of all stores used in the operation of any auxiliary manufacturing department. Credit therefor to the stores account).

Worked material journal (value of all worked material used in the operation of any auxiliary manufacturing department. Credit therefor to worked material account).

Payroll book (value of all labor employed in the operation of any auxiliary manufacturing department. Credit therefor to the payroll account.)

Voucher register (amount of all indirect charges—from outside the concern—incurred in the operation of any auxiliary manufacturing department. Credit therefor to accounts payable account).

General journal (amount of fixed charges and miscellaneous charges incurred in the operation of any auxiliary manufacturing department. Credit therefor to various accounts).

This account and all other expense accounts must be closed at the end of the accounting period. The credit entry for that purpose is not shown here for the subject of the distribution of the expense is discussed in a subsequent article.

We left the detailed expense accounts in the form of a file of material issues, time tickets and book-keeper's vouchers. At the end of an accounting period the file is taken and the various slips totaled for each account, each kind of slip by itself and the sums entered on a detailed expense card like that illustrated in Fig. 46. It will be noted that the groups of entries correspond to the entries made in the controlling accounts. The next step then is to total each class of

entry from the detail expense cards and compare the results with the entries made in the controlling account for that expense subdivision. If the two do not agree to within a very small amount, the sorting and totaling of the vouchers in the group should be checked to find out where the error is and, when found, it should be corrected.

It will be noted that it is not necessary that the sum of the distributed details should check with the total entered in the controlling expense account to the last cent. Such an idea is contrary to the commonly ac-

EXPENSE				GER		DEPT M. D. M. YEAR 1922	
ACC'T.	SCHED.	JAN.	FEB.	PT.	OCT.	NOV.	DEC.
M.D.M.F.							
M.D.M.J.							
M.D.M.M.							
M.B.							
M.F							
M.M.							

FIG. 47—EXPENSE LEDGER

cepted standards of bookkeeping which says that the subsidiary accounts must agree with the controlling accounts exactly. There are several reasons why this is not necessary in cost accounting, not only here, but in other places as well. It is frequently impossible to get the exact figures without a great deal of trouble. The wages earned, for example, on a particular job may give a fraction of a cent when the extension is made, and these fractional cents will almost surely throw the total off a little. In the second place, even if a small error does creep in, it is hardly worth while trying to locate it, for so many approximations are used in measuring both time and materials that the result can only be an approximation at best. Hence, a slight discrepancy has no real effect on the accuracy of the records. Large deviations should not be permitted to pass uncorrected.

The physical task of handling all the vouchers is very much reduced if a Burroughs duplex adding machine is employed. The machine is so arranged that figures can be totaled in one part of the machine, transferred to another and a second set totaled and likewise transferred. In this way the totals for each group of issues for a single account and the total for the account can be obtained at the same time.

The next step is to total all of the cards and see if the figure agrees with the sum entered in the controlling expense account for that group. If it does, it may be assumed that the detail expense cards have been added correctly and they can now be entered in the expense ledger.

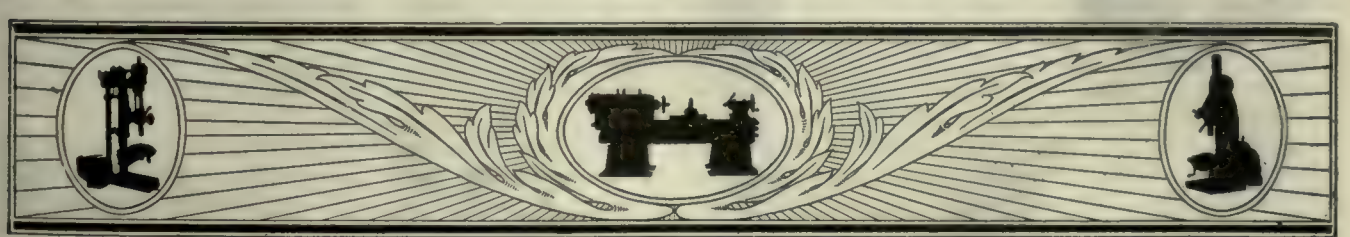
The expense ledger which is shown in Fig. 47 is distinctly different from the normal ledger form. It performs the service usually rendered by a subsidiary ledger and there is no reason why it should not be so called. There should be no hesitation in departing from traditional forms when it is perfectly clear that something is to be gained by so doing.

The ledger is arranged with one sheet for each department for an entire year. The totals of detail expense cards are entered against the symbol for the account in the column for the month in question. When that is done the column is summed up to give the total of the departmental expense for the period in question. All the ledger sheets for the expense group of departments should then be added, in turn, and the result verified with the controlling expense account. If the Burroughs duplex adding machine is used, then two operations can be done at once. The expenses are now ready to be distributed, a discussion of which comes in a following article.

There are several forms which the expense ledger could take, for it may be readily seen that several very interesting comparisons are possible. In the form shown, the expenses for the several months within any one year may be compared with each other and with the scheduled expense for the period. It would also be most convenient to compare the figures for each month with those for the corresponding month of the preceding year and of the year before that. The total expenses to date and for previous years for like periods would give a great deal of information for the guidance of a business. This is particularly true in the case of seasonal industries for in such instances it is normal to expect marked fluctuations from month to month, and hence the comparison of cumulated figures for a period with like periods for preceding years are more valuable as indications of the trend of the business than are the month by month comparisons.

To put all the information on one sheet would necessitate a very large sheet, or else a separate one for each department, and neither of these methods is very satisfactory. In the first case, the form is too large and in the second case too bulky to be easily used by the executive. The ledger, it must be remembered also, is one of the books of account and so it should not be allowed to wander from its proper place in the cost department for long periods of time. A better method, then, is to draw up the expense ledger in the form shown and then prepare a report each month therefrom for the executive, giving him the comparisons which he really wants. Such a method is much more economical, for more often the manager wants to study only certain particular accounts or departments, and if a report is prepared only those records which have significance in the control of the business need be entered.

It must not be thought that the methods outlined in the article are the only ones which can be successfully used, for many others have been devised that have given satisfaction. It must not be supposed, also, that the procedure given here will meet all needs; peculiar circumstances often need peculiar treatment. All that has been presented has been tried out and tested, and it unquestionably gives excellent control over the expense accounts through a wide range of conditions.



Methods of Design in a Small Shop

By A. W. Forbes

IT IS not the purpose of this article to give a general discussion on design in small shops, but merely to state methods which I have found useful, and to give a few of the reasons for their adoption. In some ways designing in the small shop is easier than in the large plant. The designer is helped by his constant contact with the production work. He is acquainted with the men and machines as well as the methods of the shop, and all these are large factors in design. On the other hand, a small shop cannot employ an expert in each line. In many cases the method of trial and error must be used where a simple calculation would produce the result much quicker, if there were anyone who knew how to make the calculation.

Some of this trial and error could be avoided by engaging a consulting engineer from the outside. However in that case it would be necessary to find a consulting engineer who knew the subject, and in general I

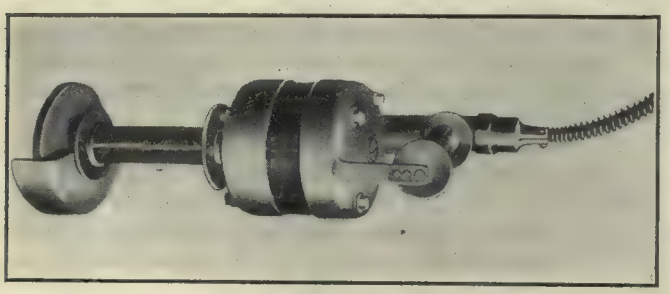


FIG. 1—THE GRINDER DESIGNED

think it easier to solve the problem than to select the man to solve it; that is in the large number of ordinary small problems. Neither would it be possible to find a consulting engineer familiar with the particular conditions under which the machine is to be manufactured and the applications to which it will be put.

I will illustrate with one of my recent designs, a portable electric grinder, Fig. 1. It was decided a few years ago that it would not be wise to enter a well covered field like that of portable grinders unless I could produce something that was an improvement on what was being sold, at least for certain applications. Burnt out windings, due to overloading the motor, are one of the commonest troubles with this type of grinder. While the trouble is usually due to the carelessness or ignorance of the operator, still a winding that would make care unnecessary in this respect would be an advantage, and it was decided to see what could be done to avoid the trouble. A few years spent in research in insulation made entirely of incombustable material produced the desired result.

A satisfactory winding that could not be burned out by overload being obtained, the next step was to secure bearings that would stand the same treatment. Oil was considered undesirable, as the bearings, located near the hottest part of the motor, would soon make trouble if neglected. A metal graphite bearing that requires no oil was finally selected by the method of trying all possible bearings and observing results. A graphite bearing does not have as long a life as an oiled bearing, but it is easily replaced and is not injured by heat or neglect.

The two main departures from standard design being determined upon, it was next necessary to consider the machine as a whole. It is sometimes said that one thing should be considered at a time. Very true, but it is also true that everything should be considered at once. The detail under consideration should be viewed in its relation to every detail in the completed machine, and life is too short to try all these points of relationship one at a time.

Such principles are more clearly seen in a sport like baseball. A pitcher must give every effort to the accuracy and speed with which he throws the ball. That alone is a complex study that requires all his thought and practice, but if he should happen to forget that there was a man on third base, there might be trouble. He must see the game as a whole, keeping all the details in mind, even when concentrating on the one point which needs special consideration.

A better illustration is found in the game of chess, though unfortunately not so many people are familiar with this game. It gives an excellent opportunity for studying mental qualities, because, while the two players are given absolutely equal opportunities, the problems are complex enough to thoroughly exercise the mind, and chance has been eleminated to as great a degree as possible. We find two contrasted types of players. One tries to study each possible move, following it up for several moves ahead. He considers one thing at a time, finally reaching a conclusion as to which is best. It makes a slow game and one that to me is uninteresting. The other type keeps the whole game in mind at once, or as much of the game as his mind has capacity to hold. He spends little time in looking at individual moves, seldom looking more than one or two moves ahead. I belong to the second class of players. It saves a tremendous amount of time, so that even in match games I have not often found it possible to use half the time allowed. An eight-year-old boy recently gave a



FIG. 2—DESIGNING PARTS OF TRIAL MACHINE

demonstration of his ability to win from experienced players, and he did it so quickly that anyone could see that he did not waste much time looking at individual moves. Both types of players win games so that we cannot say that one method is any more sound than the other, but if we were paying for the time we would prefer the second. Yet the very best players combine both.

In design the principles are the same, but there is a much larger variety of facts and principles that must be kept in mind than in even a complex game such as

chess. Even the exceptional eight to ten year old boy has secured but a small part of them.

There are all the questions of the strength of materials, stresses due to shapes of parts, wear, appearances, besides the particular functions the parts will perform in the given machine, the abuse they are likely to receive, the processes by which they are made, and in the small shop, even the men who will do the work. Any one question that the designer fails to keep before him when working on a particular detail. means a change in the design later, and there are so many points that it may mean that he will spend the rest of his life in making these changes.

Complete Designs Hard to Visualize

It is doubtful if anyone has the power to visualize the complete design of even a fairly simple machine like this snagging grinder. We can see each part by itself, and its relation to some of its neighbors, but not in proper relation to all the other parts and stresses which it must stand. Even in the case of the details that we can visualize clearly, there is often a better way that does not occur to the mind until a long time later. Drawings will help the visualization, more with some persons than with others. They extend the range of the imagination, but do not make it of indefinite extent.

It is for this reason that I recommend starting the construction of the machine fairly early in the process of design. After the main parts have been outlined a few sketches are made and the parts made from the sketches. In this preliminary machine expensive patterns are avoided, except where confidence is felt that there will not be extensive changes. It is cheaper to build up the parts under the acetylene torch. The machine will probably run, but it is not likely to be a satisfactory product. If there are many faults, it is probably better to start all over again. If only a few, then is the time to consult with others.

Two heads are better than one, and it might be claimed that some one should have been consulted before the construction was started. This might be true if there were two engineers or designers with experience in the line sufficient to advise each other without spending too much time over the subject, but in the small shop we do not often find two such men. The cheapest way to bring information about the design to those whom it is desired to consult, is to build a machine. Even if two engineers could be obtained who were well enough acquainted with the features of the machine to consult before building the first machine, it is doubtful whether much would be gained thereby. They would have so nearly the same prejudices that their work would be largely duplication. The man we need for consultation is one with a radically different point of view, and to make him understand, we need something more than ordinary drawings. There is one type of man whom I have found it useless to consult—the one who knows it all. He has certain ideas that must be accepted and adopted on his authority. In fact I have been told by experienced men who claimed to know, that I could not build any one of my grinders, using my present methods.

In the case of this particular snagging grinder, the first model was so evidently out of the question that I thought it best to start new. In fact it was over a year between the time the first machine was running and the time I had completed the sketches for a machine of design similar to the final product. This machine operated satisfactorily and if I were only making one machine for my own use I would have been satisfied, but it was still defective as a selling proposition. Certain parts would never stand the strains they were expected to receive. Others would throw out the machine on appearance only. I could have made other sketches and a new machine to correct the faults observed, but thought it better to get someone else to do this.

Not having a man connected with the organization who I thought would contribute the desired ideas to its development, I gave the machine and the list of faults observed to one of the boys in the shop (age 17), who had had several years' experience with shop work, both electrical and mechanical, and some tool work. He received instructions to correct the faults and make whatever other changes he thought would improve the machine, making a complete new grinder, except for such parts as he wished to use over as they were. He was given a younger boy to assist in making the parts, see Fig. 2.

Naturally I did not expect a perfect machine as a result, even though he did consult with me on a few of the changes. Some details had to be changed several times before I was satisfied to place the grinder on the market, but I got what I was after—a different point of view applied to the same problems. I doubt if the machine was any better than if I had made drawings for the changes necessary to correct the faults I saw, but it was in better shape from which to start the final refinements, which we made together in consultation with everyone we could find.

Sources of Design Data

There are a number of other sources of design data that should not be overlooked in a small shop. One is the salesmen, both those selling our goods and those selling to us. The former give us the point of view of the customer, and this is of value even when wrong. The latter do not often know enough about anything to amount to much, not even in their own line, but fortunately there are exceptions. If a salesman shows interest in my products I often take him out into the shop and show him the new things I am getting out. Sometimes he can show how the product can be improved by the use of his tools or materials. In that case he is doing his work as a salesman in a most satisfactory way for both parties. More often he brings new points of view which are of interest in a general way, but not specifically applied. It might be thought risky to show new ideas to salesmen from other firms, but I think the risk is slight compared with the benefits that may result.

Another source of information is time. I do not know how the time element works, but after consulting with all available persons on a problem, only to find that they have no suggestion that was not previously thought of, and after dropping the subject as settled, an idea will sometimes come that makes all other methods seem crude. I know from personal experience that these ideas sometimes come in dreams, although this is the exception. More often there is some suggestion like one of the numerous stories about Eli Whitney and the cotton gin, the one in which he conceived the idea from seeing a cat trying to pull a chicken through an opening in its coop, but only succeeded in getting feathers.

Time is the cheapest aid to design, for it consists in

elapsed time, not working time. It does not seem to interfere in any way with a full day's work in other lines. It works more effectively when the designer has temporarily forgotten the point to which it applies. The difficulty is that it holds up the work, and most of us wish to see our machines on the market. I have, on occasion, waited four to five years after the main features of design were determined upon, but do not like to do so.

As for the results of these methods my grinders have a unity of design that is often lacking in those of my competitors. This results in ecenomy of construction, as well as greater service for the applications that were considered in the design.

Keeping Countershaft Clutches in Condition

By George Walter
Millholland Machine Co., Indianapolis, Ind.

HAS the day of opportunity passed? Or will there be someone, some day, who will invent the perfect friction clutch for a countershaft? There are many friction clutches in service which have operated successfully for a number of years while others have been a failure from the start regardless of the fact that they were of the same make and design.

The principal fault in friction clutches as applied to countershafts seems to be a lack of ample clearance. Another of less consequence is insufficient oiling facilities. For example, friction clutches are used with entire success in the headstocks of modern turret lathes and the new types of geared-head engine lathes. There power is positive, control is instantaneous and reliable. They never stick because the spider, traveling upon the shaft or spindle, is always in the clear. Their only chance of binding is upon the shaft bearing due to lack of oil. This trouble is seldom experienced because as a rule they run in oil.

The spiders used upon countershafts are usually of the expanding type and very little clearance is allowed. Another type is that of the contracting band. In both cases these parts are secured to the countershaft with keys or setscrews and operated by cams. Because of the proximity of the moving parts heating results, they bind and the cam becomes a superfluous bit of equipment. In this case, oil applied direct to the friction may remedy matters for a few hours but seldom for a longer time.

Frictions have been designed where greater clearance was allowed, the moving parts being held in place by springs. Due to vibration, however, it was with difficulty that these springs were held in place. Hence this type has never been very widely used. The most popular type seems to be that of the expanding cast-iron spider depending upon no outside agency to contract it when the cam is thrown out. In time this type loses its elasticity and becomes uncontrollable.

The Flat Disk Type

Another popular type is that of the flat disks. When first installed this type seems to be very good. Soon, however, the disks become worn smooth and cling to each other tenaciously. Oil applied direct serves only to aggravate matters. Lack of it results in blue fire and smoke.

Why cannot the same principal used in machine tools be applied to the countershaft? Because a minimum swing of the shifter lever is desired and a complicated mechanism overhead is not wanted. Therefore we must do our best to make our present type of countershafts do the work and with proper care from the start and with proper foresight they can be made to do fairly well.

The oil holes provided upon most clutches are far too small and soon become stopped up, yet it is essential that they be oiled regularly from the very first day of operation. No matter what the hurry a stopped-up oil hole must be unstopped promptly if a call on the repair gang is to be avoided. It is a good plan to use oil direct upon the spider from the very first even though operating instructions do not say so. It can do no harm and may save a big repair bill. A spare oiler, familiar with the shop, should always be on hand because friction clutches will not wait for a new man to become broken in.

The Importance of Alignment

Take time to align your countershaft with precision. A 4-in. belt may be running upon a 4½-in. pulley and yet be out of center. This belt will then have a tendency to pull the pulley on an angle, wearing the bearing away on one end. In a short time this allows the friction to come into contact with the spider and control becomes impossible until the pulley is taken down and bushed.

Temporary repairs may be made in the above case by moving the spider back a short distance on the shaft, but the increased expansion has a tendency to cause a fracture of the part with resultant danger to the operator of the machine.

When disk frictions begin to cling, a good remedy is to slot them so as to divide up the contact surface. I recently repaired a friction of that type as follows.

The disk attached to the pulley I placed to one side as it was. The other I placed in a milling machine and with a saw milled grooves 0.015 in. deep and 0.025 in. wide across the face of it, ½ in. apart. Then I sawed similar grooves at right angles to these. The disk was then placed upon the magnetic chuck of a Heald ring grinder and roughed up. The entire job required less than two hours and the countershaft has never given any trouble since. Oiled once a week it pulls a capacity load every day.

After all, oil is the main consideration. Few countershaft clutches require oiling more than once a week if well taken care of from the start. Reservoirs are usually supplied inside the pulleys but owing to the small holes leading to them they are difficult to fill. Patience is often not the gift of an oiler, and often too little time is allowed him to do the work whether he is willing or not.

Friction clutches still seem to be a necessity because the shifting belt is too slow and the geared countershaft will not stand up under constant shifting on heavy loads. Whether the day of fool-proof clutches will arrive before all machine-tool manufacturers change over to the direct motor drive is a question. But under present conditions existing types can and are made to operate successfully when given the proper attention beginning with the first day of service.

The Czech Automotive Industry

BY HENRY OBERMEYER AND ARTHUR L. GREENE

The difficulties that check automotive growth — Foreign competition and the protective tariff—Potential market for the medium-priced car—The future of the industry

THERE ARE many ways of judging, superficially at least, of the prosperity of the country. Up to a certain point increased purchases of a luxury article, such as a pleasure car, represent better wages, better living conditions and general prosperity on the part of a people. After a certain point, however, which point some financial experts claim the American people have already reached, increased purchases of luxuries represent not increased prosperity of a people, but a gamble and hysteria for pleasure which represents mortgages on property, the accumulation of debts and an ever lengthening roll of bankruptcies.

In the case of the automobile and motor truck industry of the new Republic of Czecho-Slovakia it becomes evident that purchases of these commodities have not yet reached a stage where the State need fear any such evils. On the contrary purchases of pleasure cars have remained at practically the same level as of a year ago, although orders for motor trucks and motor plows have been on the increase; construction and design of motors and bodies have undergone no radical changes; none of the lighter and cheaper models so common in our own country have been put on the market by any of the four automobile manufacturers of the country; mass production, as in England, remains in the minds of automotive manufacturers more of an evil than a blessing; and the automobile owning classes are confined, as in our country a score or more years ago, to persons of wealth and means.



FIG. 1—A MACHINE SHOP IN AN AUTOMOBILE DEPARTMENT

But while this statement of conditions might seem to indicate backwardness and lack of progress on the part of the automobile manufacturers of the Czech Republic, there are many reasons to account for the conditions as found there today and which, after all, do not mean either retrogression or a standstill in production. While believing in standardization of production to a much greater extent than is ever found in England, but at the same time to a much less degree than is found in our own country, the Czech automobile manufacturer, like most of his European compeers, still believes in the cardinal virtues of endurance and quality over that of mere mass production, believes in distinctive characteristics of his body construction and has consistently refused to manufacture a motor of more than four cylinders. He likewise believes in protection of home industries to such extent that the State of Czecho-Slovakia has one of the highest import duties on foreign cars of any country in Europe.

It might be supposed that the automobile industry of Czecho-Slovakia would be in much the same precarious position as that in which similar industries in other countries of Europe found themselves after the war as a result of extended plants with increased production and with more limited export trade. It might, again, be conceivable that long established industries upon finding themselves entrenched in a new country of much smaller area would feel the effects of a restricted internal trade much more than would the industries of other countries with their own consuming population undisturbed. The logic of such an interpretation falls down in the present instance for several reasons. First of all the present lands of the new Republic, most of which constituted parts of the old Hapsburg Empire of prewar days, did not contain the main automobile indus-

tries of that country. For that reason the four automobile industries that found themselves included in the new Republic after the boundaries had been determined upon were not among the category of other industries which were too numerous to supply the more limited needs of a decreased population. And of the four automotive manufactories only two of these, it might be mentioned, are of appreciable size.

As for regaining export trade to former parts of the old Empire, the automobile industry found itself placed, both geographically and politically, in a favorable position. Much of the territory left to present-day Austria includes an appreciable number of the major automobile manufactories of the old Empire, while those sections of the Empire which were divided among Poland, Roumania and Jugo-Slavia maintained but an insignificant number of this class of manufactories. In view of the political agreements which have united these two states, including Czecho-Slovakia, in a military alliance against their neighbors, it has been comparatively easy for the automotive manufacturers of the Czech state to regain what has been left of the trade to these countries, a trade, which though greatly reduced, was before the war divided among all the competitors in the old Austrian State.

Difficulties that Check Automotive Growth

But despite the comparatively favorable position in which the automotive industry found itself after the war, the difficulties which have had to be met, some of which still confront the industry in greater or less degree, are of appreciable size. Among the major difficulties might be mentioned competition with German manufacturers, as well as with Austrian industrials; difficulties of obtaining raw materials abroad combined with excessive prices; increased selling difficulties both internally and abroad because of decreased purchasing power of the people; high costs of operating automobiles because of scarcity of gasoline and oil; an extension of French competition to the main fields of Czech export trade, namely the Balkan States, and high tariff walls erected by neighboring nations against the importation of automobiles, trucks and plows.

Just how these factors have retarded the more speedy return to normality of the automotive industry of the new Republic is perhaps worthy of note. Of paramount importance to the industry after the war was the increasing importation of German and Austrian automobiles into the country. The Government immediately after its inauguration raised a tariff barrier against foreign importations of automobiles, motor trucks and farm implements, the tariff being based on a 75 per cent ad valorem duty. With the steady depreciating currency of the German and Austrian republics, however, the ad valorem duty was soon found to be an insufficient stop-gap in keeping out the cars and motor trucks manufactured in these countries. The duty was therefore changed to a specific one, whereby each make of car was taxed separately on its selling price within the country and not, as heretofore, on its cost of manufacture in the exporting country.

This method has been found to operate quite successfully. The rates are changed from time to time as the costs of manufacture of the foreign cars decrease or increase and as the selling price within the country changes. With the passing of each month, the likelihood of German manufacturers capturing any of the internal Czech trade for themselves grows less and less as the price for raw materials steadily mounts and with it the selling price of the finished product. And with existing high railroad transportation costs from the Atlantic coast to the interior of Czecho-Slovakia, combined with the high tariff walls, Czech industrials claim that any fear of an influx of American cars and trucks is groundless. At least so it has proved up to the present time.

A very serious problem which has not decreased to any appreciable extent the past year, is still to be found in the securing of certain raw materials for automobile manufacture, not so much iron and steel, of which the country has quite sufficient for its needs, but more particularly wood and rubber. Together with this problem of importing necessary raw materials there has gone hand in hand the accompanying difficulty of ever rising prices for iron, steel, rubber, wood and coal. Even where importations from outside sources have not been necessary, such as in the case of iron, steel and coal, the Czech manufacturer buying these products from his own mines has been faced with ever increasing prices. One reason for the many advances made in the domestic market for these items has been the demand from surrounding nations for these products, so that the Czech industrial has had to compete in purchasing with industrials of Austria, Jugo-Slavia, Poland and Roumania.

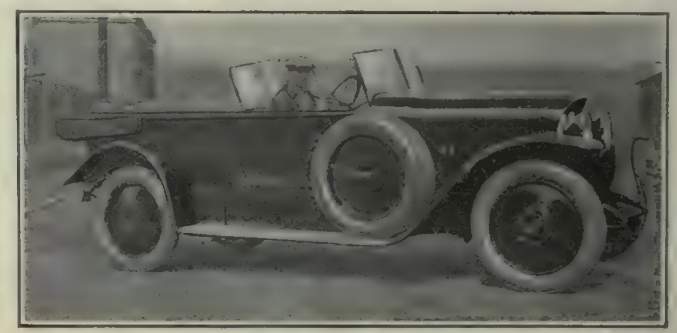


FIG. 2—THE LIGHTER TYPE "MIGNON" MOTOR CAR

With respect to the next two problems, namely decreased purchasing power of the people and high running expenses of cars and trucks because of scarcity of gasoline and oil, we come to what is perhaps the main reason for the conservatism in manufacturing, both with regard to construction and weight of motors installed and to construction of bodies. In Czecho-Slovakia there exists no middle ground for the man with a moderate salary to purchase an automobile for purely pleasure purposes and hope to maintain it with present high operating costs. For this reason, the Czecho-Moravian Co., the largest manufacturer in the State, as well as other automobile manufacturers of the country have made no attempt up to the present to produce a medium weight car at a medium price. It is true that in the early years of their founding, this company did manufacture a light four cylinder car, but after a year's trial this type of car was abandoned for that best of business reasons, no sales. Since that time, this company, which is a true criterion of conditions in general in the automotive industry of the country, has made only two standard types of pleasure cars, both of heavy weight and high horsepower. In their truck department they have specialized on three standard types of hauling motor trucks, two of gear drive and one of chain drive.

The production of automobiles in the Czecho-Moravian Co. has not been kept down because of lack of

equipment in its machine shops, one of which is shown in Fig. 1, but on account of the high operating costs and low wage schedule paid the workers. For instance, the estimated cost of operating the lighter Mignon car shown in Fig. 2 including garage, chauffeur, oil and repairs is approximately 65,000 Czech crowns per average run of 16,000 km., or about 4 crowns per km. When it is considered that the workers in this industry, an industry that ranks high from the viewpoint of wages, receives 10 or 11 crowns per hour, there is little cause to wonder that the automobile plays but little part in the life of the working man. In matters of gasoline and oil, there is sufficient reason to be found which would make the maintenance of an automobile by the working man a practical impossibility. Czecho-Slovakia produces but little of these products so that practically all consumed by the country is imported. The prices for gasoline average about $1 per gal., and motor oil costs are considerably higher.

Competition by French automobile manufacturers in the countries forming the Balkan States is beginning to assume somewhat the same fearsome proportions for Czech industrials in this field that German competition has assumed for industrials of other nations in export trade. For the Czech automobile manufacturer, this competition by his western political ally has been harder to meet than any other difficulty with which he has yet been confronted. It has meant the choice of two evils, either of which might be disastrous for the maintenance of the country's independence from surrounding enemies. Politically close allegiance with the French is looked upon as the mainstay of Czech independence. From a trade viewpoint, however, competition with the French is fraught with potential evils for the growth of the Czech industries and the extension of export trade to neighboring countries. How to reconcile political allegiance with trade competition is a problem which threatens, if unsolved, to bring many difficulties

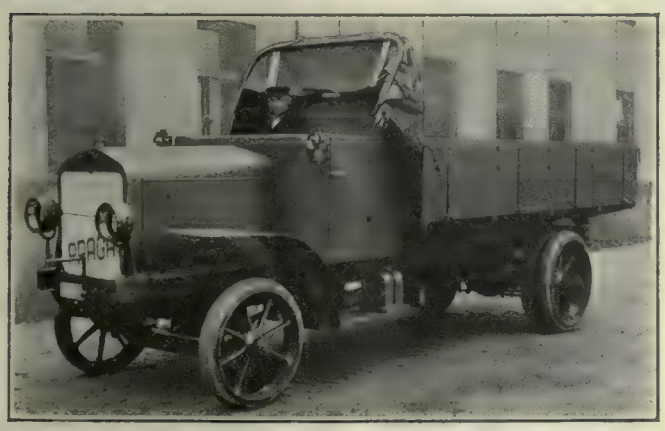


FIG. 3—THE PRAGA TYPE N 5-TON MOTOR TRUCK

to the fore for the Czech industrial within the next few years.

On the subject of protective duties erected by the countries of this section of Europe, perhaps less need be said. The one un-economic factor that seemed to govern all legislation on this score by all the states concerned, was that protection was not only necessary for the infant industries already established, but that it was also necessary for those industries which it was hoped to establish in the course of time. The government of Czecho-Slovakia was not behind other nations, it is true, in establishing these barriers to international trade and commerce, but in its own particular case, and especially in the case of automobile industry of the country, these barriers, which were originally erected to keep out the products of German industries, have been detrimental to the steady establishment of a large export trade. The high import duties erected by the neighboring nations of Czecho-Slovakia have hit the export trade of passenger cars to those countries especially hard, so much so, that today of all pleasure cars manufactured by the four automobile industries of the country, only 10 per cent of the total goes to foreign countries. In the matter of export trade of motor trucks and motor plows the situation has not been

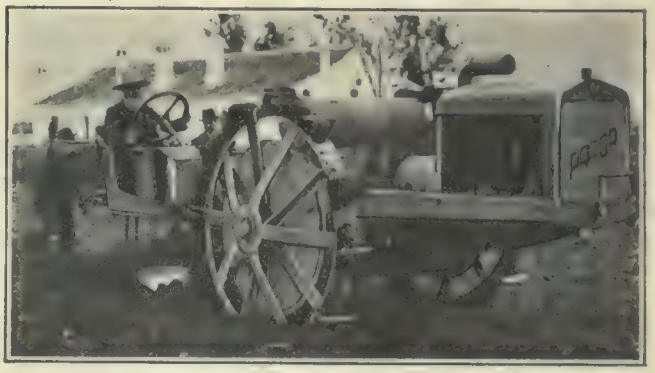


FIG. 4—THE PRAGA TYPE K MOTOR PLOW

nearly as difficult to meet because the automotive industries of the new Republic have what is almost a monopoly of these products and importations have been needed by Poland, Roumania, Bulgaria and Jugo-Slavia. In the Czecho-Moravian Works, of a total output per year of 500 motor trucks and motor plows, fully 50 per cent of this number goes into export trade to the Balkan States, Spain and Africa.

In this particular field, the Czecho-Moravian Co. is unquestionably the leading industrial unit in the country and at the time of writing is working at full time and has sufficient orders on hand to keep it employed for the next twelve months to come. In view of the widespread industrial slump that prevails among the other major industries of the country, the present production maintained in this one department is nothing less than remarkable.

The three standard types of motor trucks manufactured by this company are known as the Praga, type R, type N and type V. The first two types mentioned are gear driven and have a capacity of 2 to 2½ and 5 to 5½ tons respectively. The latter, type N, is illustrated in Fig. 3. The type V motor truck is chain driven and has a capacity of 3 to 3½ tons. Of the two types of motor plows manufactured by the company, known as Praga, type X and type K, the former which has a motor developing 20 hp., is manufactured chiefly for export trade to Spain and northern Africa. The type K, shown in Fig. 4, is of larger capacity and has a motor capable of developing 40 horsepower.

But while the truck and motor plow departments of this company might be called self-sustaining so far as maintaining production and export trade is concerned, because of the accelerated demand for these products in central and eastern Europe, as well as in more distant countries, the passenger car department has been not only unsuccessful in increasing its sales over last year, but has had difficulty in maintaining its earlier production figures. According to one of the directors of the

Czecho-Moravian Works, little hope is placed by automotive industrials on an early expansion of curtailed post-war export trade. At the same time, however, passenger automobile manufacturers in Czecho-Slovakia do expect a decided increase in purchases from their own consuming population within the next twelve months.

Fewest Cars per Capita

It is the claim of automobile manufacturers of the new Republic that Czecho-Slovakia maintains fewer passenger cars and a less number of automobile manufactories per capita than any other country of like size in Europe. In a total population of 13,500,000 there are only two large automobile manufactories and two small ones, while the total number of motor-propelled vehicles in the country, including trucks, is scarcely 17,000, a number which is less than that at present in Morocco. Of this number about half come under the heading of trucks. According to these figures, therefore, there is being operated in Czecho-Slovakia today only one passenger car to every 1,590 persons. Compared with the number of passenger cars being operated in the United States, which late figures give at 10,600,000 for the country, or about one to every ten persons, this number dwindles into insignificance.

The one important fact to be gleaned from these figures, as far as the automobile manufacturer of Czecho-Slovakia is concerned, is that a practically unlimited field presents itself at the very door of the manufacturer to increase home consumption. The question remains then, how to bring these potential customers into the market.

The Entering Wedge

In view of what has gone before and because of the many economic difficulties facing the country, it might be supposed that the present would hardly be an auspicious moment for the introduction of a medium-weight car selling at a medium price. While admitting that the time is still premature to permit the successful sale of a very low-priced car such as the Ford, because of the very real poverty existing among that class of people who would normally constitute the largest class of purchasers, automobile manufacturers of Czecho-Slovakia claim that there does exist at this time a wide class of professional men and merchants, such as doctors, real-estate men and salesmen, who need a medium-weight car for business purposes and who would come into the market if a car combining the desired qualities of medium weight and medium price were put before them. And while the number of sales that could be made among this necessarily limited class of professional men would not create any great immediate boom in the industry, it would constitute, manufacturers believe, the entering wedge for the more widespread use of the automobile both for pleasure and commercial purposes.

Mass Production Will Follow

The mere fact that there exists this type of professional man in Czecho-Slovakia that is demanding today something less expensive to operate than the ordinary heavy passenger type of automobile is clearing the way, manufacturers say, for the gradual introduction, even though it may take years to come, of the so-called popular-priced car. And with the introduction of this type of car, there may be expected to follow many of the phases in automobile manufacturing that are so common, and so often condemned by economic and financial experts in foreign countries, among our own automotive industry—namely, mass production on a large scale and the increased centralization of parts.

From what has been said, it is perhaps obvious that the best years of the passenger automobile industry of Czecho-Slovakia lie in the immediate future. There exists at this time no such state of affairs as we are accustomed to hear of in our own industry, of a saturation point being reached in the next twelve months, nor is the industry threatened with an accumulation of a large surplus. In short the strongest factors in the automotive industry of Czecho-Slovakia today forecasting improvement, so far as increased sales of passenger cars within the country itself is concerned, are that production has never been forced above demand, that there exists a big potential market for a medium-priced car, while to meet this demand, there exists only a small number of manufactories capable of meeting the requirements. Bearing these facts in mind, it is not to be doubted that the automotive industry of Czecho-Slovakia today stands in a unique and enviable position as compared with her numerous and varied sister industries.

Book Reviews

A Symbol of Safety. By Harry Chase Brearley. Two hundred ninety pages, 6x9 in., board covers. Illustrated. Published by Doubleday, Page & Co., New York City. Price $2.50.

An explanation and description of the motives and work of the Underwriters' Laboratories, a corporation established and maintained by the National Board of Fire Underwriters. A reading of this well-written book will convince manufacturer, seller and buyer of the importance of the work done by the laboratories and of the value of the label.

Following the 247 pages of the book proper are several appendices that explain the requirements and tests of the laboratories and give information about labels, procedure for inspection and other divisions of the work, and reproduce a typical standard.

The Modern Iron Foundry. By Joseph G. Horner. Two hundred and fifty-two pages, 6x9 in., cloth boards, illustrated. Published by Oxford University Press, American Branch, New York City. Price $5.

A description of English practice, comprehensive and well-written. Because it tells the "why" of things, it should be valuable as a reference book to foundrymen, apprentices and students. In addition to the treatment of all of the practical iron-foundry subjects, there is a very good chapter on die castings.

National Health Insurance in Great Britain.—Bulletin No. 312 of the Bureau of Labor Statistics, Department of Labor, is a study of the operation of health insurance in Great Britain for the ten-year period from 1911 to 1921. It embraces 103 pages and may be obtained from the Superintendent of Documents, Government Printing Office, Washington, at 15 cents per copy.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Continuous Milling Fixture for Spring Shackles

By G. H. Simon

In milling spring shackles for motor trucks in a plant where the production was not great enough to warrant the expense of special machinery or elaborate fixtures, the milling time was reduced more than one-half by the use of the simple fixtures shown in the accompanying sketches. Two fixtures were used on the table of a plain milling machine, the fixtures being placed far enough apart so that the operator could unload, clean and reload one fixture without risk of injury from the cutters at work upon the other.

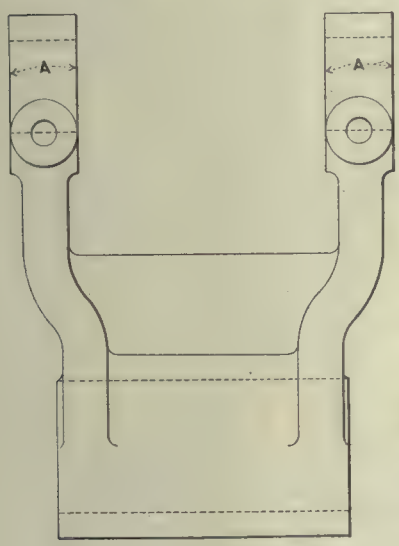


FIG. 1—SPRING SHACKLE TO BE MILLED

A plan view of one of the shackles is shown in Fig. 1. The hole in the hub is bored and reamed and both ends of the hub faced upon a turret lathe. The milling operation finishes the four faces *A* with two pairs of straddle mills working simultaneously. The previous method had been to set eight shackles upright in a single fixture and allow the cutters to pass over the whole length of the row.

The new fixtures, plan and elevation of which are shown in Fig. 2, were designed to take two shackles each, the pair leaning toward each other at an included angle of 60 degrees. Plugs *A* pass through the sides of the fixture and through the bored and reamed holes in the hubs of the work pieces. Between the arms of each shackle is a web, and this web rests against the hardened end of a plug in the fixture to sustain the pressure of the cut.

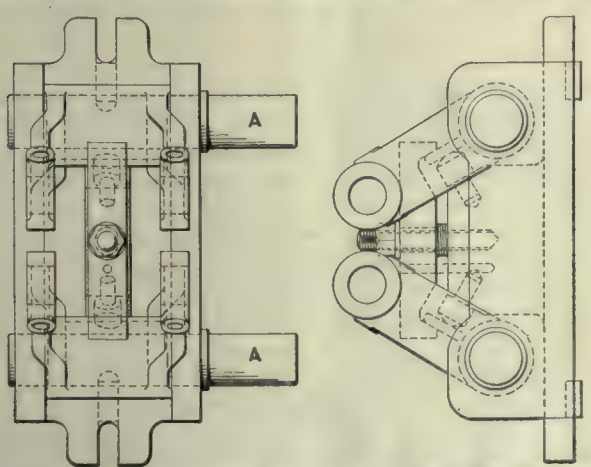


FIG. 2—FIXTURE FOR MILLING SPRING SHACKLES

The webs also provide a place for the double-end holding clamp, through which extends the single stud-bolt that furnishes the pressure to hold the work. The under surface of the clamp is shaped to hook over the webs, and an elongation of the bolt hole allows the clamp to adjust itself to any slight irregularity of the work pieces. A coil spring under the clamp serves to lift and hold it out of the way when the nut is turned back.

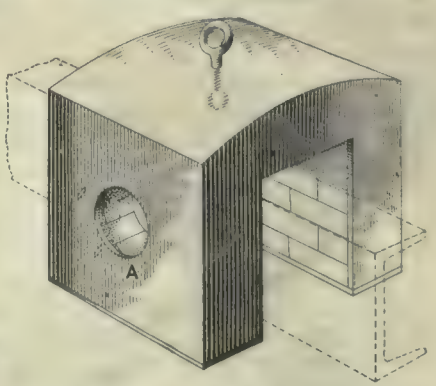
When one fixture is loaded, it is centered under the cutter arbor and the vertical feed thrown in, allowing the cutters to feed straight down until stopped by the knock-off. Meanwhile the operator can be preparing the other fixture. A quick traverse of the milling machine table enables the change in position of the cutters from one fixture to the other to be made without delay.

Portable Muffle for Heating Car Frames

By I. B. Rich

The building of some special car frames in the shop of the General Iron Works, Denver, Colo., required several bends in the frame in order to give clearance for the car truck wheels. As these are short bends requiring purely local heating, portable muffles were made, as shown in the accompanying illustration. The muffle consists of an outer case of perhaps ⅛ in. sheet steel welded up into the box-like form shown, and having a round opening cut at *A*, through which the flame of a large oil burner can be introduced in order to keep the flame at that particular point.

Openings are also cut at each end, so that the whole thing may be placed over the beam in order to retain the heat as much as possible. The inside of the muffle is lined with firebrick, which fits around the opening and is held in position by strips welded across the lower ends of what may perhaps be called the jaws. An eye-bolt welded in the top of the case enables the muffle to be lifted by a small portable crane, so that it can be easily handled while hot, and be quickly removed when the beam has reached the proper heat for bending.



A PORTABLE MUFFLE FOR LOCAL HEATING

Metal Cutting Tools—Discussion

By F. W. Elstub
Alfred Herbert, Ltd., Coventry, England

The article by W. E. Splain under the above title and published on page 663, Vol. 58, of the *American Machinist*, deals with a very complex subject in a very simple and clear manner but in the scope of a two-page article it is impossible to cover the subject adequately. Mr. Splain quotes Taylor as being the best authority on the subject of metal cutting. Taylor's work, although it embodied the experience of twenty-odd years, was, and is, certainly very valuable, but it was based on conditions that have now been entirely superseded. In Taylor's day, grinding was a mere polishing operation; today the modern grinding wheel will remove metal in a way undreamed of in his time.

We have based our doctrine on the fact that it is now easier to grind a tool to shape from a piece of straight, black bar than it is to forge it. Thus, the Taylor principles and ours are diametrically opposed—the one says forge to save grinding, the other says grind to eliminate forging. Which is the better can safely be left to the common sense of your readers.

We agree with Mr. Splain that the clearance angle on an ordinary lathe tool should rarely or never exceed six degrees. We would even go further and say that the tool before the hardening should be roughed out with six degrees of clearance but after hardening the tool should only be touched on the grinding wheel near the cutting edge, thus making the actual clearance angle even smaller.

We do not agree, however, with Mr. Splain's preference for the round-nosed tool. It absorbs too much power in distorting the chip and it has not the life of a straight-edged tool under similar conditions. It has been proved by Dempster Smith, of the Manchester School of Technology, that the maximum cutting speed and tool life are obtained when the cutting edge is straight and has a nose radius just sufficient to enable the point to stand up, say $\frac{1}{8}$ in. radius on a cut $\frac{3}{8}$ in. deep with $\frac{1}{32}$-in. feed. (See page 53, Report of Lathe Tools Research Committee, 1922, issued by the British Government, Department of Scientific and Industrial Research and published by H. M. Stationery Office, London).

In the roughing tool for which we have a decided preference, the nose radius should be approximately half the depth of cut but rather under than over.

There is another point not mentioned by Mr. Splain that we think is of the highest importance. We refer to the hollow curving of the top face known as curved rake. On the continent of Europe this type of tool has a very strong vogue, but it has not been adopted so freely in Great Britain nor, as far as we know, in America, this in spite of the fact that it possesses many marked advantages for turning steel and other non-brittle materials. No doubt the non-adoption of this tool has been due to the lack of facilities for producing tools with curved rake to known and predetermined angles. This disability has been removed by the use of a conical-shaped wheel while the tool is passed across the edge of the wheel at an angle, thus forming an elliptical-shaped curve on the tool nose. From calculations and experiments, definite rake angles at the cutting edge can be produced by a specified combination of tool settings.

It has been proved to the satisfaction of many users that curved-rake tools absorb considerably less power than equivalent straight faced tools. It is to be deplored, however, that there is no actual evidence available of the amount of power saved.

The ideal tool for any operation will:

1. Cut at the highest possible surface speed.
2. Need the least regrinding per work done.
3. Increase output.
4. Use the minimum amount of power.

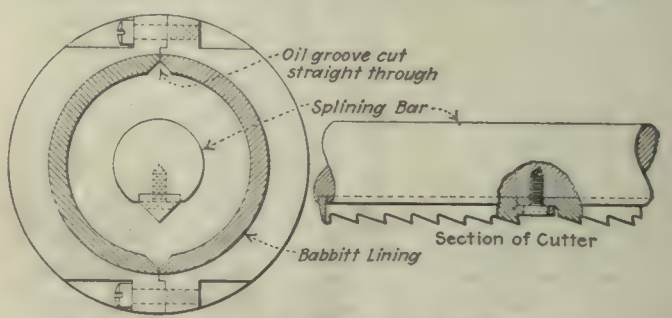
The information that will help us to find the "right tool" will be absolutely invaluable and we trust that your pages will always be open to the "right" kind of information.

A Few Points About Bearings

By H. R. Fowler

A certain amount of hand work is necessary in the production of high grade bearings, but from the standpoint of cost it is desirable to cut out as much of it as possible.

We used to take our bearings apart after boring them and mill each edge separately with a formed cutter to relieve the corners and provide grooves or pockets for the oil, but upon putting the halves together again we would sometimes find that they did not match. Finally we got the idea of using the keyseating machine to do the work by clamping the halves together, standing the bearing on end and planing a suitably shaped groove along the joint after the manner of cutting a keyway.



OIL-GROOVING BEARINGS IN A KEYSEATER

When we had finished one joint we would turn the bearing halfway round and treat the other joint in a similar manner.

The scheme worked very well indeed until we came to groove bearings that were more than 8 in. long, when we found we had exceeded the limit of the stroke of the machine. We then made a set of cutters as shown in the accompanying sketch, which served the purpose for any length of bearing. The cutters were made in 4-in. lengths, to avoid complications in hardening, and were rabbeted to overlap at the ends, where they were fastened to the splining bar by means of countersunk-head screws. These cutters have been in use for several years, both on babbitt and on brass bearings, and have proved very satisfactory.

This form of oil-grooving, with the groove going clear through, is undoubtedly the best for general use, whether ring, splash or forced oiling systems are considered, as it facilitates the washing out of the bearing by a continuous supply of fresh, cool oil. There is no tendency to gum up, as is the case when the oil groove comes to a blind end. It also provides an ample supply of lubricant to the thrust collars, when the latter bear against the ends of the boxes.

A point that is often overlooked in the cutting of oil grooves is that the edges should be rounded over, which helps the oil to get between the rotating shaft and the surface of the bearing; otherwise the sharp edges are likely to scrape the oil off the shaft. Merely breaking the corners of the groove is not enough—there should be a good generous round. It will not hurt the bearing any and it may help considerably toward cool running.

Oil-throwing on high-speed machinery is a difficult thing to overcome when ring oilers are used, as it seems as if the rings, as they bring up the oil, create a slight pressure which causes the oil to spurt out from the ends of the bearings. This trouble can be remedied to some extent by milling a vertical groove of generous size across the ends of the lower half of the bearing, allowing the surplus oil to get away more quickly and, incidentally, washing out the bearing more thoroughly.

Automobile Piston Clearance—Discussion

By Otto M. Burkhardt

On page 344 of the *American Machinist* I notice a chart by D. P. Muirhead. This gentleman gives a clearance above the top ring of 0.009 in. for a 4 in. position. This amount is altogether too little for an efficient engine, as can be proven by the following calculations.

The piston head temperature is, according to some authentic experiments carried on by Mr. Jehle of the Aluminum Company of America, in the neighborhood of 800 deg. Fahr. The coefficient of expansion for cast iron is approximately 0.0000067 per degree Fahr. per unit length. Assuming the cylinder wall temperature to be 200 deg. Fahr., we have a temperature difference between cylinder and piston of 600 degrees.

For a piston 4 in. in diameter we would obtain a total expansion of the piston relative to the cylinders of,

$$0.0000067 \times 600 \times 4 = .016 \text{ in.},$$

or very nearly twice as much as allowed for on the chart.

The skirt clearances given by Mr. Muirhead are very good when applied to pistons with some flexibility, such as are now in vogue on high-grade cars. The calculation just given should be used exclusively for determining the clearances on the upper lands. The equation is also applicable for determining the clearance for piston rings, only with the difference that piston rings do not get quite as hot as the piston top. The writer has found that 500, 400 and 300 deg. temperature are properly to be assumed for the three rings, enumerating them in the order of their location, from the top downward to the skirt.

Supplementary Statement

In the article, "Using the Offset Drill Arm," Vol. 58, page 883, of *American Machinist*, mention was made of an offset drill arm being used in connection with a Pawling & Harnischfeger drilling and boring machine at the plant of the Allis-Chalmers Co., Milwaukee, Wis. The reader would naturally infer that the drill arm was manufactured by the Pawling & Harnischfeger Co., but as a matter of fact it is the drill arm of the Harris Engineering Co., of Bridgeport, Conn.

This article brings up an unusual condition in that both the Harris Engineering Co. and the Pawling & Harnischfeger Co. manufacture offset drill arms. The author, A. Becker, did not realize that situation.

A Lead Compensator

By Herbert M. Darling

In making taps and hobs, it is necessary to allow for the shortening of the lead caused by shrinkage in hardening. This shrinkage is usually about 0.0015 in. per in. of length. To produce a tap that will have a correct lead after being hardened, the threading lathe must be fitted with a lead-compensating device. In most tap factories this device is quite elaborate and expensive, but the one illustrated herewith was made at very small expense.

Recently I had to make a set of short master lead-

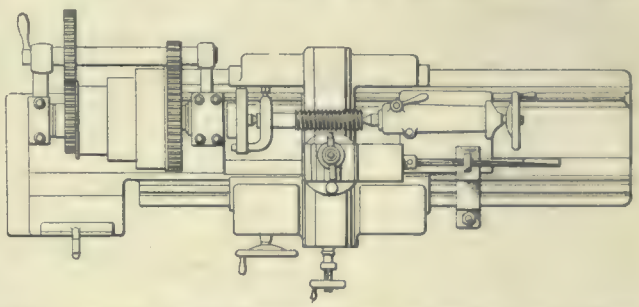


FIG. 1—PLAN OF COMPENSATOR ATTACHED TO LATHE

screws for a special tap threading machine. The screws were to have an increase in lead of 0.0015 in per in. so that the taps would have that same allowance for shrinkage. For threading the screws, I made the "lead stretcher" shown in Fig. 1, and in detail in Fig. 2. The dimensions given are suitable for its use on a 16-in. Hendey lathe. In use the bracket *A* is clamped to the front V of the lathe, the compound rest being swung around parallel to the center line. The handle of the compound-rest screw is removed and the coupling *B* attached in its place. The swivel block *C* is adjustable to a position in line with the compound-rest screw. The shaft *D* is a free sliding fit through the swivel block and has a floating connection to the coupling *B*. Shaft *D* has a right-hand $\frac{1}{8}$-in. keyway cut spirally with a lead of one turn in 66.6 in. A $\frac{1}{8}$-in. pin is driven into the swivel block and enters this keyway. The compound-rest screw is ten pitch or one turn in 0.100 in. When the lathe carriage is moved forward the shaft *D* will turn slightly and, in turn, will move the compound-rest screw. If the carriage moves one

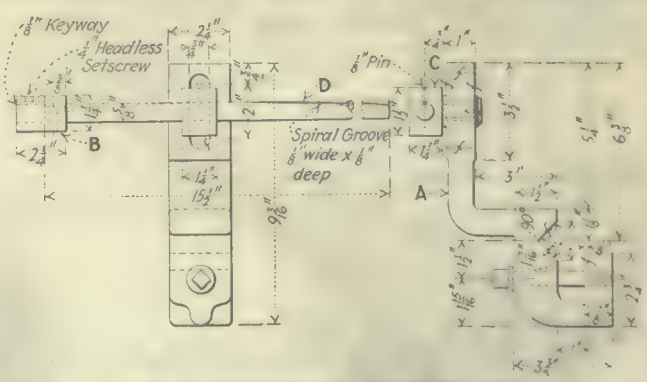


FIG. 2—DETAILS OF COMPENSATOR

inch, the compound rest will be moved 0.0015 in., and in threading, the tool will be advanced 0.0015 in. by the compound rest, for every inch the carriage advances, and therefore will cut an increased lead of 0.0015 in. per inch on the work being threaded.

Making a Tapered Helical Reamer

By J. Davies

I have looked in many handbooks for formulas to use in the calculations when making tapered helical reamers, but without finding anything very definite, so I was driven to the necessity of fixing up some rules for myself, and I pass them along for your consideration. The notes may be useful to others, or perhaps someone else might suggest improvements on them. Let us suppose that we are going to make a reamer to the dimensions given in the sketch, Fig. 1, and follow through the entire process.

After cutting off and centering, the first operation would be to turn to within about $\frac{1}{4}$ in. of the diameters given, then anneal before finish turning. Annealing takes out the initial stress in the steel and gives you

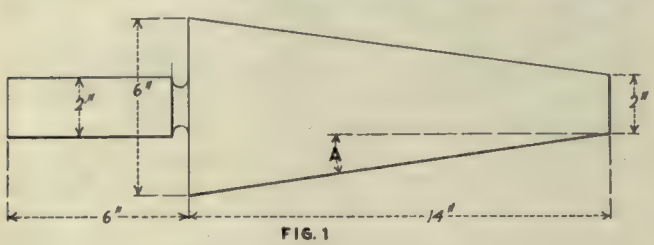


FIG. 1

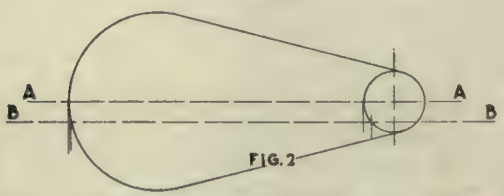


FIG. 2

FIG. 1—SKETCH OF TAPERED REAMER. FIG. 2—WHY THE HEIGHT OF THE TOOL IS IMPORTANT

a better chance to harden the reamer without breaking the teeth. Since the work is such a large solid body with the teeth coming right up to a cutting edge, there is great danger of breaking the teeth in hardening.

Next comes finish turning, leaving about 0.015 in. on the shank and from 0.015 to 0.020 in. on the body for grinding, or a little more according to your facilities for hardening, as the reamer never runs perfectly true after hardening. In turning the taper, it is best to use the taper-turning attachment if you have one. Some taper-turning attachments are graduated in inches per foot taper and some in degrees; if in taper per foot then the calculations would be:

$$\frac{D-d}{L} \times 12 = \frac{6-2}{14} \times 12 = 3\frac{3}{7} \text{ in. per ft. taper,}$$

Where D = large diameter,
d = small diameter, and
L = length of tapered part.

If the attachment is graduated in degrees, the number of degrees would be:

$$\frac{D-d}{2} \div L = \frac{6-2}{2} \div 14 = 0.1428 = \tan A,$$

the angle with the center line.

Tan^{-1} 0.1428 = 8° 10′, which value is as approximately correct as the lathe could be set.

If it is necessary to shift the tailstock center, we must remember that when the piece is revolved the same cut is made on all sides of it, so that when we find the amount of taper, the tailstock must be set over one-half the value. If D equals the large diameter and d the small diameter of the tapered portion, L the total length of the piece and l the length of the tapered portion, then the offset x of the tailstock is determined by the following formula:

$$x = \frac{D-d}{2} \times \frac{L}{l} = \frac{6-2}{2} \times \frac{20}{14} = 2\frac{6}{7} \text{ in.}$$

In the actual turning the tool must be set at exactly the height of the centers of the lathe, and if taken out for sharpening, it must be set back to the same place. If the tool is set either above or below the center, it will take more off the big end of the work, as the sketch in Fig. 2 will show. The large arc represents the big end, the small arc the small end and A the path of the tool on the center line. Now, if the tool be lowered to the line B, it will be nearer to the large circle than the small one at the ends of its travel, hence it would take more off the big end than the small one.

Now that the lathe work is finished, we shall proceed to set up the milling machine. The lead of the helix is 60 in. In setting up for milling a helix, there are two indispensable factors that must first be determined; namely, the pitch of the feed screw and the number of revolutions of the index crank required to turn the work around once. Suppose the feed screw has $\frac{1}{4}$ in. pitch and that it requires 40 revolutions to turn the work around once, the table would advance 40 × $\frac{1}{4}$, or 10 in. per revolution of the work if the lead screw and worm shaft were geared with a 1 to 1 ratio. This value is called the lead of the machine.

From the explanation the following universal rule can be deduced: Multiply the lead in inches to be cut by the number of threads per inch on the lead screw and divide by 40, in order to find the gear ratio needed for the work.

$$\frac{60 \times 4}{40} = \frac{6}{1}, \text{ or a 6:1 ratio.}$$

Thus any set of gear wheels that have a ratio of 6 to 1 can be used whether simple or compound, as the work need turn only one-sixth as fast as it would with the 1 to 1 ratio.

Next let us calculate the proper number of divisions on the index plate for cutting fifty teeth. Since 40 revolutions of the worm shaft give one turn of the work, then one turn of the worm shaft would give $\frac{1}{40}$ turn of the work, suitable for dividing the work into

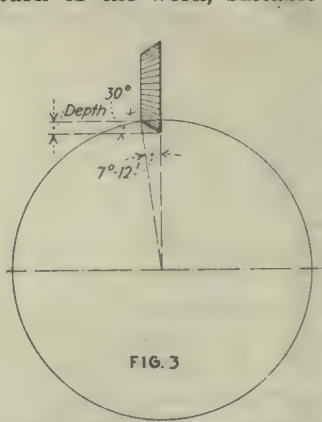


FIG. 3

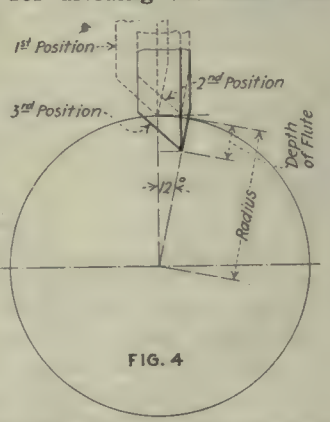


FIG. 4

FIG. 3—DETERMINING DEPTH OF FLUTE. FIG. 4—DETERMINING POSITION OF MILLING CUTTER

40 equal spaces. We can then deduce the following rule: Divide 40, or the number of turns required for one turn of the work, by the number of divisions into which the work is to be divided, and the resulting fraction will give the number of turns or part turns which the index crank must make to obtain the desired

result. Thus, $\frac{40}{50} = \frac{4}{5}$ of a revolution, which can be obtained on any convenient circle of holes in the plate.

Next we must move the table around so that the line of the cut will be as nearly as possible in line with the milling cutter. This angle is found by dividing the circumference, taken at the center in a taper reamer, by the pitch of the helix, which result will be equal to the tangent of the angle. The diameter at the center of the reamer is 4 in.; the formula therefore would be

$$\frac{4 \times 3.1416}{60} = 0.209 = \tan B$$

$B = 12$ deg., nearly, angle at which to set table.

Now it is evident, since this is a taper job, that one center must be higher than the other. Also, it is imperative that the centers should be in line with each other, that is, pointing directly toward each other. If not, the teeth would not be equally spaced, and we should have wide lands on some teeth and no lands at all on others. Also, the cut must be deeper at the big end than it is at the small end in order to leave the lands parallel. This being the case, we shall work out the depth of cut and get the angle and height of the centers.

The depth of the cut can be found as follows: Dividing 360 by the number of cuts gives us the angle at the center, as shown in Fig. 3. Thus, $360 \div 50 =$ 7 deg. 12 min. center angle. Multiplying the tangent of the angle by the radius gives the width of the cut.

If we are using a 60-deg. cutter, the tangent of the opposite angle, or 30 deg., multiplied by the width will equal the depth. The depth then will be tan 7 deg. 12 min. multiplied by the radius, multiplied by tan 30 deg. At the large end the depth is, $0.126 \times 3 \times 0.577 = 0.218$ inches.

If we set the machine at the correct angle we need not consider the depth at the small end, as it will automatically adjust itself. The depth of the cut at the large end will be 0.218 in. If this cut were continued until it ran out to nothing, it would run out at the point where the surface of the cone and the center line would meet. The length of this center line can be found by simple proportion, thus: If the center line is 14 in. long in a 2-in. taper, how long will it be in a 3-in. taper?

$$2:14 = 3:x \qquad x = \frac{14 \times 3}{2} = 21 \text{ inches.}$$

Or, by using the previous calculations which we made for lathe work, the side opposite, that is 3 in., divided by the tangent of 8 deg. 10 min., equals the length of the center line, or 21 in. Now, by deducting the depth 0.218 in. from the radius 3 in., we can obtain our angle for the centers.

$$3 - 0.218 = 2.782 \text{ in.}$$

$$\frac{2.782}{21} = 0.132 = \tan 7 \text{ deg. } 30 \text{ min., approximately.}$$

The angle between the centers is thus about 7 deg. 30 min. There is still a chance for a serious error, as the tail center may not be at the right height. The difference in height from the table would be the tangent of 7 deg. 30 min. multiplied by the length of the work or the distance apart of the centers.

$$0.132 \times 20 = 2.640 \text{ in.}$$

This calculation neglects the depth of the center holes. If extreme accuracy is required, the depth of the center holes must be allowed for.

After adjusting the machine to these requirements, set the sharp point of the cutter exactly over the point of the center. We are using a 60-deg. cutter with angles of 48 deg. on one side and 12 deg. on the other, as this is found by practice to give the best results. Lower the table and place the work between the centers, start up the machine and raise the table until the cutter just touches the work at the large end. Now the work must be pushed over to one side and raised until the edge of the cutter which forms the cutting angle coincides with a radius of the work when the cutter is at the required depth. This position can be found as follows:

Referring to Fig. 4, the first position has already been set by placing the edge of the cutter over the center. For the second position, since the edge of the cutter makes an angle of 12 deg. with the center line, the side movement of the work will equal the radius minus the tooth depth, multiplied by sin 12 deg. The figures are: $(3 - 0.218) \times 0.2079 = 0.5784$ in. movement.

The depth of the tool from the center line, or the amount to raise the table can be obtained as follows: The radius minus the depth, times the cos 12 deg. gives the height of the cutter point above the center line. The distance to raise the table can be easily found. Thus,

$(3 - 0.218) \times 0.9782 = 2.722$ in. from center line to cutter.

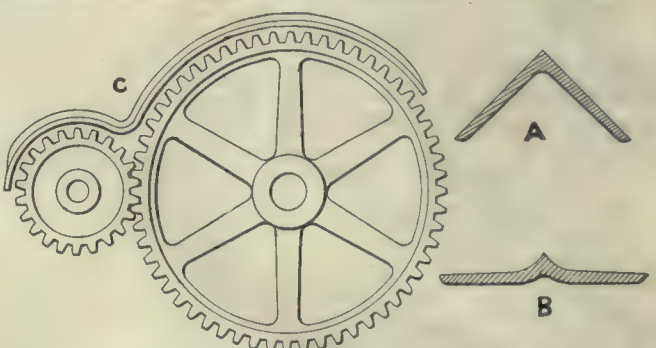
$3 - 2.722 = 0.278$ in. to raise table.

No other calculations are necessary, and we can go ahead with a reasonable certainty of making a good job. This may not be the best method, but it is the way the problem appears to me. If any of my fellow readers have different methods, let us have them, as the exchange of ideas is mutually profitable.

A Novel Method of Making a Gear Guard

By Frank C. Hudson

A very interesting method of making a guard for the gears in large hoisting machinery has been devised by the Vulcan Iron Works, Denver, Colo. The plan consists of taking an angle of the proper dimensions, as



GEAR GUARD MADE FROM STEEL ANGLE

shown at *A* in the accompanying illustration, and rolling it, as at *B*, which spreads out the two legs and leaves the corner to form a substantial web or backbone that adds materially both to the appearance and stiffness of the guard.

The flattened guard is then shaped to fit the gears it covers, as shown at *C*, while the backbone is tapered down at the ends both for the sake of appearance and to make the ends free from propections of any kind.

American Machinist
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KENNETH H. CONDIT AND FRED H. COLVIN
Editors
July 12, 1923

Commercial Arbitration Becoming Popular

THE INTERESTING experiment in commercial arbitration instituted by the Arbitration Society of America seems to be working out well. We learn from a recent issue of the organ of the Merchants' Association of New York that results of a questionnaire sent to the members of the association showed 806 out of 810 favorable to arbitration. Not only that, each of the 806 pledged himself to adopt the practice of submitting commercial controversies to arbitration as soon as adequate arbitration machinery is available.

The arbitration movement is one of the most promising that has come to our notice in recent years. At last the congestion of our law courts is to be taken out of the class of Mark Twain's weather of which everybody complained but about which nobody did anything.

Just how serious the situation has become in the New York courts is indicated by the fact that there are now some twenty-four thousand cases on the calendar of which something less than nine thousand can be settled in a year. New ones are added at the rate of thirteen thousand per year.

In most cases the commercial dispute rests on interpretation of facts and can be as justly settled by an impartial arbitrator in a more or less informal and inexpensive way than by a court with all of its formality and delay. If arbitration will clear the court dockets of even a third of the pending cases it will be an unmixed blessing to the community and will save a lot of money.

As to the parties in a commercial dispute the savings to them in time and expense are remarkable. Lawyer's and witness' fees may be dispensed with and a case may be settled by the arbitrator in a few hours instead of as many weeks. With courts congested as are those of New York the best case in the world may be lost if it does not come to trial for three years. The witnesses may die or get out of reach and the keenest memory for facts loses its edge after such a lapse of time.

Some indication of the wide interest in arbitration as a substitute for litigation may be had from a communication from the Court of Arbitration of the International Chamber of Commerce to the Merchants' Association. In that letter a model paragraph, much the same in substance as the pledge taken by the Association members in their questionnaire, is suggested for insertion in the margin of any business letter head.

Perhaps if arbitration gets to be established internationally as the best means of settling commercial or contractural difficulties it may be possible to convince statesmen that armies are too expensive for settlements of squabbles between nations.

Study Your Gaging Methods

THERE seems to be lack of appreciation in some quarters as to the way in which the method of gaging affects the cost of the product. First of all comes the determining of the amount of interchangeability which is either necessary or desirable. This depends largely on the quantity to be manufactured and the frequency with which parts have to be replaced. From the point of view of production cost, it is necessary to determine whether it is cheaper to do a little fitting, to have selective assembly without fitting, or to stick to strictly interchangeable manufacturing within the necessary limits.

There are many cases where needless expense is incurred for gages in the attempt to secure unnecessary accuracy on parts which are never replaced. For while it insures easy assembly, the cost is frequently out of proportion to the benefits derived. Experienced engineers have come to the conclusion that unit interchangeability should be used in more instances than seems to be the case. This means that the units which go to make up the complete machine, should fit together, as units, but that all the individual parts which go to make up the unit need not be interchangeable, but can be put together by selective assembly, or even fitted.

Closely allied with the question of gages is the setting of tolerances. Here, too, the experienced engineer is of great value in determining what tolerances will be satisfactory and yet not be so close as to increase the cost of production, and add to the percentage of scrap.

Then there is the cost of gages themselves, some types being more expensive than others. The choice of methods also affects this expense and here is where the unilateral gaging system is particularly useful. With the bilateral system, or the "plus and minus" method, both maximum and minimum or go and no-go gages have to be special. But with the unilateral system a standard plug gage is the "go" gage for the hole and a standard ring gage the "go" gage for the shaft. And standard gages are always less expensive than when they have to be made special. The "no go" gage must of course, be special in either system.

Careful attention to tolerances and gaging methods will help to reduce the indirect production costs more than many seem to realize.

Endangering the Morale of Technical Government Employees

THE MUCH discussed dismissal of the experienced engineer at the head of the Reclamation Service by the new Secretary of the Interior is likely to have at least one bad result. Other underpaid technical men in the Bureaus of Standards and of Mines, and in the Coast and Geodetic Survey are sure to wonder about the security of their positions when a man with the long service of Mr. Davis can be thrown out on two weeks' notice. They can hardly be blamed for lending a more attentive ear to offers of higher pay from private industry. And if they begin to drift away from the national technical services it will be impossible to replace them. We hope that Secretary Work's action is not to be taken as establishing a precedent.

Shop Equipment News

Peerless 13-Inch Universal Shaping Saw

The Peerless Machine Co., Racine, Wis., has just announced a sawing machine with 13x13-in. capacity, similar to the universal shaping saw which was announced in the *American Machinist* on page 386, Vol. 56.

The frame accommodates blades from 14 to 21 in. in length and as in the smaller machine the blade clamping apparatus is designed to permit putting up to 10,000 lb. tension on the blade. In addition, a so-called saw blade thrust plate has been added. This plate is shown above the blade in the illustration. The purpose of it is to take care of the upward thrust so as to hold the blade tooth points in a straight line. Tests indicate that blades of 1 in. and even ¾ in. width can be used safely.

The thrust plate is 4 in. wide, 30 in. long and 0.048 in. thick, or corresponding closely to 18-gage saw blade stock. It is made of saw blade steel and receives tension through the use of two clamping straps. In addition, two set screws permit fine vertical adjustment so as to bring the thrust plate down to the blade for careful alignment.

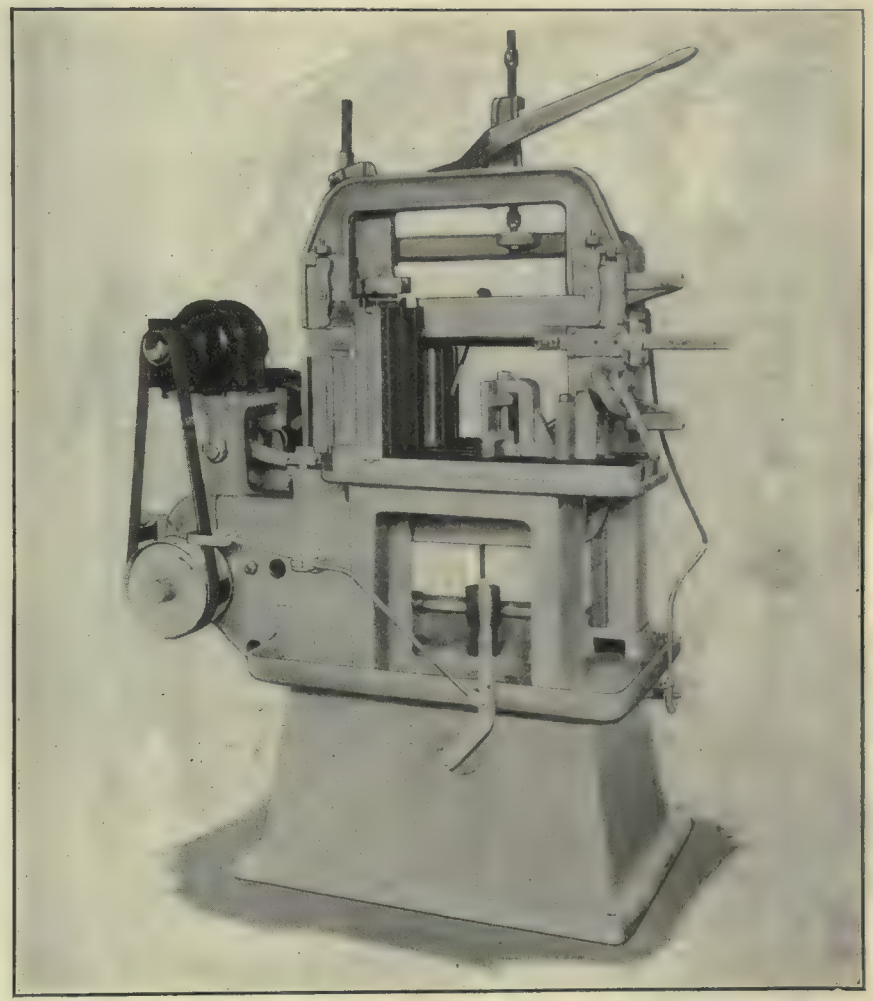
An improvement designed to cut down handling time is the dual control feed mechanism. The operator throws the feed lever on either side of the machine with one hand while the other hand is used to bring down the saw blade and frame to approximately cutting position just prior to engaging the feed. In the illustration it will be seen that the belt shifting gear is connected to the starting lever so that one straight line forward motion shifts the belt onto the tight pulley thereby putting the saw frame in motion and also engaging the feed, so that the cut is started.

The dual control apparatus also saves time when the operator wants to stop the machine just after it has marked the cut, to see how near the line the cut is going to be. Sometimes the length of the work is on the right hand side of the blade and again it is on the left side.

A stop rod for automatically stopping the saw at the completion of the cut or at a pre-determined depth is also part of the saw frame mechanism. The rod is made telescopic in action by use of a tubular member. In addition, knurled depth and height gages are found on the screw located above the saw frame. Thus instead of letting the large coil spring lift the saw frame up to its extreme height upon completion of a cut, the height gage is brought down sufficiently to permit the blade to rise just enough to clear the work.

The vise table is the upper part of the bed that is bolted to the base of the machine and stands 42 in. from the floor. An angle plate held in place with two large bolts makes up the front vise jaw. The rear jaw is brought forward by means of a screw and shoe arrangement. The screw accommodates fine adjustment with a total travel of 2 in. For approximate or coarse adjustment two nuts are loosened in the shoe permitting the heads of the two bolts to drop and be drawn back or forward with the shoe. The two T-slots in the vise table proper are made so that standard ⅝-in. bolts can be used and alignment secured from the finished walls of the slots without the bolts injuring the walls. In addition, the two cored T-slots are provided with angular teeth similar to a ratchet rack which receive the heads of the bolts in the shoe. These cored ratchet teeth take the thrust of the two bolts in the shoe and space off the coarse rear jaw adjustments.

The height of the front jaw is 15



PEERLESS UNIVERSAL SHAPING SAW

in. An auxiliary front jaw or angle plate is located on the other side of the saw blade to align the work being cut off and the width of this jaw is 10 in. Thus a piece of work 20 in. in length is balanced on the vise table. The total over-all width of the vise table from the loading side to the outboard bearing side is 18 in. In the outboard bearing two T-slots similar to those described above are provided for clamping the work when desirable.

For angular cutting it is simply necessary to remove the auxiliary angle plate and swing the front jaw around to any angle up to 45 deg. The capacity on a 45-deg. angle is 9 in. Attention is called to a square key shown in the figure that insures square alignment of the vise. The rear jaw is made so that its front face is rotatable vertically on a hinge pin. This jaw has a heel that aligns it with the front jaw when straight cutting is done but that swings around when angular or taper work is held in the vise. This construction has eliminated the necessity of a sub-base thus combining the use of angle plate, vise proper and swivel vise in one. A refinement in the nature of a water trough around the vise and two pipes that guide the water into the tank in the base completes the vise and table.

The rear of the machine has the same appearance as the 6-in. shaping saw, being equipped with a three-speed sliding transmission that will provide stroke speeds of 125, 80 and 45 strokes per minute. The speeds are intended for the three general classes of steels, i.e., mild steels, alloy steels and tool steels.

The motor bracket is an integral part of every machine and is designed to receive motors of 1 to 1½ hp. In belt drive the belt is simply run down from the lineshaft to tight and loose pulleys.

In the front of the machine the usual feed adjusting hand wheel is found. Any pressure from zero to 200 lb. can be applied vertically to the blade. The blade travels back and forth in a horizontal plane.

The lubricant pipe can be adjusted to any direction through the clamp shown in view. The pump is of the centrifugal type and runs at constant speed.

To eliminate the friction set up through the lifting spring that holds the whole unit in suspension and to insure accurate lifting of the unit on each return stroke, roller bearings are provided in four joints.

General specifications are: Height, 7 ft.; width, 2 ft. 7 in.; length, 6 ft. 3 in.; weight, net 2,200 lb., shipping weight about 2,400 pounds.

Blau Twist Drill Grinding Machines

Friedrich Neumann's Successors, Inc., 42 East 20th St., New York, N. Y., have recently placed on the market a line of twist drill grinding machines manufactured in Vienna, Austria, by Blau & Co. The machines give quick and accurate sharpening of twist drill points and enable grinding the drill uniformly on both lips to predetermined angles.

Two models of the machine are made, one for small drills and the other for larger ones. The reason for this division is partly because of the fact that a simpler machine can be used for small drills, and also because a plant usually has a large number of small drills that require frequent sharpening. The small machine is for use on drills from No. 38 to ⅜-in. in diameter, while the larger one is for drills from ⅜ to 2-in. in diameter. In a plant equipped with both machines the grinding of large and small drills can thus be carried on independently, and it is not necessary to hold any drills in the hand while sharpening.

The small model of the machine is known as the SPL, and is illustrated in Fig. 1. The advantages claimed for it are that only one setting of the drill is required until the grinding is complete, and that the same amount of grinding is done on each cutting edge, that the lip clearance is variable as desired, and that a swinging motion is given the gripping head so as to produce a correctly ground surface.

A cup-shaped base plate mounted on a pedestal carries the mechanism of the machine. The countershaft at the back of the table is driven from the overhead lineshaft and, in turn, drives the spindle carrying the wheel. The drill to be ground is held between the jaws of the chuck at the front of the machine, which jaws are tightened by the star wheel on the body of the chuck. The shank end of the drill is centered and backed up by the retainer shaft in the end of the chuck. After setting, the retainer is locked in position.

The head carrying the drill is mounted on a swinging arm and counterweighted. With his right hand the operator swings the head. The motion is such as to produce a surface that is part of the surface of a cylinder. By means of the lever shown at the side of the machine, the drill-holding head is fed toward the wheel. A screw stop is provided to limit the motion of the lever, which stop is then set after the point has been ground sufficiently. By means of an indexing device in the chuck, the drill is then swung through 180 deg. without changing any other adjustment. The second lip can then be ground. Thus, both lips have exactly the same form and angle. It is stated that the entire grinding operation can ordinarily be accomplished in about one minute.

A collar on the gripping head has a scale marked for different sizes of



FIG. 1—BLAU SMALL TWIST DRILL GRINDING MACHINE

drills. The lip clearance is controlled by means of this scale, and is automatically adjusted to the desired amount by merely swinging the collar. By setting for a larger drill than the one in the chuck a greater clearance than normal can be obtained. Smaller clearances are obtained by setting the collar for smaller drill sizes. The machine requires ¼ hp., has a floor space 2 ft. square and weighs 180 pounds.

The larger machine is designated as the model SPK. As can be seen in Fig. 2, it is considerably larger

and more complicated than the small machine, partly because it contains some automatic motions. The drive shaft carrying tight and loose pulleys is mounted at the bottom of the base. A separate motor for individual drive may be placed on an extension of the base.

Near the top of the pedestal the grinding spindle, driven by belt from below, is mounted. At one end it carries an annular wheel for grinding the drill, and at the opposite end a small grinding wheel for thinning the point of the drill. The large grinding wheel is encased, except at the portion where grinding takes place, so that the water is not thrown from the machine. A pump and water circulating system are provided.

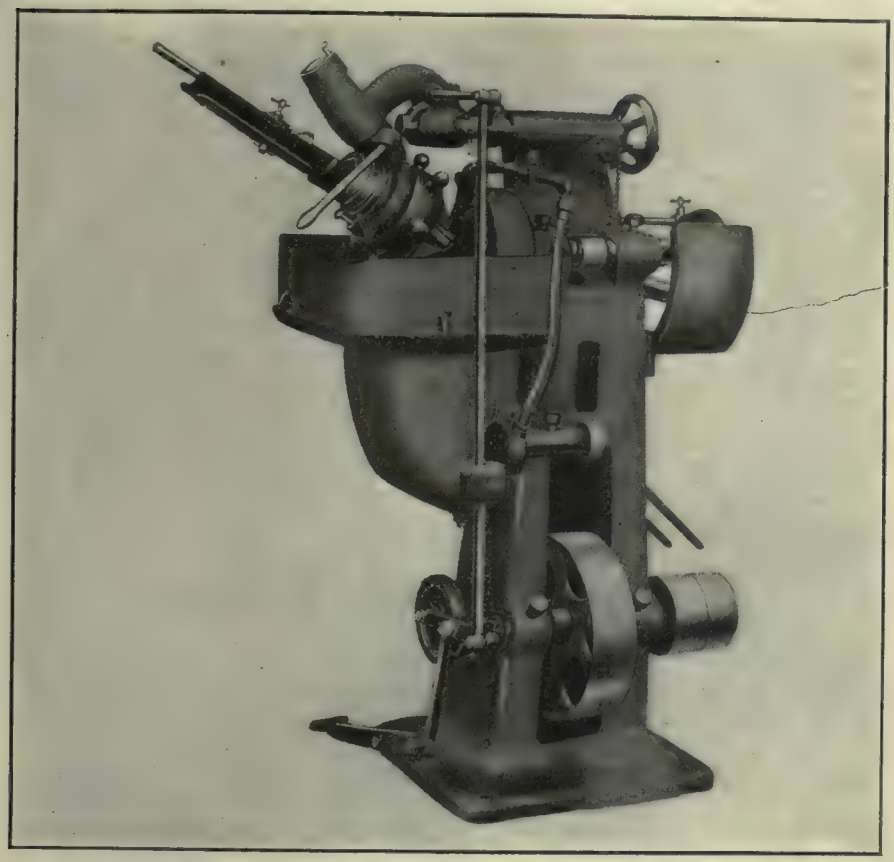


FIG. 2—BLAU LARGE TWIST DRILL GRINDING MACHINE

The drill is held in a chuck or gripping head similar to that used on the small machines. The front end of the drill is gripped by jaws fitting each land near the cutting edge. The shank end is centered by means of a reversible cup-shaped retainer. The lip ground on the large machine is different from that on the small one, in that each ground surface lies in the surface of a cone and is produced by two motions on the machine.

The whole head swings about the horizontal shaft at the top of the column, so that the drill point is moved across the wheel and causes it to wear down uniformly. The head is connected to a pedal mechanism, so that when the pedal is depressed the head is caused to oscillate back and forth automatically. The drive for this motion is taken from the main drive shaft at the bottom of the machine.

The head can also be oscillated about a shaft mounted on the swinging arm, which shaft really is the axis of the grinding cone. This motion is produced by one hand of the operator acting on the handle mounted on the side of the head. The mounting of the head is such that the distance between the axis of the drill and that of the grinding cone can be varied, so as to suit the size of the drill and the point desired.

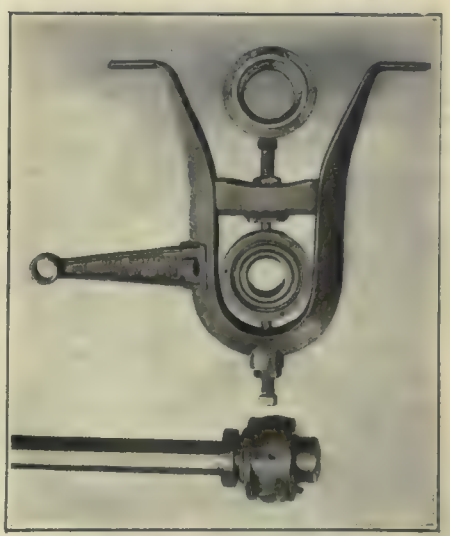
A scale is provided for adjusting this distance, which scale reads directly in diameter of drill. A normal lip clearance can be produced by setting the scale to the size of the drill to be ground, while either larger or smaller lip clearances can be obtained by setting for either larger or smaller sizes of drills than the one being ground. After one lip has been ground, the gripping head is simply indexed through 180 deg. and the other lip ground to give an exact duplicate of the first grinding.

The machine is equipped with a point thinning feature. After the lips have been ground, the drill is laid in the support at the end of the machine carrying the small wheel. It is then raised by means of a screw until a sufficient amount has been ground from the point. After one side has been ground, the stop limit is set, the drill is turned over and a like amount ground from the other side of it. In this way, a freer cutting drill requiring much less feed pressure is obtained. The large machine requires ¾-hp. to drive it, has a floor space 4 ft. square and weighs 750 pounds.

St. Louis Roller Bearing Countershaft Box

The St. Louis Machine Tool Co., St. Louis, Mo., is now marketing a roller bearing countershaft box which has been developed for use with its own products. The arrangement of the parts of the device is shown in the accompanying illustration.

The box is fitted with an adjustable taper roller bearing, of proper size for the service required, and has suitable sockets so that it will fit in standard hangers. The back of the box is solid, the front has the usual style of end plate, and both front and back are fitted with felt washers and retainers. Necessary collars for the shaft accompany the box.



ST. LOUIS ROLLER BEARING COUNTERSHAFT BOX

These boxes can be put into old hangers without taking them down. They can also be furnished complete with pressed steel hangers.

Geometric Milling Tool

A tool that will drill, face and mill the six sides of a hexagon has been developed by the Geometric Milling Tool Co., 108 N. Jefferson St., Chicago, Ill. The tool, which is shown in Fig. 1, consists of a case in which are three spindles, carrying three tools. The three spindles are located in the bottom plate, each spindle carrying a gear meshing with a gear on a central shaft, and also with an internal gear cut on the inside of the case. The central shaft has a taper shank to fit into the spindle of the machine. When the central shaft is revolved, the three cutters revolve and also rotate on a fixed circle, thus generating a cycloid curve as illustrated in Fig. 2.

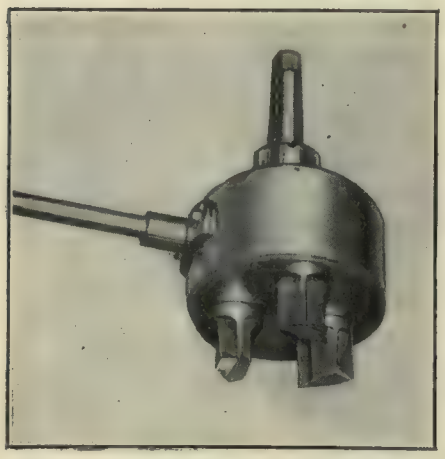


FIG. 1—GEOMETRIC MILLING TOOL

Each tool has two cutting edges, and the cutters are both demountable and interchangeable. The tool can be operated in an ordinary drill press in conjunction with a simple fixture to hold the work and guide the body of the tool. While the tools are in operation, the body is held stationary by means of an arm which allows the tool to move vertically, but prevents the body from rotating. The tool produces a slight curve in the sides of the hexagon, but the curve is so slight that it should not be objectionable for practical purposes.

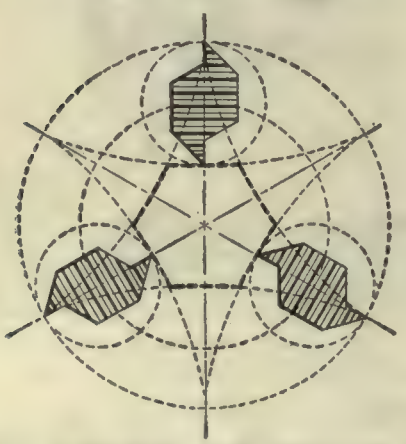


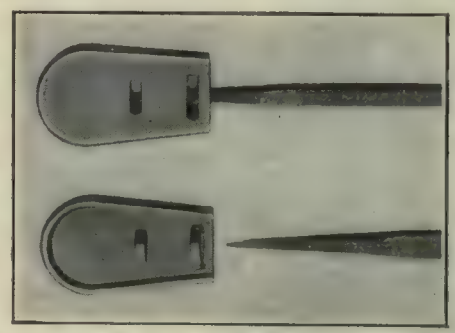
FIG. 2—SHOWING HOW HEXAGON IS GENERATED

The tool is sturdily built, of good materials, and is bronze bushed throughout. The tool is regularly made to mill hexagons on valves and fittings of $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 and $1\frac{1}{2}$ in. pipe sizes, but can be equipped with special cutters to conform to any manufacturer's standard.

Nestor Metal File Handle

A metal handle for use on small files has recently been placed on the market by the Nestor Manufacturing Co., 40 West 13th St., New York, N. Y. At the top of the accompanying illustration is shown the upper surface of the handle with a file fitted to it, while the lower view in the illustration shows the under side of the handle.

The handle is made from sheet steel by stamping operations. The edges are rolled to give a smooth surface, and two straps are formed for holding the tang of the file. The device is nickel-plated to prevent rusting.



NESTOR METAL FILE HANDLE

The handle is $1\frac{1}{8}$ in. broad and $1\frac{7}{8}$ in. long and is suitable for practically all types of files up to 8 in. in length. It can be readily attached and detached, and provides a strong grip on the file. The gripping portions are not likely to be enlarged with use, as in the case of wooden handles, so that a grip on the tang is no longer afforded.

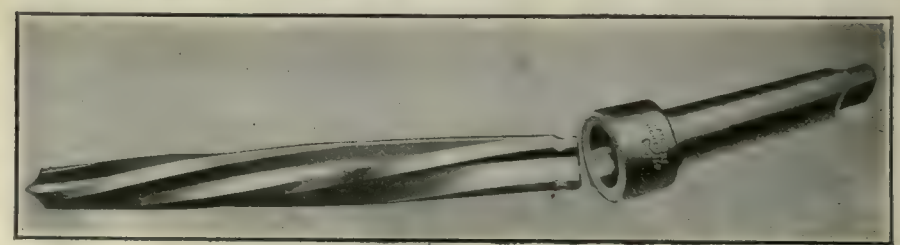
Latrobe High Speed Bridge Reamers

A line of high speed bridge and boiler reamers is now being manufactured by the Latrobe Tool Company, Latrobe, Pa. The reamers are made in both five flute straight and four flute spiral types, either of which can be furnished in bridge reamer or short car reamer length. The points are ground sharp with a chamfered cutting edge on each flute, to enable the tool to enter burned holes or holes that are not matched.

The body of the tool is made from a bar of high speed steel rolled to the proper profile to form the flutes when the bar it twisted. It is machine finished and hardened before being assembled in the carbon steel shank.

To attach the shank to the reamer a hole is drilled in the end of the shank the proper size and depth to receive the end of the reamer. It will be noted that notches are cut in the body of the reamer where it is inserted in the shank. The shank is chucked in a lathe, the reamer inserted in the hole and the tail stock center is brought against the point of the reamer to keep it hard against the bottom of the hole and to hold it in alignment. The lathe is started at a high rate of speed and two spinning tools are brought against opposite sides of the large diameter of the shank right over the joint to be made. The friction heats the shank red hot in a few moments, and soon makes it hot enough to be plastic, so that it can be formed by pressure.

As soon as the shank metal is hot enough to work more pressure is applied to the spinning tools while the work is still rotating at high speed. The outside diameter is reduced and the metal of the shank flows around the reamer body and keys in the notches and flutes shown. Shrinking of the shank from its higher temperature makes the joint tight, and only finish grinding is required to complete the tool.



LATROBE BRIDGE REAMER AND SHANK

Gisholt "Precision" Balancing Machine

The Gisholt Machine Co., 9 So. Baldwin St., Madison, Wis., has recently placed on the market the "Precision" balancing machine that is herewith illustrated. The machine applies the principles of dynamic and static balancing invented by Dr. B. L. Newkirk and is similar to the "Precision" balancing machine described on page 653, Vol. 56 of the *American Machinist*. It is adapted to a wide variety of work, such as crankshafts, flywheels, rotors, pulleys, and other revolving parts. It will receive bodies up to 24-in. in swing and 32-in. between bearings.

It is possible to obtain complete dynamic and static balancing by means of two corrections that are individually measured near the ends of the body. When a number of duplicate parts are to be balanced in production, great rapidity can be obtained. In such circumstances, it is not necessary to make the test for static balancing, and the operator need perform only a few simple steps.

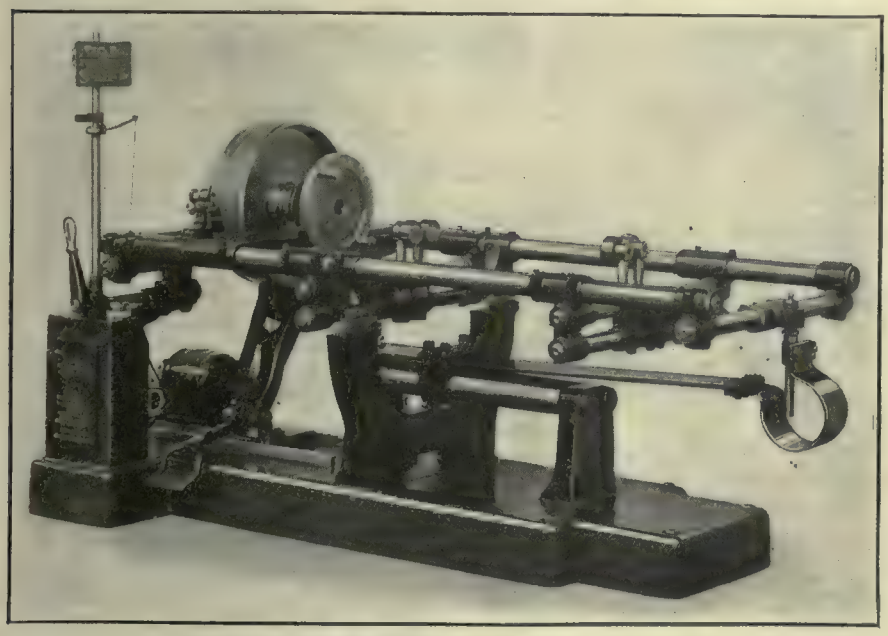
A spring-mounted and pivoted frame carries a special type of head stock and adjustable rollers to support the work. The form and location of the springs are such that a free vertical vibration of the frame may take place about the pivot springs as a fulcrum point. All revolving parts, including the rollers which support the work, are mounted on ball bearings.

In making a test, a speed of rotation above the "critical speed" of the frame is first used, and the driving power is then disengaged, permitting a gradual diminution of speed down to and through the free critical speed of the frame. From the observation on the dial indicator, mounted part way up on the column at the left, the amount of correction required is determined.

A disk at the left of the revolving parts carries a standardized 10-oz. weight, adjustable radially by means of a vernier to 0.01 inch. These parts are exactly balanced when the weight is at zero. The disk is adjustable to any angle by reference to a protractor dial. The weight can thus be moved to counterbalance the work.

With the correction thus arbitrarily applied, the machine is again speeded up and allowed to pass through the critical speed as before. The second amplitude in this process bears a relation to the first amplitude dependent on the angle between the point of application and the point required. After determining and setting off this angle, a third run will check the result. For determining the corrections proportionate to amplitudes, and ascertaining angles, a special calculating rule requiring but two settings is situated at the top of the instrument column.

After completing the first determination, the work is reversed in position and the correction determined for the plane initially over the pivots, thus completing the operation. A critical speed of about 100 to 110 r.p.m. is generally employed.



GISHOLT "PRECISION" BALANCING MACHINE

Frick Spacing Indicator

The Frick spacing indicator, shown attached to a lathe in the illustration, has just been introduced by the Precision & Thread Grinder Mfg. Co., Philadelphia, Pa. This instrument was developed for accurately spacing the teeth of no-pitch hobs during grinding and is also of use for accurate spacing of shoulders in counterboring operations, where it is ordinarily impossible to measure the depth accurately.

The indicator consists of a cast iron base, adapted to be clamped on the ways of a lathe, carrying a fine-pitch screw and a sliding rod. By means of a clamp, both rod and screw may be held at a given setting. At the end of the screw is mounted a micrometer dial, graduated to tenths of thousandths of an inch which may be used to rotate the screw or, by loosening a thumbscrew, may turn freely upon it. The sliding rod carries a dial indicator at its outer end and is moved in and out by the micrometer dial on the screw. A stop pin, mounted on the lathe carriage, is arranged to depress the indicator plunger as the carriage is moved.



FRICK SPACING INDICATOR

With the stop pin against the indicator plunger, screw and rod clamped, and the micrometer dial loose on the screw, the indicator and the micrometer dial are both set at zero. The dial is then fastened to the screw and the required spacing is set by means of the dial, after unclamping the screw and rod. The lathe carriage is then moved until the indicator reads zero. For the next space the dial is again set at zero and the preceding operations are repeated. Rapid work is thus possible.

News Section

Steel Men Are Promised Eight-Hour Day

Announcement was made by President Harding on his arrival in Tacoma recently that the American Iron and Steel Institute had given provisional assent to his effort to obtain the abolition of the twelve-hour day in the steel industry.

The announcement took the form of making public a letter to the President from the Directors of the institute, headed by Judge Elbert H. Gary, President of the Board of Directors of the United States Steel Corp.

This letter was in response to a request by the President that the Iron and Steel Institute give him a pledge that as soon as conditions of employment warranted the employers of labor concerned would return to the eight-hour day for most workmen and to the ten-hour day for others. The pledge is contained in the letter made public in behalf of President Harding today.

The history of the announcement dates back to the meeting of the Iron and Steel Institute in the Spring, when a committee, of which Judge Gary was Chairman, reported that it was not feasible to abolish the twelve-hour day in steel plants. Various reasons were given for his conclusion, the chief of which was that the scarcity of labor, due to the restrictions placed on immigration, made it impossible for steel manufacturers to put the eight-hour day into effect.

The President's Attitude

President Harding at that time expressed his keen disappointment over the action of the Iron and Steel Institute. In connection with the letter made public today it was explained that on June 18 the President asked the institute to give him a pledge that it would abolish the twelve-hour day when conditions of labor warranted that course.

The letter from the Directors of the institute reads:

New York, June 27, 1923.

To the Honorable Warren G. Harding,
President of the United States:

Dear Mr. President—Careful consideration has been given to your letter of June 18 by the undersigned Directors of the American Iron and Steel Institute, comprising all of those whose attendance could be secured at this time.

Undoubtedly there is a strong sentiment throughout the country in favor of eliminating the twelve-hour day, and this we do not underestimate. On account of this sentiment, and especially because it is in accordance with your own expressed views, we are determined to exert every effort at our command to secure in the iron and steel industry of this country a total abolition of the twelve-hour day at the earliest time practicable. This means the employment of large numbers of workmen on an eight-hour basis and all others on a basis of ten hours or less without an unjustifiable interruption to operations.

The change cannot be effected overnight. It will involve many adjustments, some of them complicated and difficult, but we think it can be brought about without undue delay when, as you state it, "there is a surplus of labor available."

Machinery Exports Still Increasing

Exports of metal-working machinery during May, 1923, with revised comparative figures for May, 1922, as compiled from the returns to the Department of Commerce, were as follows:

	May, 1922 Value	May, 1923 Value
Lathes	$66,604	$57,138
Boring and drilling machines	71,065	42,106
Planers, shapers and slotters	17,590	17,256
Bending and power presses	15,771	27,038
Gear cutters	6,174	17,787
Milling machines	25,255	24,914
Thread cutting and screw mach.	17,668	71,476
Punching and shearing machines	12,610	14,167
Power hammers	13,146	8,150
Rolling machines	16,270	3,000
Sharpening and grinding machines	83,304	112,779
Chucks, centering, lathe, drill and other	24,387	27,080
Reamers, cutters, drills and other parts for machine tools	113,696	200,037
Pneumatic portable tools	18,930	55,565
Foundry and molding machinery	75,887	13,085
Other metal-working machinery and parts of	313,721	398,765
Total metal-working machinery	$892,078	$1,090,343

Similar figures covering motor car exports follow:

	May, 1922 Value	May, 1923 Value
Automobiles & chassis (Total)	$5,763,539	$9,795,725
Motor trucks and busses except electric	812,170	1,236,416
Passenger cars, except electric	4,924,134	8,534,265

Considering Standards For Gas Pipe

The American Gas Association has submitted for the approval of the American Engineering Standards Committee three specifications for cast iron pipe and special castings.

These specifications were developed by the American Gas Institute in 1911, at which time the dimensions for bell and spigot castings were adopted. In 1913 the Association adopted the dimensions for flanged castings, and specifications governing the manufacture of all cast-iron pipe and specials, which were derived from an old standard adopted in 1905 by the American Gas Light Association. These again were based on seven years' experience with the standards designed by the Society of Gas Lighting in 1890. It is said that the specifications now under consideration are in general use for underground gas pipes throughout the United States.

The A.E.S.C. has appointed a large and thoroughly representative special committee to consider the application for the approval of these specifications, and sponsorship for future revisions under the regular procedure involving the organization of a representative sectional committee to consider and develop any changes required. The following are the members of this special committee:

S. G. Flagg, Jr., chairman, representative of the American Society of Mechanical Engineers on A.E.S.C.; F. A. Barbour, representing the American Water Works Association; E. A. Barrier, representative of the Fire Protection Group on A.E.S.C.; W. Forstall, representing the American Gas Association; A. H. Hall, representative of the gas group on the A.E.S.C., and representing the American Gas Associaton; W. G. Hammerstrom, chief engineer, the Lynchburg Foundry Co., Lynchburg, Va.; H. Kely, representing the Associated General Contractors of America; N. F. S. Russell, representing the U. S. Cast Iron Pipe & Foundry Co.; R. Toensfelt, representing the American Society for Municipal Improvements; W. Wood, president, R. D. Wood & Co.; C. D. Young, representative of the American Society for Testing Materials on the A.E.S.C.; F. A. McInnes, representing the New England Water Works Association; F. F. Schauer, representing the Natural Gas Association of America; A. W. Claussen, representing the Underwriters' Laboratories, and J. C. Meloon, representing the National Automatic Sprinkler Association.

Spirited Litigation in New Home Case

Two decisions unfavorable to the banking creditors of the New Home Sewing Machine Co., Orange, Mass., were given July 3 by Judge Anderson of the United States District Court. By one decision the receiver, Charles N. Stoddard, is given free use of assets comprised in bills receivable, amounting to $655,160, inclusive of $180,000 cash already collected. In another decision on an issue raised by banks seeking to intervene as parties to the litigation, the judge denies the petitioners' right to intervene. He finds that attorneys representing a group claiming to be a banking creditors' committee filed early in the proceedings a petition asking leave for the banks to intervene and that this petition was granted. In their recent petition the banks assert the previous petitioners acted without authority, to which the court replies that "in effect this is a charge of fraud upon the petitioners and upon this court." The judge decided that proof of such fraud should be sought, if at all, through separate court inquiry.

Railroads in Cincinnati Markets

The Cincinnati machine tool market has been stimulated during the past two weeks by the volume of business placed by railroads. In a period when the usual Summer lull has been felt to some extent, the railroads have been placing good orders with local concerns. In several instances Eastern railroads, that have previously confined their purchases to the highest grade machinery, sent in orders for cheaper grade machines. The machine tool manufacturers report that the Western railroads are showing no inclination to purchase any tools or machinery except that of the highest quality. The Denver & Rio Grande R.R. was one of the largest buyers in the local market during the past ten days. The LeBlond Machine Tool Co. closed a big order with this railroad for shop tools.

Electrical manufacturers have also been in the Cincinnati market lately placing generous orders with machine tool houses in this city. The Westinghouse Electric & Manufacturing Co. and the General Electric Co. have been active in placing orders for tools and radial drills.

Public utilities are not in the market at present and are holding off making any purchases except those that are absolutely essential. One large company states that it is doing considerable business with the oil industry.

Many Inquiries

Inquiries for machine tools seem to be rather plentiful, but they are not developing into immediate business. Taking into consideration the usual falling off in the volume of business at this time of the year, orders have been fairly good and are ahead of the total for the same period in 1922. Most of the machine tool manufacturers believe that the outlook is for a continuation of present conditions during July and possibly August with a revival of activities on a larger scale in September. Some houses report, however, that they have sufficient orders now on hand to run their plants through the Summer months. Deliveries are not as rapid as desired, partly because material is hard to obtain and also because shipments on the railroads are somewhat slow.

Orders from automobile manufacturers have decreased lately to a marked extent and it is not expected that there will be many large purchases of machine tools by this industry until Fall. Electrical tool houses state that their orders have been holding up well and that their manufacturing schedule calls for a fair amount of production in the next month.

Milling machines are not in such great demand at present while orders for lathes have also shown a decrease, although manufacturers feel that both orders and actual production are satisfactory for this time of the year. Firms making planers state that orders are good and their business is much better than last year.

Those concerns that deal in used machinery report that business has not slackened throughout June and the beginning of July. Their books show that sales throughout the first six months of 1923 are 100 per cent better than in 1922 for the same period. Public utilities are in the used machinery field making numerous purchases of appreciable size, although much of their buying is being confined to the equipment which is absolutely necessary. Garages are also placing some nice orders, especially for air pumps and accompanying equipment. The railroads are buying but little used machinery at present.

Inquiries for pig iron during the past week were noticeable, but buying was restricted to small lots, principally for early delivery. The coke market showed some improvement. Local foundries have fallen off somewhat in volume of production, but are operating on a large scale.

Indiana Preparing for Busy Fall

While there seems to be a lot of optimism among machine tool and machinery men in Indianapolis, actual volume of sales is not what was expected. It is true there has been the usual seasonal lull, which was expected. The prospects, however, are good and it is expected the Fall production will be better than Spring. There is a notable tendency toward closed cars, which should have some considerable effect on machinery and tool sales with the body corporations here.

During the past two weeks there have been many inquiries concerning special machinery for use in oil fields. Activity in the oil fields in the southern part of the state has been on the increase for some time and the sudden interest in machinery leads to the belief that new operations are contemplated. The one bright spot in the business comes from the lumber mills and construction industry. Demand for saws, mill machinery, and special tools for woodworking plants continues unabated and no respite is expected now until late Fall.

Another source of activity comes from the flour milling machinery field. From the volume of inquiries and actual business reported here, it would seem mills in all parts of the country are getting ready to take care of the big wheat harvest. While it will be weeks before actual milling of new wheat begins, the mills are getting ready for a rush of business.

Used machinery business is only fair. There does not appear to be a big stock on the market and it is certain the demand is not large.

Building Three Airships for Government

Work has been started at the plant of Airships, Inc., Hammondsport, N. Y., on three T. C. airships on a contract recently awarded by the Air Service, it is announced by the Aeronautical Chamber of Commerce of America.

The T. C. is the latest large sized training ship in use by the Air Service. it has a capacity of 200,600 cu.ft., a length overall of 195.81 ft., and a maximum diameter of 44.54 ft. The ships carry a crew of six men, and have a cruising radius of 1,630 miles at 47 miles per hour, and a maximum speed of 60 miles an hour, being powered with two Wright Type I engines, mounted on outriggers just forward of midships of the car. It is expected that all three of these ships will be delivered and in service within a year provided present plans are carried out as intended.

Chicago is Cheered by Fall Prospects

Sales of machine tools in the Chicago district during June were lighter than those reported during May. It is believed that the falling off of business during June is mainly due to the seasonal slump. Inquiries and sales were approximately 20 per cent over those during the same month last year, but are confined in the main to small orders.

While some business continues from the railroads, the bulk of inquiries are from manufacturers. There are still prospects of fairly sizeable railroad buying. Several dealers in used machinery report a satisfactory volume of sales. Inquiry is mainly for single tools. Specialized tools appear to predominate in many of the inquiries.

With considerable business pending dealers feel that prospects for new business in the near future are good. There are indications of fairly good sized orders from industrial users, a number of whom are making inquiry for small groups of equipment. Manufacturers in the metal trades are recovering from the slack period which began in May due to the falling off of orders and new business is making its appearance. The shortage of skilled labor is thought to have had a depressing effect upon general buying in the Chicago district, several concerns, because of labor shortage having been unable to operate at capacity.

The sales of agricultural machinery and equipment increased more than 10 per cent during May over the previous month, according to the Federal Reserve Bank of Chicago, which has just made public figures from 110 manufacturers in the Chicago district.

Chicago dealers have obtained considerable satisfaction from the prospects for new business which is in sight for the future as a result of plans just announced here for expansion of existing plants and also new plants.

Will Continue Central Station School

A very thorough course of instruction marked the third year of the Central Station School of Industrial Heating of the N. E. L. A. and the response met with among Central Station companies has been so encouraging that it is planned to continue the school in future years and to organize similar schools in the different geographic divisions of the association within the United States.

The courses this year were given by the Westinghouse Electric & Manufacturing Co. at East Pittsburgh and the General Electric Co. at Schenectady, N. Y., and included lectures on practically every phase of industrial heating and inspection trips to plants where heating installations had been made. The program was arranged by Wirt S. Scott of the Westinghouse companies, who is chairman of the Industrial Heating Division of the N. E. L. A. and who, in 1921, was the real originator of the whole idea of an industrial heating school. Mr. Scott also took personal charge of the class at East Pittsburgh and himself gave many of the lectures. Harold Fulwider of the General Electric Co. was in charge of the class at Schenectady.

News of Washington Activities

By Paul Wooton

THE most important single step toward stabilization in the coal industry was taken when the Interstate Commerce Commission abolished the railroad practice of assigning cars. It is pointed out, however, that the retention of this great advantage is dependent upon the attitude of the coal producers themselves. If advantage is taken of the situation to exact unreasonable prices from the railroads or if the railroads should be able to demonstrate that they cannot fuel themselves properly without assigned cars, as they have contended, the same body which has issued this order has the power to undo it. This victory for the coal operators was attained on a seven to four decision. Should two members of the Commission become convinced that this order is not working out properly, its revocation doubtless would be prompt.

There is no reason, however, to believe that the coal-producing industry is so lacking in vision as to attempt to gouge the railroads. From Sept. 1, the effective date of the order, the practice of buying coal with cars and with money will cease. Cars, private and otherwise, must be counted against the distributive share of each mine. It is just possible that the private car interests can delay the effective date by the securing of an injunction, but it is believed that the chance is small of securing an injunction which would endure during the life of the litigation, which it is reasonably certain the private car owners will bring. It is thought unlikely that the railroads will take the case to the courts.

Commissioners Hall and Daniels, in their dissenting opinions, simply argued the legal and technical points involved.

German Factories in Orient

While German chemical manufacturers are understood not to have abandoned the consideration of erecting factories in this country, it is known that they are rather dubious of the success of such a plan. The prospects of applying this policy to the Orient seem to impress the Germans as being more favorable. In the Orient they would have the advantages of cheap labor, a lower rate of taxation and would still have all of the advantages which go with their patents and secret processes. There, too, the German manufacturer would be less liable to lose his technicians and skilled employees to a competitor—one of the drawbacks to location in a country where a competitor would be likely to offer increased salaries to key men. By locating in the Orient a factory would be in the heart of a large consuming district, particularly were the product dye stuffs. The great objection to such a plan would be the difficulties of securing raw materials.

Many expressions of regret are heard because the plan to form a coal-tar export association apparently has failed. The failure of this proposal, it is pointed out, comes at a time when the interest in this type of organization is greater than ever before. Friends of the idea point to the fact that even in the case of silver—a commodity with various inherent disadvantages militating against association export—the coal tar exporters are allowing the plan to go by the board. There are now fifty-six operating export associations. The more recent ones have been formed by exporters of tires, naval stores, corn products, grain products and rubber goods.

The export association idea has not made great progress in the industries where a limited number of powerful concerns already have established export facilities. They naturally do not want to share any of their business with their competitors in this country.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb	$0.034	$0.034	$0.0252
Cold finished shafting	per lb	0.042	0.042	0.0335
Brass rods	per lb	0.1825	0.1913	0.155
Solder (½ and ½)	per lb	0.2862	0.2812	0.21
Cotton waste	per lb	0.1231	0.1231	0.101
Washers, cast iron (½ in.)	per 100 lb.	4.66	4.66	3.83
Emery, disks, cloth, No. 1, 6 in. dia	per 100	3.08	2.96	3.11
Lard cutting oil	per gal	0.575	0.592	0.575
Machine oil	per gal	0.349	0.349	0.34
Belting, leather, medium	off list	37%	37%	43%
Machine bolts up to 1x30 in.	off list	44¼%	44¼%	58%

Freight Cars Are in Good Condition

Fewer freight cars are now in need of repair than at any time since January, 1921, according to reports just filed by the carriers with the Car Service Division of the American Railway Association.

These reports showed that on June 15 this year 200,784 freight cars of various kinds or 8.9 per cent of the total number on line were in need of repair. This was a decrease of 10,982 since June 1, at which time there were 211,766 or 9.4 per cent.

Of the total number, 150,540 freight cars were in need of heavy repair, 5,024 less than on June 1. There were also 50,244 freight cars in need of light repair, which was a decrease of 5,958 compared with the number in need of such repair at the beginning of the month.

During the first 15 days in June, 1,280,277 freight cars were repaired and turned out of the shops. This was an increase of 102,320 freight cars over the number repaired during the preceding fifteen day period.

Philadelphia Business Exceeds Last Year's

Tool manufacturers in virtually all lines of manufacturing in Philadelphia are in need of men to meet the demand on their shops. What falling off there has been in the volume of business has been off-set by the shortage of skilled workmen.

Most of the tool manufacturers report business considerably in advance of this period of last year. There are no signs at this time of any great abatement, although some report fewer orders than was the case a few weeks ago.

Manufacturers of punch and die tools report the volume of inquiries concerning their product has not greatly lessened and orders are in to keep the shops busy. The production of hatchets and hammers is about thirty per cent ahead of this period last year.

The Metal Manufacturers Association reported all its shops are busy, with most of them needing men.

The monthly report of the Federal Reserve Bank of Philadelphia states that iron and steel products are not selling as well as they were. The general industrial situation is summarized with the statement that although orders are of smaller volume and are for prompt delivery, there is a feeling of optimism. The present lull is considered favorable for a sound business condition, as it enables many firms to make preparations for more active buying in the late summer and early fall.

Wholesale hardware is in greater demand, with building contractors the heaviest purchasers. Coal mines also are buying. The demand for gas and electric light fixtures has fallen off. Tinware manufacturers report an active business. A similar report comes from manufacturers of concrete mixers.

Wholesale lumber dealers report sales dull, but hope for contractors to finance building operations is bright.

Export Catalogs Should Be Registered

Many American exporters have been disappointed in finding that catalogs and important printed matter sent to foreign customers in certain countries have not reached their destination, states an editorial in *Commerce Reports* published by the Department of Commerce. In one country, for instance, where the cost of fuel is very high, an American business man found that the mail carriers were using his catalogs for fuel. In another section of the same country, where his catalogs had to be carried three miles to the factory of one of his customers, the mail carrier had thrown the catalogs away.

It therefore seems necessary to register important printed matter and catalogs in order to insure safe delivery in many countries. In most instances the printing of catalogs is expensive, and the extra outlay of 10 cents for registration in order to insure delivery seems to be money well spent.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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ANOTHER week has passed. None of the failures rumored or predicted have occurred. The markets have in a measure recovered their poise and one finds himself wondering why the financial world was for a time afflicted by a baseless hysteria of fear.

The answer seems to be that men are more alarmed by the unknown than the known and that the vague apprehension felt in Europe over the Anglo-Franco-German situation communicated itself to some bankers here whose gloomy silence was construed to mean more than they were willing to tell. But now that the worst is known it has lost its terrors and there is every reason to expect that normalcy will soon resume its sway in the Western World.

Briefly, this worst appears to be that Great Britain has decided to make her own settlement with Germany and leave France to do likewise. This naturally displeases the French and some nervous souls have suggested that the result might be war. Those who are willing to believe this are welcome, but the vast majority of men are likely to reject the idea as preposterous at least until the generation who fought the last great war are dead. There are nevertheless a few who shudder when they read that France is building many new airplanes and that Lord Derby has announced that there would be no further reduction in Great Britain's fighting forces for the present. Another effect of these belligerent gestures is a rise in the Bank of England rate which has been advanced from 3 to 4 per cent, while both francs and sterling have been very weak and marks are a little nearer zero.

On this side the Atlantic there has also been some tightening of the money market and rates are a shade higher as a result of the seasonal demand for credit that is always felt at the end of June. The reserve ratio of the Federal Reserve System is in consequence lower at 74.4 per cent as compared with 76.9 a week ago. The bills discounted have increased by $150,000,000, the circulation is up about $56,000,000 and the gold on hand has decreased by $23,000,000. This loss of gold probably represents yellow backs forced into circulation in pursuance of a questionable policy that may make it hard to recover them when our gold reserves need reinforcement.

The gold certificates or yellow backs in the hands of the public were increased by $36,140,000 between January 1 and June 1. Since the latter date another $36,000,000 has probably been distributed and the Federal Reserve Banks seem to be persistent in their efforts to get the gold out of sight lest being visible it may inflame speculation and bring about the inflation so much feared. Whether the cure is worse than the disease remains to be seen.

But it is at least reassuring to feel that since any undue distension has been prevented there is no likelihood of an acute contraction and that business is on a perfectly even keel as the harvest season opens and the crops are made ready for market.

Almost the only unsatisfactory feature of the outlook is the surplus supply of wheat. This year's crop is expected to exceed 800,000,000 bushels. With an estimated carry over from last year of at least 130,000,000 bushels there will be an available supply of nearly 1,000,000,000 bushels next fall. This is 200,000,000 bushels in excess of the probable demand for domestic consumption and export, and the problem of its disposition is a serious one.

"The steel industry is working at full capacity, but prices for some shapes are slightly lower. Car loadings continue to beat previous records, but there are still some surplus cars and the prospect is for less congestion and a prompter traffic movement this Autumn. Railroad earnings are still increasing and the outlook is that the year 1923 will be the most prosperous in the history of the roads."

A demand that the Government shall buy it or finance it is already heard, but it is not likely to be granted and unless Europe can be put in a position to buy our superabundant production the result may be serious for the wheat producing states.

But the grain market is nevertheless reasonably steady upon the theory that in some way the farmer will muddle through and that the profit he is making on his corn and other crops will in a measure offset his loss on wheat.

The other commodity markets do not call for much comment. Cotton declined on a bearish Government report that will soon be forgotten and is already discredited by the recovery in prices since recorded. Sugar is unchanged. Coffee is gradually dropping to an investment level as it becomes evident that the Brazilian Government does not intend to support the market.

Rubber is easier. Copper is distinctly weaker at 14½ cents, reflecting the economic importance of Europe, where the prewar consumption was so large. For similar reasons tin and lead are also lower. Pulp wood and paper are distinctly firm because the Canadian Parliament has passed a bill prohibiting the export of pulp wood from Canada. If the Governor General signs this bill, as expected, it will reduce the supply of pulp wood available for the United States by about 20 per cent.

The steel industry is working at full capacity, but prices for some shapes are slightly lower. Car loadings continue to beat previous records, but there are still some surplus cars and the prospect is for less congestion and a prompter traffic movement this Autumn. Railroad earnings are still increasing and the outlook is that the year 1923 will be the most prosperous in the history of the roads.

Retailers and jobbers are doing an exceptionally good business and the two leading mail order houses report startling increases in their sales.

Raw wool is steadier and woolen goods are in excellent demand. A between seasons hesitancy is reported by the wholesale houses in the cotton goods business, but the complaints come chiefly from those that represent the New England mills. Therefore it is not surprising to read that more Southern mills have been sold to Northern manufacturers.

In the security market there has been an improvement in the demand for the better class of bonds. This is the conventional precedent to an advance in stocks that will probably take place when the recent prophets of disaster again reverse themselves and the New York speculators stop saying they see ghosts on the other side the Atlantic.

Meantime the barometer is rising and the sea seems likely to remain smooth until it is again troubled by those who think, like King Canute, that they can control the tides because they have the power of the government behind them.

All Car Loading Records Are Broken

Despite the fact that loading of revenue freight has exceeded the million car mark for three consecutive weeks, a record unheard of at this season of the year in previous years, the number of surplus freight cars in good repair and immediately available for service continues to increase.

Surplus freight cars of all descriptions on June 22, the latest figures available, totaled 58,671 cars. This was an increase of 6,683 over the total on June 14. At the same time the reported shortage in freight cars, for the country as a whole, amounted to only 11,896 cars, or a decrease since June 14 of 891 cars.

Surplus box cars in good repair totaled 34,735, an increase in approximately a week of 4,875, while surplus coal cars numbered 4,269, or an increase during the same period of 1,140.

Pratt & Letchworth Co. Is Sold

Announcement was made recently of the sale of the Pratt & Letchworth Co., one of the oldest manufacturing plants in Buffalo, to the Dayton Malleable Iron Co., Dayton, Ohio. The Buffalo foundry will become a unit of the Dayton concern. The present officers of the company will be retained with John C. Bradley, chairman of the board of directors. Negotiations for the merger were completed last week, but the matter was not made public then.

The capacity of the Buffalo plant is 40,000 tons a year. Approximately 1,500 men are employed.

The Pratt & Letchworth Co. was founded in 1848 by Samuel F. Pratt, Pascal P. Pratt and William P. Letchworth for the manufacture of saddlery and carriage hardware. It was known at one time as one of the largest manufacturers of railroad castings in the country.

Personals

OTIS GROSS, New Philadelphia, Ohio, has been promoted to assistant superintendent of the New Philadelphia plant of the American Sheet & Tinplate Co., made vacant by the resignation of Elmer Griffith to become superintendent of a mill in Michigan. Gross has been identified with the local mill for several years and has been advanced from labor superintendent.

E. L. CHAPMAN, for many years representing the Davis Tool Co. in the Missouri district, has been appointed representative of the West Tool Co., Detroit, Mich., for the state of Michigan.

GEORGE H. GRUNDY has been appointed manager of steel sales for Peter A. Frasse & Co., New York City.

GEORGE G. EVERITT, for eleven years associated with the Eastern sales organization of the Whitman & Barnes Manufacturing Co., Akron, Ohio, with headquarters in New York City, has been made manager of the New York office and warehouse at Church and Chambers Sts.

WILLIAM S. MCGREEVY and KENNETH H. BARTLETT, receivers of the Seneca Falls Mfg. Co. Inc., Seneca Falls, N. Y., have announced that the plant where "Star" engine lathes and "Short-cut" lathes have been manufactured will be sold July 17 at a receiver's sale.

MATTHEW MANN of Cortland, N. Y., has been appointed manager of the Vitrified Wheel Co., Westfield, Mass. RUDOLPH J. HEIN has been appointed office manager. Both have for some time past been identified with the Maxf Grinding Co., Chester, Mass.

ERNEST WILDHABER, research engineer and mathematical expert of the Niles-Bement-Pond Co., New York, during the past three and one-half years, has severed his connection with the company, and maintains an office with his brother Max Wildhaber at 15 Moore St., New York.

CLARENCE S. SIEBERT, for a number of years with the Superior Sheet Steel Co., Canton, O., has joined the concern of Waldo, Egbert & McClain, Inc., Buffalo, as a special steel representative.

W. B. MCCRACKEN has been placed in charge of the Chicago offices of the Champion Engineering Co., Kenton, Ohio, recently opened at 431 South Dearborn St., in that city. Mr. McCracken has been many years in the crane business and until recently was connected with the operating department of the Champion Company.

STEPHEN MOLTRUP, of Beaver Falls, Pa., has retired as president of the Standard Steel Gage Co. and Frederick N. Beegle, president of the Union Drawn Steel Co., Beaver Falls, Pa., was elected to succeed him. Samuel Hanna will succeed Walter Moltrup as vice-president and Herbert May is the new treasurer. Mr. Moltrup is treasurer of the Moltrup Steel Products Co. and will devote his entire time to that company.

J. B. HILL has been appointed representative for Williams, White & Co., Moline, Ill., in the Detroit district, succeeding C. G. d'Ugglas who died recently. Mr. Hill is located at 623 Majestic Building.

W. J. LEIGHNER has been appointed works manager of the George Cutter Co., a subsidiary of the Westinghouse Electric & Manufacturing Co., located at South Bend, Indiana.

W. H. ROLINSON has resigned as manager of the interior lighting section of the merchandising department of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, and H. M. WIBLE, in addition to his present duties as manager of the rectifier section, is appointed manager of the interior lighting section. Mr. Wible will be located in the South Bend Works of the Company.

E. D. STEWART has been appointed branch manager of the El Paso office of the Westinghouse Electric & Manufacturing Co.

DR. A. S. MCALLISTER, engineer physicist, Bureau of Standards, who during the past two years has been liaison officer of the U. S. Bureau of Standards and the Federal Specifications Board, assigned to the headquarters of the American Engineering Standards Committee at New York City, has been recalled to Washington for special work, by Secretary Hoover of the Department of Commerce. DR. D. R. HARPER, physicist of the Bureau of Standards, has been assigned to the American Engineering Standards Committee succeeding Dr. McAllister. Dr. Harper is a graduate and former instructor of the University of Pennsylvania, and has been associated since 1909 with the Bureau of Standards.

MAX MAAG, Zurich, Switzerland, inventor of the gear system which bears his name and which is exploited in this country by Niles-Bement-Pond Co. arrived in the United States last week on a business trip.

W. B. CURRIER, JR., formerly general manager of the Cleveland Planer Co., Cleveland, Ohio, has severed his connection with that company and is now associated with the E. L. Essley Machinery Co., Chicago.

WILLIAM C. FRYE, for seven years president of the Chain Belt Co., Milwaukee, Wis., has retired from active participation in the affairs of the company and has been succeeded by C. R. MESSINGER who since 1917 has been vice-president and general manager.

WILLIAM BREEDEN has been appointed manager of steel sales for the Buffalo district for Peter A. Frasse & Co., New York. Mr. Breeden was formerly general manager of sales for the Lackawanna Steel Co., Lackawanna, N. Y.

SAMUEL M. VAUCLAIN, president of the Baldwin Locomotive Works, is receiving the sympathy of his many friends in his bereavement caused by the death of his wife.

H. J. BRADNER of the Lees-Bradner Co., Cleveland, Ohio, recently returned from a three months' business trip through England, France and Germany.

Obituary

JOHN ECKERT, president of the Milwaukee Forge & Iron Co., Milwaukee, died June 22 after an illness of six months. He was 44 years of age.

W. R. JOHNSON, chief engineer of the Colt Patent Firearms Manufacturing Co., Hartford, Conn., died suddenly as the result of an automobile accident that occurred while he was returning from a fishing trip July 2. Mr. Johnson's home was in Meriden, Conn.

WALTER C. SHOUP, age 48 years, president of the Autographic Register Co., New York City, died recently at his home, Short Hills, N. J., following a short illness.

WILLIAM E. MANNING, aged 53 years, vice-president in charge of sales of the Youngstown Sheet & Tube Co., Youngstown, Ohio, died recently in a hospital there. He was one of the best known men in the steel industry. He was born in Youngstown, the son of Dr. Henry Manning and member of a pioneer family there. He leaves a wife and one daughter.

PHILIP W. JONES, aged 62 years, superintendent of the Buckeye Rolling Mill, Newark, Ohio, died recently in the City hospital there. Mr. Jones had been engaged in the manufacture of steel in Youngstown for almost 40 years. He came to Newark from Toledo in May, 1910, when the Buckeye Rolling Mill was purchased and assumed the management of the plant.

Business Items

The Philadelphia Gear Works, 1120-1128 Vine St., Philadelphia, has opened a New York office at 50 Church St.

Permanent headquarters have been secured by the Whiting Corp., for its Birmingham, Ala., office. The new address is 1702 Jefferson Bank Building.

Fire, starting in the core room and pattern department of the Dayton Steel Foundry Co., Dayton, Ohio, caused a loss estimated at $100,000 on July 1. The blaze was discovered by the watchman at the Dayton Oxygen & Hydrogen Plant located nearby. The fire started in the southeast wing of the building. Company officials state that the plant will be rebuilt as quickly as possible.

S. F. Bowser & Co., Fort Wayne, Ind., recently celebrated the manufacture of the millionth self measuring gasoline pump that has been made by them.

The mechanical goods department of the Johns-Pratt Co., Hartford, Conn., has recently issued a locomotive chart upon which is presented a drawing of every part of a locomotive and a brief description of its function.

The July meeting of the New England Foundrymen's Association will be held at Hummocks, Hamilton, R. I., Thursday, July 12.

The Federal Trade Commission has dismissed its complaint against the M. T. K. Products Co., of Rochester, N. Y., for the reason that the charges of the complaint were not supported by the proof. The concern is a manufacturer of an abrasive bearing fitting compound, and in the complaint was charged with circulating misleading statements concerning a competitor's product.

August 15 has been tentatively set as the date when the plant equipment and other assets of the defunct Mitchell Motors Co., Inc., Racine, Wis., will be offered for sale by the trustee, Herbert F. Johnson of Racine. This is contingent upon the ability of the committee of appraisers to complete its work and file its report by July 15, the date that has been set.

The sale of the assets of the Winther Motors, Inc., of Kenosha, Wis., is scheduled to be held July 12 at the office and plant. Stockholders are considering a plan of reorganization framed by a committee of which Dr. E. W. Timm of Milwaukee is chairman.

The Empire Machinery Exchange Co., Inc., Cleveland, Ohio, has opened new and enlarged quarters at 2261 E. 14th St., Cleveland.

The Brightman Brothers Co. has been incorporated with a capital stock of $250,000, at Columbus, Ohio. The company will make hexagon steel bar nuts, shafting machinery and straightening machinery. The officers are: C. W. Brightman, president; G. F. Brightman, vice-president and treasurer; H. M. Brightman, vice-president; H. L. Brightman, secretary, and T. L. Brightman, assistant secretary.

The following officers have been elected by the Howell Electric Motors Co., Howell, Mich.: W. M. Spencer, president and treasurer; R. B. McPherson, vice-president; C. F. Norton, vice-president and general manager, and H. T. Proctor, secretary and assistant treasurer.

Unfilled orders for completion within one year were swelled to a valuation of $20,000,000 by receipt of contracts for ten switch engines of latest heavy type and design at the Lima Locomotive Works, Lima, Ohio. The engines are to be built for the Union R.R. of Pittsburg. Unfilled orders assure operation of the plant at maximum capacity.

The Pioneer Products Co., of Dayton, Ohio, has purchased the plant of the Bookwalter Wheel Co., Miamisburg, near that city.

At a recent meeting of the Electric Furnace Co., Salem, Ohio, the following officers were elected: F. T. Cope, general manager; R. F. Benzinger, Alliance, Ohio, manager of sales; George Lozier of Salem, Ohio, superintendent.

The firm known as the Hoosier Drilling Machine Co., Goshen, Ind., has been reorganized with additional capital stock and will henceforth be known as the Hoosier Universal Machinery Co. The organization will continue to manufacture drilling machines and drilling machine vises, and in addition will manufacture the Hoosier Spring Cushion Universal Joint and the Hoosier Factory Truck.

The Automotive Gear Works, Inc., a Delaware corporation, has qualified to do business in Indiana with a capital in that state of $100,000 preferred and 1,000 shares common, no par. It will manufacture machinery. Charles E. Hamilton of Richmond, is agent for the corporation.

The Anderson, Ind., Foundry & Machine Works will move into its new 100-ft. machine room addition next week. There will be no addition to the working force as a result of the occupancy of the new addition as the plant is now up to its full quota. The company has 160 workers. The new 100-ft. addition to the machine shop is equipped with a five-ton crane and other heavy machinery for the manufacture of oil engines.

Trade Catalogs

Tool and Cutter Grinding. The Norton Machine Co., Worcester, Mass. This excellently gotten up booklet has been issued to serve both as a handbook on tool grinding and as a catalog of the Norton universal tool and cutter grinding machines. The greater portion of the book is devoted to a discussion of cutter grinding in general and takes up the subjects of machines, wheels and procedure. Problems in cutter grinding are then treated, with illustrations and directions as to how to handle different types of work.

The catalog section of the booklet takes up the Norton machines, their uses and the ways in which they can be employed. Instructions are also given for setting up machines and for their proper handling. The booklet is 5x7 in. in size and contains 117 pages, being really a comprehensive treatise on the subject of tool and cutter grinding.

Electrical Supplies. The Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. The new catalog for 1923 and 1924 has been issued by this company and is one of the most complete and attractive catalogs that has ever been issued. It contains 1,288 pages and is profusely illustrated with half-tones, line cuts, drawings and diagrams. There is much excellent descriptive matter to be found in this book and it makes a valuable addition to the shop library.

Belt Record Cards. Chicago Belting Co., Chicago, Ill. Cards 8x5 in. are being issued by this company and sent to users of belting in all parts of the United States. The cards are designed for the man who wants to keep an accurate record of his belts and the manner in which they are functioning.

Variable Speed Transmission. The Reeves Pulley Co., Columbus, Ind. Catalog T-44 has been issued by this company. It contains descriptions and illustrations of the many products that are made by the company and there is also a complete price list of transmission parts to be found in the back of the book.

Triplex Ammeter. Roller-Smith Co., New York. A folder describing the Triplex Ammeter for three phase A.C. circuits has been issued by this company. It tells the story of the product clearly and concisely. The folder is perforated on the left-hand edge so that it may be filed easily.

Foundry Sand Cutting Machines. The American Foundry Equipment Co., New York City. Sand cutting machines with large capacities and other features are shown in a folder that has recently been issued by this company. The machines are capable of cutting, mixing, cooling and piling sand in a remarkably excellent fashion and are now used by some of the largest foundries in the world.

Motors. The Jeannin Electric Co., Toledo, Ohio. Various types of motors that are made by this company are shown in a thirty-six page catalog that has been issued recently. The motors are all single phase repulsion induction motors and each part is clearly described and illustrated. The booklet also contains color work and diagrams that are useful to any shop.

Fuel Oil Burning Equipment. Combustion Engineering Corp., New York City. The many advantages that are claimed for oil as a fuel are set forth in an attractive booklet that has recently been published by this company. Diagrams, charts, graphs, tables and halftones are used with which to illustrate the descriptive matter.

Microgage. The Microgage Co., Boston, Mass. A booklet telling of the features of the microgage has been issued by this company. Absolute accuracy and ease of operation are two of the features brought forth.

Drop Hammers. Erie Foundry Co., Erie, Pa. Board drop hammers in sizes from 200 to 4,000 lb. are described in a folder that has been issued by this company. Specifications are also included in the circular.

Threading Machinery. Landis Machine Co., Waynesboro, Pa. An exceptionally well arranged catalog has been issued in which is described the various threading machines that are made by this company. The booklet has seventy-eight pages, is well illustrated and contains valuable information for machinery users.

Double End Lathe. Rockford Milling Machine Co., Rockford, Ill. A catalog describing the Sundstrand double end turning lathe and all of its specifications has been issued. Features not found on many similar machines are told of in this catalog.

Double End Drilling and Centering Machine. The Rockford Milling Machine Co. Rockford, Ill. A folder showing by illustration and descriptive text the advantages of this machine has been issued. Various parts and attachments are also shown.

Drill Jigs. George A. Gloor, Detroit, Mich. A four-page folder describing the Selfclamp drill jig has been issued by the maker.

Bushing Stock. The American Metal Products Co., Milwaukee, Wis. Castings made of Ampco metal are described in a folder recently issued.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Industrial machinery, especially oil well equipment and supplies. Buenos Aires, Argentina. Purchase and agency. Reference No. 7042.

Metals and bearings, anti-friction. Mulhouse, France. Agency. Reference No. 7015.

Tin-can making machinery. Guadalajara, Mexico. Purchase. Reference No. 6981.

Forthcoming Meetings

New Haven Branch of the American Society of Mechanical Engineers. Third annual machine tool exhibit Sept. 18, 19, 20 and 21. Mason Laboratory, New Haven, Conn. A. C. Jewett, chairman.

Association of Iron and Steel Electrical Engineers. Iron and steel exposition, Buffalo, Sept. 24 to 28. John F. Kelly, secretary, Association of Iron & Steel Electrical Engineers, 708 Empire Building, Pittsburgh, Pa.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Iron and Steel—June pig-iron output nearly as heavy as month preceding, despite hot weather. Third-quarter buying movement not developing according to expectations. Tendency shown to shade pig-iron prices to points but slightly above cost of production. Some concessions in steel quotations due to lower price of iron. Plates and shapes holding steadily at $2.50 per 100 lb. at mill, on majority of orders. Base price of bars, $2.40. Demand more active in plates and structurals during last week. Tank construction taking bulk of plates; railroad requirements still heavy.

Declines—Birmingham base on No. 2 foundry pig iron, quoted at $25 per gross ton, against $27. Visible tin supply decreased considerably; quotations down 1⅜c. per lb. in New York during week. Lead down $3 per ton July 5; third decline in week, due to falling off in buying. Copper market weak but prices unchanged. Copper sheets and wire, washed white wiping cloths, red and white lead and lard cutting-oil declined in New York during week.

Advances—Stronger tone in zinc market; quotations advanced about 5c. per 100 lb. during week. No other advances reported.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$29 05
Northern Basic	29.27
Southern Ohio No. 2	29.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.25
BIRMINGHAM	
No. 2 Foundry	25 00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	29.76
Virginia No. 2	32.17
Basic	28.26
Grey Forge	28 76
CHICAGO	
No. 2 Foundry, local	30.61
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.51
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	28.77
Basic	27.77
Bessemer	29.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	6.75
New York	5.50@7.00
Chicago	4.00@5.00

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.95	4.45	4.85
Nos. 22 and 24.	3.75	5.00	4.50	4.85
Nos. 25 and 26.	3.80	5.05	4.55	4.90
No. 28	3.85	5.15	4.65	5.00

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00	5.15	4.70	5.10
Nos. 12 and 14.	4.10	5.25	4.80	5.20
Nos. 17 and 21.	4.40	5.55	5.10	....
Nos. 22 and 24.	4.55	5.70	5.25	5.65
No. 26	4.70	5.85	5.50	5.80
No. 28	5.00	6.15	5.80	6.10

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	62	50½	⅜ to 1½	30	13
		LAP WELD			
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	26	11
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	60	49½	¾ to 1½	30	14
2 and 3	61	50½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded.	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ¼-in. to 1-in.. O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	5.00	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	7.50	8.00	7.35
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.40	3.90	4.30
Cold finished flats, squares	4.90	4.40	4.80
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.32½
Soft steel bar shapes (base)	3.54	3.36	3.32½
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.71	3.40
Bar iron (3.25 at mill)	3.54	3.36	3.32½
Carbon tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 3/32, 8½c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.25
Tin, 5-ton lots, New York			38.37½
Lead (up to carlots), St. Louis	6.25	New York	6.72½
Zinc (up to carlots), St. Louis	5.85	New York	6.30

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.20	27.00	27.50
Antimony (Chinese), ton spot	8.00	10.00	8.25
Copper sheets, base	24.50	23.75@24.00	23.00
Copper wire (l.c.l.)	17.75	21.00	16.25
Copper bars (l.c.l.)	22.00	24.25	19.50
Copper tubing (l.c.l.)	27.00	29.25	23.00
Brass sheets (l.c.l.)	19.75	24.25	18.75
Brass tubing (l.c.l.)	25.50	29.75	20.50
Brass rods (l. c. l.)	18.00	21.00	15.75
Brass wire (l. c. l.)	20.25	22.00	.....
Zinc sheets (casks)	10.25	10.10	.....
Solder (½ and ¼), (caselots)	31.50	29.50@31.50	20.00
Babbitt metal (83% tin)	56.00	49.00	40.00
Babbitt metal (35% tin)	30.00	17.00	16.00
Nickel (ingot and shot)	29.00	.....	35 00
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	13.50@14.00	12.00	12 00
Copper, heavy, and wire	13.25@13.75	11.50	11 00
Copper, light, and bottoms	11.25@11.75	9.50	10.00
Lead, heavy	5.00@ 5.50	5.00	5.75
Lead, tea	4.50@ 4.75	4.00	4.75
Brass, heavy, yellow	7.50@ 7.75	....	7.50
Brass, heavy, red	11.00@11.50	9.50	9.50
Brass, light	6.00@ 6.50	5.00	6 50
No. 1 yellow brass turnings	7.50@ 7.75	6.00	7.00
Zinc	3.75@ 4.25	3.00	3.50

TIN PLATES—American Charcoal—Bright—Per box.

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 20x28, 112 sheets	$23.50	$19.50	$18.50
"A" Grade:			
IC, 20x28, 112 sheets	21.00	17.00	17.00
Coke Plates—Primes, 20x28 in.			
100-lb., 112 sheets	14.00	12.60	14.50
Terne Plates—Small lots, 8-lb. Coating			
IC, 14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13¼x13¼, per lb.	10.75@11.00	36.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	1.13	1.27	1.28
White lead, dry or in oil	100 lb. kegs.	New York, 14.00	
Red lead, dry	100 lb. kegs.	New York, 14.00	
Red lead, in oil	100 lb. kegs.	New York, 15.50	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.50@5.00	
Coke, prompt foundry, Connellsville	per net ton	5.50@6.00	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	30%	50-10%	45-5%
1½ and 1½x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	15%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	20%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	30%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	25%	45%	40-5%
Bolt ends, with hot pressed nuts	30%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, ⅜ and smaller	60%	.....	...
Semi-finished nuts, ½ and larger	55%	65–10%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ⅛ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ¼ in., per 100 lb. (net)	5.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	List net	2.75	2.50
Rivets:			
Rivets, ⅞ in. dia. and smaller	40%	50–10%	60%
Rivets, tinned	40%	50–10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1¼ to 1¾-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅜ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30–10%	30–10%	30–10%
Heavy grade	20–5–2½	30%	20–5–2½%
Rubber and duck:			
First grade	50–10–5%	50–10%	40-10%
Second grade	60–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4 73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1 40
Cloth	3.38	2 67	3.20

New and Enlarged Shops

Machine Tools Wanted

D. C., Wash.—Bureau of Supplies & Accounts, Navy Dept.—receiving bids until July 17 for five electric grinders and two air compressors.

D. C., Wash.—A. L. Flint, Genl. Purch. Officer of the Panama Canal—receiving bids until July 18 for engine lathe, bench grinder, drill presses and embossing press.

Fla., Jacksonville—Jacksonville Engine & Machine Wks., 142 South Ocean St.—cylinder grinder.

Fla., Sandford—J. G. Leinecker—one 2 in. and one 3 in. capacity double bolt cutter.

Fla., Tallahassee—Tallahassee Iron Wks., R. O. Collins, Pres.—foundry and machine shop equipment, including lathe, drill press, welders, grinder, etc.

Ill., Chicago—Reliance Iron & Steel Co., 2133 South Sawyer St.—electric press for bundling steel sheet scraps.

Ind., Indianapolis—S. & B. Sheet Metal Wks., 930 Fort Wayne Ave.—sheet metal working machinery and equipment.

Kan., Cheney — Wallace-Blakely Motor Co.—power metal lathe (used).

Kan., Ellinwood—Hines & Koehler—8 ft. tinners' brake.

Kan., Ellinwood—A. Polzer (blacksmith)—power metal lathe.

Kan., Ellinwood—Stekel Lanteman Motor Co.—power lathe, drill press and emery stand.

Kan., Ellinwood—P. Wendell—power drill press and metal lathe for machine shop.

Kan., Great Bend—Dixon Tin & Battery Sta., 2014 Forest Ave.—lathe (used).

Kan., Great Bend—F. Richardson, 2009 Bway. (sheet metal work and plumbing)—power tread cutter machine.

Kan., Great Bend—Scranton Machine Shop—power metal lathe.

Kan., Great Bend—Used Car Exchange, L. Spruill, Purch. Agt.—power drill press, metal lathe and emery stand (used preferred).

Kan., Great Bend—Wells Bros. (blacksmith)—11 and 20 in. power lathes, drill press, hangers, pulleys, power emery stand, belting, bearings, cylinder grinder and shafting.

Kan., Hutchinson—Brown Cycle Co., 131 Sherman St., East, C. N. Brown, Purch. Agt.—power metal lathe.

Ky., Barbourville—J. M. Hinkle, Box 295—power metal lathe and screw machine for machine shop.

La., New Orleans — Blattman-Weeser Sheet Metal Wks., Inc., Burgundy and Toulouse Sts.—10 ft. power machine for cornice, corrugated iron and moulding work, 16 gauge capacity.

Mass., Roxbury (Boston P. O.)—H. B. Church Truck Service Co., 26 Reading St.—power winch for motor truck, drills, reamers, taps, dies, punches and other bench tools (used).

Mich., Detroit—Johnson Piston Ring Co., 6010 Woodward Ave.—miscellaneous machine equipment for the manufacture of piston rings.

Mich., Detroit—Lincoln Mfg. Co., 2630 Erskine St. (metal spinning and stamping)—one No. 1½ B Bliss toggle drawing press (used).

Mich., Dowagiac—J. Heddon's Sons (machine shop)—Brown & Sharpe automatic milling machine.

N. Y., Buffalo—Becker-Hoffman Service Co., Inc., 250 Franklin St.—equipment for proposed garage and repair shop at 133 South Elmwood Ave.

N. Y., Buffalo—D. E. Belden, 263 Carolina St.—garage and repair shop machinery, tools and equipment.

N. Y., Buffalo—F. J. Brinkworth, 154 Hodge Ave.—equipment, also one 1,000 gal. gasoline tank and pump for proposed automobile service station at 2089 Main St.

N. Y., Buffalo—W. P. Carey, 1579 Niagara St.—equipment for automobile service station, also one 1,000 gal. gasoline tank and pump.

N. Y., Buffalo—P. C. Dwyer, Bailey Ave. and Highgate St.—gasoline and service station equipment, including pumps, tools, air compressor, etc.

N. Y., Buffalo—A. C. Eiss, 59 Gold St.—equipment for proposed garage and repair shop at 1420 William St.

N. Y., Buffalo—J. P. Gimbrone, 490 Niagara St.—equipment for automobile repair shop at 518 Niagara St.

N. Y., Buffalo — D. T. Kissinger, 1110 East Delevan Ave.—gasoline and service station machinery, tools and equipment, including air compressor, pumps, etc.

N. Y., Buffalo—W. H. Linford, 2082 Niagara St.—gasoline and service station machinery, tools and equipment.

N. Y., Buffalo—C. Liske, 1041 Genesee St.—equipment for proposed bicycle and motor cycle repair shop at 1037 Genesee St.

N. Y., Buffalo—B. Marshall, 394 Jefferson St.—equipment for automobile repair shop.

N. Y., Buffalo—W. McNeely, 80 Park St.—equipment, also one 1,000 gal. gasoline tank and pump for proposed automobile service station at 1605 Elmwood Ave.

N. Y., Buffalo—J. Orlando, 243 Seneca St.—equipment, also two 550 gal. gasoline tanks and pumps for proposed garage and repair shop at 223 Seneca St.

N. Y., Buffalo—A. Shabtag, 1553 Niagara St.—gasoline and service station machinery, tools and equipment, including air compressing outfit, etc.

N. Y., Buffalo—F. A. Van Dyke, 32 Edward St.—equipment for proposed garage and repair shop on Erie and Henry Sts.

N. Y., Buffalo — Whistler & Schanland, 1283 Niagara St. (manufacturers of tool dies)—Nos. 6 or 7 press, or similar.

N. Y., Long Island City—Stinzing Machine Shop, 250 4th Ave.—one Bliss power press, about No. 20.

N. Y., Jamestown—L. F. Swanson, 409 Washington St.—additional machine shop equipment.

N. Y., Malone—J. B. Hinds, 107 Catherine St.—vertical drill press and twist drill.

N. Y., New York—F. Streicher, 105 John St.—vertical milling machine for machine shop.

N. Y., Ogdensburg—B. A. Evans—two electrically operated gas pumps, air compressor with tank, lathe, drill press and miscellaneous motor repair tools for proposed garage and machine shop at Gouverneur.

N. Y., Rochester—Cullinan-Malcolm Co., 4322 Lake Ave.—additional garage and repair shop machinery and equipment.

N. Y., Rochester—V. Gavin, 109 Weyl St.—garage, repair and service station machinery, tools and equipment, including air compressor, pumps, etc.

N. Y., Westfield—Log Cabin Service Sta.—air compressor, gasoline and service station machinery, tools and equipment.

O., Cleveland—Midcontinent Producers & Refiners Corp., 619 Hanna Bldg.—equipment for gasoline and service station on Hayden Ave.

O., Cleveland—Natl. Refining Co., Natl. Bldg.—equipment for gasoline and service station on Detroit Ave., Lakewood.

O., Cleveland—Western Reserve Oil Co., 3706 Franklin Ave.—machinery, tools and equipment for gasoline and service station on Elmwood and Detroit Aves., Lakewood.

O., Columbus — Brightman Bros. Co., Markinson Ave., C. W. Brightman, Pres.—equipment, including two drill presses, two 24 in. lathes, several milling machines, etc., for new plant for the manufacture of nuts and shafting.

O., Euclid—C. A. Ashcraft—complete machinery, tools and equipment for Durant and Star service station at Wickliffe.

O., Painesville—Stanton Motor Co.—machinery, tools and equipment for large addition to Ford garage and service station.

O., South Columbus—Seagrave Co. (manufacturer of fire apparatus), C. S. Greenlee, Purch. Agt.—general equipment, including 24 in. lathe and one grinder, etc., to increase capacity of plant.

Ore., Portland—Office of United States Engineer, Custom House—receiving bids until July 20 for one 200 ton hydraulic wheel press and one 25 in. high speed back geared crank shaper.

Pa., Allentown—Pennsylvania Independent Oil Co., 4th and Linden Sts.—machinery, tools and equipment for new gasoline and service station.

Pa., New Brighton — Sampson & McBeth, c/o J. E. Martsoff—equipment for new garage and service station at Beaver Falls.

Pa., Phila.—J. Matlock, 518 North 32nd St.—power metal bench lathe for machine shop.

Pa., Pittsburgh—Bd. Educ., Fulton Bldg.—lathes, grinders, shapers, blowers, furnaces, drill presses and planers for Westinghouse High School.

Va., Richmond—Broad St. Bicycle Wks., 506 West Broad St.—drill press and welding outfit.

Va., Richmond—D. L. Claville, 906 East Cary St.—drill press, emery stand and welding outfit for automobile repair work.

Va., Richmond—J. C. Cocke & Co., 533 West Broad St. (watch maker)—small lathe.

Va., Richmond—Cornice Repair Shop, 313 North Smith St. (automobile repairs)—small lathe for metal work.

Va., Richmond—A. I. Fleming Welding Wks., 1623 West Broad St.—drill press and lathe.

Va., Richmond—C. W. Pennell, 711 West Broad St.—drill press for automobile repair work.

Va., Richmond—Seaboard Motors Co., 605 West Broad St.—arbor press and electric drill.

Va., Richmond—Supreme Motor Repair Co., 1631 West Broad St.—drill press and cylinder grinder.

Va., Richmond—Terrell Bros., 422 West Broad St. (watch maker and jeweler)—small lathe and bench tools.

Va., Richmond—Vaughn Motor Co., 114 West Broad St.—lathe, drill press, milling machine and reamer.

Wis., Appleton—Northern Boiler & Structural Iron Co., E. Kottke, Mgr.—machinery and iron working equipment, including drills, belting and shafting, for steel fabricating shop.

Wis., Beloit—J. R. Morash, 126 East Shirland Ave. (machinist)—one chain hoist, grinders, 22 in. drill press, belting and shafting.

Wis., Green Bay—Green Bay Fdry. & Machine Co., Arndt St. and South Bway., R. A. North, Mgr.—forges, machinery and equipment for new gray iron foundry and machine shop.

Wis., Green Bay—Sun Ray Heater Co., c/o A. E. Halterman—machinery and equipment for the manufacture of portable electric therapeutic devices.

Wis., Kiel—H. Daniels (machinist)—6 ft. lathe, chain hoist and shafting.

Wis., Marshall—Lazers & Sons Motor Co.—automobile repair machinery, drill press, small tools, gasoline storage tanks and pumps for garage at Waterloo.

Wis., Milwaukee—Badger Corp., c/o B. J. Reynolds, 915 Majestic Bldg. (manufacturer of automobile accessories, etc.)—tool room lathe, medium size drill press, emery wheel and stand.

Wis., Sturgeon Bay—G. Peterson—machine and assembly shop equipment, also belting and shafting for the manufacture of gas engine work stand fixtures.

Ont., Ottawa—Dept. of Justice, W. S. Hughes, Supt. of Penitentiaries—machinery for machine shop, also for carpentry department of penitentiary at St. Vincent de Paul, Que. (new).

Ont., Toronto—Mahaffy Iron Wks., 4 Trafalgar Ave. — equipment, including lathes, drills, etc., for proposed $50,000 factory.

Que., Chateauguay — M. D. Chevalier, Ville de Levy St.—equipment for garage on Wilson Ave., Montreal.

Que., Ste. Cesaire—Central Garage, Ltd., J. O. Brisbois, Purch. Agt.—garage and automobile repair equipment.

Que., Shawenegan Falls—J. Perreault, 68 Champlain St.—machine shop equipment.

Que., Three Rivers—L. Alarie, St. Antoine St.—garage and automobile repair shop equipment.

Que., Vercheres—Larose & Frere—garage and automobile repair shop equipment.

Machinery Wanted

Ala., Citronelle—City Council—ice manufacturing machinery and equipment.

Ala., Dothan—H. C. Forrester—complete ice manufacturing machinery and equipment.

Ala., Eufaula—J. D. Schaub & Co.—8 x 12 in. Chandler & Price power job printing press, also paper cutter.

Ala., Fort Payne—W. B. Davis & Sons—machinery and equipment for $150,000 plant for the manufacture of hosiery at Tuscaloosa.

Ark., Camden—T. D. Fooks—lumber mill machinery and equipment, including saws, planers, transmission and conveying machinery, etc.

Calif., San Francisco—Main Iron Wks., 16th and Daggett Sts.—stake riveters.

Colo., Denver—Blayney-Murphy Packing Co., Union Stockyards—machinery for proposed packing plant.

Del., Wilmington—Arizona Klondike Gold Mines Co., 7 West 10th St.—gold smelting and refining machinery and equipment.

Fla., Jacksonville—F. G. Russell, 40 Riverside Ave. — complete foundry equipment.

Fla., Seffner — J. S. Parkerton — rock crushing machinery and equipment, 100 ton capacity.

Ga., Savannah—Southern Cotton Oil Co., 204 East Bay St.—machinery and equipment for $75,000 cotton oil plant.

Ind., Miami—Bd. Educ.—complete vocational equipment for $100,000 school.

Kan., Cheney—Cheney Sentinel, K. Cox, Purch. Agt.—power job press.

Kan., Cheney—E. E. Strohmeyer (harness shop)—power stitcher for leather work.

Kan., Ellinwood—Bills Cleaning & Tailoring Wks., W. Saitken, Purch. Agt.—cleaning extractor, belting, hangers, pulleys, bearings and shafting.

Kan., Ellinwood—Digen Harness Shop—power leather stitcher and finisher.

Kan., Great Bend—Great Bend Printing Co., C. E. Howell, Purch. Agt.—power paper cutter.

Kan., Great Bend—J. H. Weber (cabinet maker)—power scroll saw, wood lathe and sander.

Kan., Hutchinson—Golden Rule Press, C. Hood, Purch. Agt.—power paper cutter, also Miller feeder attached to power job press (used preferred).

Kan., Hutchinson—H. Robert, A St. (job printer)—power paper cutter.

Ky., Louisville—Office of United States Engr., P. O. Box 72, E. F. Kanzler, Purch. Agt.—one oxyacetylene welding torch, non flash back type with oxygen and acetylene regulators, gauges and two 12½ ft. sections of hose.

La., New Orleans—Bd. of Port Comrs., Room 200, New Court House—air compressor and receiver for grain elevator.

Me., Portland—Brown Co.—peanut packing machinery and equipment for plant at Palm Beach, Fla.

Mass., Campello (Brockton P. O.)—Howard Print, Inc.—14 x 22 in. Universal printing press with motor (used).

Minn., Holloway—A. P. Wells (job printer)—22½ in. power paper cutter.

N. J., Bloomfield—Combination Rubber Mfg. Co., Franklin Ave.—tire building and rubber working machinery and equipment for 4 story plant.

N. Y., Adams—A. Fuller Co., Box 125 (manufacturer of cane and willow furniture)—double surface planer and electric sanding machine.

N. Y., Bemus Point—Long Point Service Sta., C. B. West, proprietor—air compressor and other equipment for gasoline and service station.

N. Y., Buffalo—DuPont Fibre Silk Co., River Rd.—fibre silk looms and machinery for $400,000 plant at Nashville, Tenn.

N. Y., Buffalo—Tifft Lumber & Mill Supply Co., 345 Tifft St.—carpenter shop machinery, tools and equipment.

N. Y., Canastota—Watson Truck Corp., R. H. Imhofe, Purch. Agt.—spoke turning machines.

N. Y., Jamestown — Amer. Salvage & Housewrecking Co., Washington and 17th Sts., W. C. Hyer, Mgr.—brick cleaning and sawmill machinery and equipment, including saws, planers, transmission and conveying machinery.

N. Y., Jamestown—Black Belt Corp., 15 East 15th St., F. A. Ochs, Mgr.—machinery and equipment for addition to plant for the manufacture of leather belts.

N. Y., Jamestown — Efficiency Garage, Inc., 212 Washington St., O. Johnson, Mgr.—tire repair machinery, tools and equipment, including tire changing tool and vulcanizing outfit.

N. Y., Jamestown — Himbaugh Bros., Jones St. and Gifford Ave. (manufacturer of furniture)—complete machinery and equipment for dry kiln.

N. Y., Medina—The Tribune—linotype.

N. Y., Watts Flats—Southern Tier Milk Products Co., Inc.—dairy machinery and equipment.

N. C., Bakersville — Bakersville Roller Mills—ice manufacturing machinery and equipment.

N. C., Hickory—Hickory Chair Mfg. Co.—woodworking machinery and equipment, to replace that which was destroyed by $125,000 fire.

N. C., Littleton—E. E. Wollett & Son—6 x 15 high speed planer and edger.

N. C., Lumberton—Bd. Educ.—vocational equipment, including lathe, press, drill, small machine tools, etc., for $150,000 school.

N. C., Raleigh—Bd. Educ.—complete vocational equipment for $125,000 school.

O., Cleveland—County Comrs., c/o R. J. Lander, Surveyor, Cuyagoha County Court House—ice machine for county morgue.

O., Columbus—Hann & Adair Printing Co., 48 East Long St., C. Wilson, Pres.—composing room equipment and several presses to enlarge plant.

O., Ironton—Ironton Stove & Mfg. Co.—foundry equipment.

O., Napoleon—J. V. Scherer—10 x 15 in. power job press, Chandler & Price preferred.

O., Wellston—Wellston Mfg. Co.—complete foundry equipment (new).

Pa., Allentown—Allen Laundry Co., 41 North 10th St.—additional laundry machinery and equipment.

Pa., Catasauqua—Davis & Thomas Co.—foundry equipment.

Pa., Corry—B. & B. Mattress Co.—machinery and equipment for new mattress factory.

Pa., Freeland—Barnes Fdry. Co.—foundry equipment for plant at Jersey City, N. J.

Pa., Jamestown—Crescent Tool Co., Foote Ave. and Harrison St.—presses and pickling equipment.

Pa., Littlestown—Keystone Cabinet Co., H. H. Rose, Mgr.—machinery and equipment for plant for the manufacture of kitchen cabinets.

Pa., Marietta—Natl. Castings Co.—foundry equipment.

Pa., Oil City—United Natural Gas Co.—machinery and equipment for plant for the manufacture of charcoal.

Pa., Pittsburgh—A. M. Byers Co., Water St. (pipe)—charging machines and other equipment.

Pa., Sharon—Sharon Coal & Supply Co., 305 South Dock St.—coal handling machinery and equipment.

Pa., Warren—C. Zerres—handling and ice plant machinery and equipment.

Pa., West View (Pittsburgh P. O.)—Bd. Educ. — vocational equipment, including lathe, press, drill, etc., for $100,000 school.

S. D., Bowdle—Pioneer (newspaper)—power perforator and slug casting machine.

Tenn., Bristol—Cortrim Lumber Co.—machinery and equipment for proposed $50,000 addition to lumber and planing mill.

Tenn., Millington—Bd. Educ.—vocational equipment, including lathe, drill press, machine tools, etc., for $75,000 school.

Tenn., Rockwood—Roane Iron Co., Chamberlain Bldg.—iron casting machinery and equipment.

Tex., Breckenridge—J. W. Lancaster—laundry machinery, belting, hangers, pulleys, bearings and shafting.

Tex., Dallas—R. H. Baldridge, 528 Interurban Bldg.—100 cu.ft. air compressor and engine.

Tex., Fort Worth—Smith Bros. Grain Co., 6th and Pecan Sts.—machinery for proposed $100,000 grain elevator.

Tex., San Marcos—The Record—Miller feeder with job press, 12 x 18 in.

Va., Richmond—E. C. Meyer & Co., 3 West Broad St. (jewelry and watch repairing)—small lathe and gold refining outfit. Estimated cost $800.

Va., Richmond—Natl. Tire & Rubber Co., 452 West Broad St.—air compressor and vulcanizing outfit.

Va., Richmond—Parker Bros., 527 West Broad St.—air compressor and bench tools for automobile repair shop.

Va., Richmond—A. Reeves, 311 West Broad St. (barber supplies, grinding and polishing)—grinding machinery, emery wheel and stand.

Wash., Puget Sound—Bureau of Yards & Docks, Navy Dept., Wash., D. C.—receiving bids until July 18 for electric traveling bridge crane for navy yard, here.

W. Va., Clarksburg—Bd. Educ.—equipment, including saws, planers, drill press, lathe and machine tools for $75,000 vocational school.

Wis., Abrams—Abrams Creamery Co.—power churns, separators, testing machine, shafting and hangers.

Wis., Appleton — Badger Printing Co., Adkins St., D. Smith, Pres.—$12,000 worth of machinery, including Miehle press, paper cutter, monotype machine, etc., for propuosed addition to printing plant.

Wis., Belgium—Krier Preserving Co.—special canning machinery for proposed $40,000 plant, to replace that which was recently destroyed by cyclone (new).

Wis., Brillion—J. A. and F. H. Fuhrman—cheese making machinery, belting, shafting and vats for proposed $35,000 factory at Iron River.

Wis., Cuba—Connecting Link Mining Co., C. M. Treat, Secy.—crushing machinery, hoists, belting and shafting for proposed $40,000 mill.

Wis., Cuba—Scott-Sellick Co.—mining machinery, equipment, hoists, belting and shafting for proposed $50,000 wet mill.

Wis., Cudahy—Helmholz Shoe Mfg. Co., Packard Ave., W. Helmholz, Purch. Agt.—siding, eyelet and vamping machines.

Wis., Green Bay—Oneida Mfg. Co., L. W. Melcher, Mgr.—shop equipment, drills, small tools, etc., for the manufacture and repair of machinery and mechanical appliances.

Wis., Madison — State Bd. of Control, Capitol Bldg., F. Crocker, Secy.—ammonia refrigeration plant, ice machine and dishwashing machinery for refectory at Union Grove.

Wis., Merrill—G. B. Cotter—sixteen steam operated excelsior cutting machines, belting and shafting for proposed $50,000 factory.

Wis., Milwaukee—Brookshire Cheese Co., c/o N. F. Petrie, 709 Caswell Block—power churns, belting, shafting and vats.

Wis., Milwaukee — Retailers' Tallow & Calfskin Assn., c/o J. Herman, 2322 State St.—special machinery, belting and shafting for propsed $50,000 rendering plant.

Wis., Milwaukee—E. Seeger, 382 10th St.—emery wheels, hangers, belting, shafting and pulleys.

Wis., Milwaukee—J. Zirwes, 673 Dover St. (carpentry and woodworking)—one standard size Universal woodworking machine, to include planer, rip saw, cross cut saw and sticker.

Wis., Shawano—E. H. Kuester—mangles, washers, driers, etc., for proposed $40,000 laundry.

Wis., Whitewater—Metal Toy Wks., C. Schmiers, Mgr.—machinery, woodworking and small tools for the manufacture of metal toys and novelties (new and used).

Man., St. Boniface — Dominion Tar & Chemical Co., Ltd., L. O. P. Walsh, Vice Pres.—complete equipment for distillery, also three storage tanks.

Man., St. Boniface—A. Murray & Co., Ltd., c/o L. O. P. Walsh, Vice Pres.—complete equipment for the manufacture of roofing pitches, tarred and asphalt felts, building papers and other tar products.

Ont., Alexandria—Wicker Co. Ltd., M. Larocque, Purch. Agt.—equipment for the manufacture of wicker goods.

Ont., Corbyville—Industrial Alcohol Co.—equipment for alcohol plant, to replace that which was destroyed by fire.

Ont., Hespeler—Woodworking Co.—woodworking machinery, including saws, planers, shapers, etc., electric power.

Ont., London—Bd. Educ., E. Smith, Chn. Vocational Com.—tools and equipment for mechanical trades department of proposed $120,000 addition to technical school.

Que., Joliette—Pelland & Freres, J. Pelland, Purch. Agt.—additional machinery for sash and door factory.

Que., Montreal—Brandram Henderson, Ltd., 2984 St. Urbain St.—complete equipment for enamel and varnish plant.

Que., Montreal — Strathcona Potteries, Ltd., c/o Crankshaw & Chevalier, McGill Bldg.—machinery and equipment for the manufacture of pottery, wares and earthenware.

Que., Montreal—Triad Co., Ltd., c/o L. Fitch, 83 Craig St., W.—equipment for the manufacture of leather goods, boots and shoes.

Que., Outremont—La Compagnie de Cement Unie, Ltd., c/o F. Callaghan, 430 Wiseman Ave.—cement making and quarrying machinery.

Que., St. Jerome — A. Phaneuf — woodworking machinery.

Que., St. Maurice—O. Lamothe—bandsaw and additional equipment for sawmill.

Que., Shawenegan Falls—J. A. Bourassa—sawmill machinery.

Que., Shawenegan Falls—J. J. Ermond (pattern maker)—woodworking machinery.

Que., Shawenegan Falls — C. Gingras, Cedar Ave.—additional equipment for sash and door factory.

Que., Sillery—Quebec Pulp & Paper Co., Ltd.—groundwood pulp mill equipment, capacity 100 ton per day.

Que., Upton—L. O. Donais & Fils—additional sawmill equipment.

Metal Working Shops

Ark., Camden — O. B. Burns (Hudson dealer) awarded the contract for the construction of a 2 story, 50 x 110 ft. garage on Adams and Jackson Sts. Estimated cost $40,000.

Calif., San Francisco—L. R. Lurie, 315 Montgomery St., is having plans prepared for the construction of a 1 story garage on 7th and Bryant Sts. Estimated cost $40,000. O'Brien Bros., Inc., 315 Montgomery St., Archts. Pickwick Corp. and Pacific Auto Stage Lines, 3730 Mission St., San Francisco, lessee.

Calif., San Francisco — Williams Bros. Aircraft Corp., 1211 Van Ness Ave., is having plans prepared for the construction of a 2 story, 100 x 200 ft. factory on 25th St. between Potrero Ave. and Utah St. Estimated cost $40,000. R. R. Irvine, 736 New Call Bldg., San Francisco, Archt.

Calif., South San Francisco—The Metal & Thermit Corp. awarded the contract for foundations, grading, etc., for proposed factory. Estimated cost $80,000. Noted May 17.

Calif., Stockton—The Davis-Heller-Pearce Co., Delta Bldg., will build a 2 story, 100 x 100 ft. garage and automobile sales building on American and Channel Sts. Estimated cost $80,000. Studebaker Agency, Miner Ave. and Sutter St., Stockton, lessee.

Conn., East Hartford (Hartford P. O.)—D. B. Roberts, 275 Connecticut Blvd., plans to build two 2 story salesrooms and garages. Estimated cost $40,000 each. Engineer or architect not selected.

Conn., Hartford—A. R. Blumenthal, 299 Grafield St., is having plans prepared for the construction of a 2 story, 120 x 120 ft. garage, etc., on Morgan St. Estimated cost $60,000. B. A. Sellew, 721 Main St., Hartford, Archt.

Conn., Middletown—B. Williams, 34 Silver St., South Farms (Middletown P. O.), awarded the contract for the construction of a 1 story, 90 x 90 ft. garage on Center St. Estimated cost $40,000.

Conn., Plantsville — The Walker Stuart Fdry. Co., Summer St., plans to build a 2 story factory. Cost will exceed $40,000. Engineer or architect not selected.

Ky., Louisville—E. Straus, 4th and Market Sts., plans to build a plant for the manufacture of store and office fixtures on Baxter St. and Hamilton Ave. Estimated cost $200,000. Engineer or architect not selected.

La., New Orleans—H. M. Field awarded the contract for the construction of a garage on Howard Ave. and Carondelet St. Estimated cost $40,800.

La., New Orleans—The Todd Eng. Dry Dock & Repair Co., South Peters and Howard Sts. has had plans prepared for the construction of two warehouses and shop buildings. Estimated cost $60,000 each. W. E. Hart, c/o Enterprise Electric Co., 826 Baronne St., New Orleans, Archt.

Minn., St. Cloud—A. Peter and A. J. Durupt plan to build a 2 story, 66 x 150 ft. garage. Estimated cost $40,000.

Mo., St. Louis—The Pevely Dairy Co., 1001 South Grand Blvd., awarded the contract for the construction of a 2 story, 150 x 170 ft. garage on Chouteau St. Estimated cost $100,000.

Mo., St. Louis—The St. Louis-San Francisco R.R., 900 Olive St., awarded the contract for the construction of 1 story repair shop, 20 stall roundhouse, power house, machine shop, mill shop, store room, etc., on Fyler Ave. Estimated cost $500,000. Noted June 7.

N. Y., Glendale (Brooklyn P. O.)—The Osbruck Realty Co., Inc., 2332 Myrtle Ave., Ridgewood, (Brooklyn P. O.), will build a 1 story, 102 x 186 ft. garage by separate contracts under architect's supervision, on Pansy St. south of Central Ave., here. Estimated cost $40,000. H. C. Brucker, 2541 Myrtle Ave., Ridgewood (Brooklyn P. O.), Archt.

N. Y., Yonkers—The Otis Elevator Co., 11th Ave. and 26th St., New York City, awarded the contract for the construction of a 5 story, 90 x 145 ft. addition to its plant, here.

O., Cleveland—The Euclid-66th Co., c/o J. J. Klein and G. B. Harris, Engineers Bldg., awarded the contract for two 2 story, 75 x 100 ft. and 80 x 110 ft. automobile sales and service buildings at 6604 Euclid Ave. Estimated cost $150,000. Noted July 5.

O., Cleveland — L. J. Hostetter, 10803 Earle Ave., has had plans prepared for the construction of a 1 story, 50 x 127 ft. garage at 2024 East 70th St. Estimated cost $40,000. J. H. Graham & Co., 8201 Cedar Ave., Cleveland, Archts.

O., Cleveland — The Lees-Bradner Co., 6210 Carnegie Ave. (gear cutting), is receiving bids for the construction of a 1 story, 55 x 100 ft. and 30 x 100 ft. machine shop and storage building. Estimated cost $50,000. E. J. Lees, Pres. W. J. Wefel, Union Bldg., Cleveland, Archt. Noted July 5.

O., Cleveland—M. Rubin, c/o A. F. Janowitz, Archt., Standard Theatre Bldg., is having plans prepared for the construction of a 1 story garage on Lakefront and Hartshorn Rds. Estimated cost $40,000.

O., Cleveland—H. S. Thomas, c/o Stutz Motor Co., 4310 Carnegie Ave., plans to build a 1 story addition to garage and salesroom on a 66 x 186 ft. site at 4211 Carnegie Ave. Estimated cost $50,000. Engineer or architect not selected.

O., Euclid—K. F. Spietl, 3439 East Scarborough Rd., Cleveland Heights (Warrensville P. O.), has had plans prepared for the construction of a 1 story, 40 x 100 ft. commercial building and garage, here. Estimated cost $40,000. A. C. Wolf & F. M. Griffith, Swetland Bldg., Cleveland, Archts.

O., Sycamore—The Blu Bar Mfg. Co. plans to rebuild its plant for the manufacture of children's vehicles, etc. Estimated cost $50,000. Engineer or architect not announced.

Ore., Portland—The Oregon-Washington Ry. & Navigation Co., Wells Fargo Bldg., plans to spend $181,825 for shops and tools. G. H. Robinson, Purch. Agt.

Pa., Neville Island (McKees Rocks P. O.)—The Dravo Contg. Co., Diamond Bank Bldg., Pittsburgh, will build a 1 story, 75 x 273 ft. structural shop, here. Estimated cost $75,000.

Pa., Orangeville — Orangeville Brick & Sheet Products Co.—brick making machinery and equipment for proposed $100,000 plant.

Pa., Rankin (Braddock P. O.) — The Acheson Mfg. Co. (plumbing) is having plans prepared for the construction of a 1 story, 100 x 200 ft., 80 x 150 ft. and 100 x 150 ft. steel factory. Estimated cost $150,000. Private plans.

Tenn., Memphis—The City, C. C. Pashby, Clk., will soon award the contract for the construction of a 1 story shop building. Jones & Furbringer, Porter Bldg., Memphis, Archts.

Tex., Tremble (Fort Worth P. O.)—The Texas & Pacific R.R., Union Sta., Fort Worth, is having plans prepared for the construction of shops, roundhouses, etc., here. Cost will exceed $500,000. E. F. Mitchell, Texas & Pacific Bldg., Dallas, Ch. Engr.

Wis., Janesville — The Chevrolet Motor Co. is having plans prepared for the construction of a 1 story, 90 x 288 ft. factory. Estimated cost $100,000. C. E. Wilson, c/o owner, Archt.

Wis., Madison—The Schmidt Bros. Co., c/o A. J. Schmidt, 2611 Monroe St., will build a 1 story, 60 x 125 ft. garage and repair shop. Estimated cost $40,000. Noted July 5.

Wis., Madison—Small & Fladd, Archts., Ellsworth Bldg., are receiving bids for the construction of a 1 story, 60 x 87 ft. garage for the Madison Ford Garage, 210 East Washington Ave. Estimated cost $40,000. L. F. Schoelpopf, Mgr. Noted June 21.

Wis., Milwaukee—R. L. J. Clark, 2218 Meinecke Ave., awarded the contract for the construction of a 2 story, 100 x 140 ft. garage on 20th St. Estimated cost $60,000. Noted Feb. 8.

Wis., Milwaukee—The Modern Auto Repair Co., 2431 State St., will soon award the contract for the construction of a 1 story, 110 x 125 ft. addition to its garage. Estimated cost $50,000. H. T. Schramek, 808 South Pierce St., Milwaukee, Archt.

Wis., Racine—The Amer. Skein & Fdry. Co., 23rd and Racine Sts., awarded the contract for the construction of a 2 story, 42 x 140 ft. foundry. Estimated cost $40,000.

ADDITIONAL OPPORTUNITIES

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SEARCHLIGHT SECTION

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American Machinist
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Six Months in the Metal-Working Industries

Happenings in the Machinery Field Since January

By K. H. CONDIT
Editor, *American Machinist*

Last six months have seen returning prosperity—Reduction of unemployment followed by increased wages — Records fall in automobile, railroad, and iron and steel industries

UNTIL one takes the time to sit down and run through the news pages of such journals as the *American Machinist* it is hard for him to realize just how much can happen in one brief half year. When he does run through the news of the machinery industry carefully he begins to understand what a truly marvelous enterprise it is and how important has been its function in developing the material side, at least, of our modern civilization. Without the machinery which is responsible for present-day production, transportation and communication the whole intricate structure would soon fall and bring chaos to all but the most primitive and isolated human beings.

So much for the relative importance of the industry with which we are mostly concerned. What has transpired within it and affecting it since Jan. 1, 1923?

About the first events of importance were the national automobile shows. At New York many builders of machine tools, parts and equipment were represented in creditable exhibits. In connection with the show there was some talk that the automobile was so well established that there would be no need for future exhibitions with their attendant expense. It will probably be some time before such an institution as the automobile show has come to be, is allowed to die out. Further details of the automobile situation will be found in Mr. Reeves' review.

Exhibitions

The usual elaborate machinery exhibit in connection with the railroad mechanical convention at Atlantic City failed to materialize this year as the meeting was held in Chicago. The foundrymen had their usual big display which included many machine tools and other machine shop equipment. It was in Cleveland.

Plans for Philadelphia's Sesqui-Centennial to be held in 1926 began to take shape both from the industrial and engineering standpoints. There will be an international engineering congress during the celebration and the industrial exhibits will probably be the finest ever staged here or elsewhere.

A centennial of unusual interest to mechanical men took place in April when the Delaware & Hudson Company, as the first steam railroad to round out one hundred years of corporate existence, staged a dinner and special train excursion over its lines. Stress was laid on its part in developing the anthracite coal industry of the United States.

The Coal Situation

Which brings us to the coal situation, always important where machinery is concerned. The President's Fact Finding Commission under the chairmanship of John Hays Hammond has been working hard to get at the basic economic facts underlying our uneconomic coal situation. They have pointed out that there are quite a few too many bituminous coal mines and far too many coal miners. Engineering practice has been pronounced generally good but distribution methods are open to criticism. Their dictum to the hard coal miners and operators that the public will not stand for another coal strike seems to have had something of a sobering effect.

Another phase of the coal situation is the assigned car practice which the Interstate Commerce Commission has ordered stopped. In handing down the ruling one of the commissioners took occasion to hand the coal men several Irish bouquets. The Commission has lately been holding hearings on the railroad consolidations authorized by the Transport Act. Some hesitancy has been shown by strong, well-managed roads to take on the burdens of the weaker sisters. Physical

achievements of the railroads during the six months have been noteworthy. Car loadings have reached record figures one week only to be surpassed the following week. Details of the motive power and shop situations will be found in Mr. Colvin's review on another page. Railroad earnings have at last begun to approach the rates mentioned in the Transportation Act. As a result deferred maintenance of way and shop equipment may be remedied.

Records have also fallen in the iron and steel industry, producer of the raw material for the machine shop. The building boom which was checked on the verge of dangerous inflation was responsible to a large extent for the demand for steel although the railroads have also been rather heavy purchasers. The long-expected report of the Iron and Steel Institute's 12-hour day committee was a great disappointment in many quarters and has resulted in stirring the church investigators to renewed activity. In view of the report made by the 12-hour day committee of the Federated American Engineering Societies there is no cause to be surprised at the reaction of the churchmen to the Institute's report.

The wave of returning prosperity has practically eliminated the unemployment problem which was so serious a year ago. Detroit and the automobile factories felt the effects first and were the first to begin scouting for help. The shortage has become general since then and has been reflected in increased wages. About the only serious labor troubles seem to have been in the building trades.

The immigration question has naturally shown signs of returning animation as labor became scarce. Some people would have us let down the bars entirely and let "nature take its course." Others would put up more bars and keep out everybody. The golden mean has not been discovered and in the meantime the thing to do seems to be to treat the men you have so that they will stay with you and give them the best machinery and equipment available so that their efforts may be multiplied to the greatest possible extent, a good way to proceed at any time.

Another great help to economical production is standardization or, as some prefer to call it, simplification. Interest is growing steadily in this direction and engineering, government and industrial organizations are all doing their part to speed the good work. Screw threads, paper sizes and grades, preferred numbers and gears are among the many items receiving special attention at present.

No review of the machinery industry would be complete without mention of those who have made their mark on its tablets and gone beyond. A few of the many who have answered the last call are: John Armstrong, Armstrong Bros. Tool Co.; Clarence S. Bement, former president Bement-Miles Co.; Winslow Blanchard, Blanchard Machine Co.; James W. Carpenter, J. M. Carpenter Tap & Die Co.; Clyde M. Carr, Joseph T. Ryerson & Son, Inc.; F. C. Furlow, Otis Elevator Co.; W. H. Jennings, Murchey Machine & Tool Co.; A. B. Landis, A. B. Landis & Co.; C. K. Lassiter, Consolidated Machine Tool Corp.; Ernest Mills, Smith & Mills; Oscar E. Perrigo, Pratt & Whitney Co.; George A. Rentschler, Hooven, Owens & Rentschler Co.; W. T. Sears, Niles-Bement-Pond Co.; Henry S. Shaw, former president Boston & Maine R.R., Saco-Lowell Works and other companies; Charles Sheldon, Whitman & Barnes; C. T. Taylor, William Cramp & Sons Ship & Engine Building Co. and De La Vergne Machine Co.; M. C. Townley, Walcott Lathe Co.; Arnold Turner, Turner Machine Co.; Peter Weber, Sloan & Chace Mfg. Co., Ltd.; Dr. S. S. Wheeler, Crocker-Wheeler Co.; Frank E. Wing, L. S. Starrett Co.; Henry Woodland, Allis-Chalmers Mfg. Co.

Record Demand for Motor Transport

By ALFRED REEVES
General Manager National Automobile Chamber of Commerce

Heavy closed car sales expected in Fall — Keen competition with low prices, improved highways and suburban growth creating increased use of cars and trucks

EXTRAORDINARY demands for individual transportation and for motor trucks, marked the first six months of 1923. The development of the first half of the year has been in the line of production, merchandising and administration rather than in technical features.

It is true that some cars are adopting four wheel brakes, novel gearshifts are being introduced, one line has added an air-cooled motor, permanent tops are in vogue, and experiments are being made with balloon tires. Each manufacturer, in short, is working on details which he believes will meet with public demand; but fundamentally the construction of cars has not been changed.

The outstanding fact of 1923 thus far has been the record production which amounted to two million vehicles in the first six months as compared with 1,161,000 in the same period last year.

Motor vehicle output is usually heaviest in the first part of the year so that the industry is looking for some seasonal recession, but the production this year will be well over the three million mark, which is far above the record of 2,659,000 cars and trucks manufactured in 1922.

There are several factors in the situation in 1923 which have contributed to the great increase in motor transport.

Motor vehicle values are the best in history. The reduced prices of 1921 have been generally adhered to despite rising material and labor cost. The makers

have counted on volume of business rather than profit per unit for their reward.

Merchandising has been better organized. Corporations are buying cars for their salesmen. Many concerns such as Armour & Co. find that the vehicles yield a profit in the added time efficiency of the salesman.

Rapid Growth in Highways

Highway building is going forward at the rate of 20,000 miles per year. This means an added usefulness and resultant demand for the motor car.

Highway intelligence is likewise on the increase. The public is getting a better understanding of how to handle traffic. Two states and thirty-eight cities reduced their traffic fatalities in 1922, and it is hoped that the record will be improved upon this year.

City planning commissions are working on the traffic problem in cities.

Aside from the remedy of wider thoroughfares, parking buildings, and one way streets, relief is looked for in the development of suburbs.

The counties of Long Island which lie outside of Greater New York have increased their motor car registration nearly four-fold and the number of trucks nearly five-fold in the past six years. There have been 60,000 homes built in that territory during this period.

It is apparent then that 1923 is proving itself a year not only of large usage of motor transport and of record manufacture, but it is also a time when the current issues of traffic are receiving attention.

Prospects

In view of a production of 2,000,000 vehicles for the first six months, it is natural to expect a slowing down during the last six months. This slowing down usually comes in June and while there was some letting down during last month it was less than expected.

There should be a substantial buying of open cars during the summer but a slowing down in the fall.

The closed car continues in very heavy demand and there are many who look for the production within the next year or so to run sixty per cent closed as compared with the present thirty-seven per cent closed.

Competition is very keen among the various manufacturers. Prices are being held very low, with a view to maintaining as big a production as possible.

Railroad Manufacturing and Repair Shops Busy During the Past Six Months

By FRED H. COLVIN
Editor, *American Machinist*

Much new rolling stock put into service and many orders placed — Some new shop equipment purchased, but repair shops generally poorly equipped

A REVIEW of the railroad shop situation for the first six months of 1923 leads us to believe that it is safe to say that there is an awakened interest on the part of railway officials in improved shop methods and in the general betterment of the mechanical department. It is still true, however, that in too many cases the real railroad heads, those who control the purse strings, are more financiers than railroad men and do not appreciate the part which good shop equipment and standardized rolling stock play in economical railroading.

Advantages of Simplification

There are some roads which refuse to be carried away with the desire for newer types of locomotives every time an order is placed. They have selected a few well known types which have proved suitable to their needs and stick to them in spite of pressure from inventors and builders, with royalties to collect on patents of doubtful value. These same roads are eliminating older types as fast as possible, realizing that the fewer kinds of locomotives they have, the lower the repair costs and the less time is lost by keeping engines in the shop.

More shop equipment is being bought by many roads and there is a renewed interest on the part of railroad shopmen for better methods. This is the natural result of a more liberal allowance for new machinery, as no one can maintain very high enthusiasm in reducing costs when the management refuses to co-operate in the way of better and much needed machinery for the shop. There are instances, however, where machines which have done duty for from thirty to fifty years are still in service.

Much of this comes from the refusal of the higher officials to recognize the railroad as an active part of the problem of economical transportation. It is looked upon solely as an expense, and the part it can play in reducing transportation costs is seldom recognized. When officials will refuse to sanction the expenditure of three thousand dollars for a machine which is necessary to keep two million dollars worth of electric locomotives in operation, there is good evidence that a new brand or directors is sorely needed.

Money Not Actually Saved

Nor is the money which they refuse to appropriate really saved, even in the crudest sense. For in most cases it simply compels the railroad shop officials to build some sort of a makeshift machine to do the work, costing much more than the one asked for, and to disguise the expenditure under the head of shop maintenance. Nearly all of the home-made devices, with which railroad shops abound, are the result of refusal

to purchase proper machines for the work to be done. The cost is nearly always higher and the output lower than if standard machines had been purchased.

Then, too, the effect of this on the men is far from favorable for securing real production. Being brought up on makeshift devices and believing them to be the best for the purpose, they do not realize what standard machines could and should do and are content with less than the normal output. This is not so much from a desire to hold back, or delay production, as from a lack of knowledge as to what modern machine tools can really accomplish. Furthermore it leads to an inordinate amount of time being wasted in tinkering up some device to do the work which can be done better and cheaper on a standard machine. Why are railroad shops so full of home-made devices? First because of the necessity of getting something to do the work and later because of the ingrown idea that home-made devices might be better for the work to be done. There is an indefensible idea that railroad shop work is "different" from that done anywhere else.

The purchasing agent has also played a disastrous part in demoralizing the personnel of the railroad shop. Being all-powerful in many cases he could absolutely ignore the requests for certain machines for the work to be done, and substitute others simply on the basis of price, or because of other reasons which need not be mentioned. This alone has had much to do with the attitude of indifference which so many complain of in the railroad shop. For how can foremen be highly enthusiastic over their work when their judgment as to machines needed can be thwarted by a man who does not know a monkey wrench from a buzz saw? There is, fortunately, less of this than formerly, and this is one of the hopeful signs of real improvement in the railway situation.

Railroad shop executives appreciate many of the shortcomings of the present system and are keen for betterments of many kinds. Many of them refer to the Ford shop and envy the possibility of securing the best machines for the work from a purely efficient standpoint. They also realize that, while the Ford method of making repairs is costing more money than is usual at present, it will eventually show its economy. Given the opportunity to study machining methods in other shops, the most modern machines for the work, and the incentive which other industries offer, and the railroad shop man will hold his own with any machine shop executive doing a similar variety of work.

There has been considerable buying of new locomotives and cars during the first half of the year. Up to June 9 the locomotives numbered 1,684, freight cars 67,209 and passenger cars 1,300. Of these locomotives the great majority were the heavier types, Mikados, Decapods, Santa Fe's and Pacifics making up over 1,100 of the total.

The Car Service Division of the A. R. A. reports records of over 50,000 freight cars and over 1,200 locomotives being put into service since Jan. 1, 1923. This increase is encouraging but it also emphasizes the need for better and more efficient shop equipment to reduce the cost of maintenance, for a good many of the repair shops do not possess tools big enough to handle the parts on the heavy locomotives being put into service.

First Half of 1923 Sees Big Advance in Electric Power and Manufacturing Industries

By ROBERT M. DAVIS
Statistical Editor, *Electrical World*

Increased cost of equipment, fuel and labor has brought economies of generation to the front—Tendency toward larger turbo-generators—Big financial programs laid out

THAT the electric light and power industry is one of the fastest, if not the fastest growing industry in America today, will be denied by few authorities on industrial activities. And at no time in the forty years' history of the industry has its annual expansion been greater than that which is being witnessed during 1923. It is estimated that the electric light and power industry will spend $602,143,000 for additions and extensions during the present year, of which $283,813,000 represents the value of prime mover and generator equipment. In 1922 only $164,333,000 was spent in additions and extensions to generating plants and in 1920 only $95,666,000 was so spent.

The demands for more and more electrical energy at a comparatively low cost to the consumer despite the abnormally high cost of equipment, fuel and labor, has kept the problem of economic generation continually in the foreground. Greater efficiency in fuel consumption by improved stokerage and boiler construction has resulted in a saving to the industry during the last three years of almost eleven million tons of coal representing a value of over ninety-two million dollars. The advent of pulverized coal has stimulated strong competition on the part of multiple-retort and traveling-grate stokers, which are still the mainstay of all central stations. Considerable attention is being given to boiler furnace construction which will conserve heat and reduce maintenance. Excellent results are reported with high-temperature furnace installation in firebrick form which will withstand a pressure of 40 lb. per square inch at 1,900 deg. F. without shrinkage.

In the design of boilers the radiant heating surface is being increased where possible. Double-deck construction is being used in central stations not employing economizers. Where economizers are used the pressure type are being provided consisting of modified

boiler head sections having one pass and operating on the counter-flow principle with high gas velocity. Radiant-type superheaters and steel-tube cast-iron shell economizers have come into more prominence during the past year.

Elimination of causes of past turbine trouble, the development of record breaking sizes, provision for bleeder or mixed pressure operation and acceptance of orders for turbines operable at high steam pressures are the outstanding features of turbine development during the past year. The difficulties experienced with buckets and wheels due to axial vibration and the approximate coincidence of four-node and six-node critical speeds with the operating speeds have been carefully studied and have been overcome. Among other improvements which have been made are the provision of removable and replaceable low-pressure nozzles, improvement of nozzle partitions, provision of steam-sealed labyrinths with non-corrodible teeth, the use of cast-steel valve casings and turbine heads for temperatures of 450 deg. F. and greater, the elimination of vertical joints in high-pressure casings, and the redesign of emergency governors which permits testing them without disconnecting the generator from the line.

The most remarkable steam turbines for rating are the single-case units being constructed for the Brooklyn Edison Company, which are rated 62,500 kva. The 35,000-kw. base-load turbines which are being built for the American Gas and Electric Company to operate at 500 lb. pressure and 725 deg. F. are unapproached by any other turbines on order so far as pressure and temperature are concerned.

The Export Situation in Machinery

By W. H. RASTALL
Chief, Industrial Machinery Division, Bureau of Foreign and Domestic Commerce

American machinery exports seem to have reached a stable position—Comparison with exports of United Kingdom—Relative importance of various markets for our machinery

THE EXPERIENCE of the past half year indicates that our export trade in machinery has once more reached a basis that may be considered stable although there is still doubt as to whether it should be called normal or subnormal and in any case it is a very different basis from any we have ever considered normal heretofore. During the eleven months ending May 30, 1923, the exports of certain classes of industrial machinery were valued at $111,223,917 as compared with $111,062,261 for the corresponding period a year ago, but with $315,762,672 the year before that. During the war and the post armistice boom this trade was very large, but since early in 1920 it has been receding and although always fluctuating quite widely, and each type of machinery reacting a little differently from every other type, the trade appears to have reached its minimum at about $120,000,000 per year and may be expected to expand as conditions in certain foreign countries become stable and the general world situation improves.

The trend of this export business is shown more clearly by the returns of Table I, which exclude locomotives, electrical materials, typewriters, sewing machines, and all but strictly industrial machinery. Unfortunately it is not possible to develop an index number that can be applied to these returns.

In pre-war years Germany supplied about forty-five per cent of the machinery entering the international trade of the world. This was stopped during the war, resumed with the armistice, encouraged by the decline of the mark, restricted by other post-war conditions, but now it appears that Germany is no longer a really important factor in this trade. Apart from the small amounts of machinery exported from France, Switzerland, Italy, Holland, Sweden, and Japan, the machinery trade of the world is divided between British and American producers and it is to be expected that the latter will be able to take over a fair proportion of the business formerly secured by German manufacturers provided it is given adequate attention.

Also one would expect that up to this time American participation in this international machinery trade would decrease and British participation increase for at the time of the armistice British producers were more or less out of the market while American manufacturers were enjoying an exceptional trade. The experience of the markets of Japan and China shows what has actually happened and as is indicated by Table II

TABLE I—YEARLY EXPORTS OF MACHINERY

U. S. EXPORTS OF INDUSTRIAL MACHINERY

Fiscal Year	
1910	$ 49,117,620
1913	88,058,604
1915	73,264,575
Calendar Year	
1919	284,678,786
1920	324,252,357
1921	208,798,201
1922	112,288,922

TABLE II—EXPORTS OF MACHINERY TO CHINA AND JAPAN

	Percentage of Machinery Imports into China		Machinery Imports into Japan	
Year	From U. S.	From United Kingdom	From U. S.	From United Kingdom
1910	....	....	11.1	81.4
1911	5.8	35.5	13.6	72.1
1912	3.8	37.5	13.4	63.3
1913	9.4	45.4	9.4	66.4
1914	8.3	46.0	15.3	59.6
1915	14.7	44.5	28.0	59.1
1916	17.6	38.4	46.0	45.1
1917	23.6	27.6	52.3	39.8
1918	30.4	16.7	78.5	17.5
1919	45.0	14.4	74.0	18.6
1920	54.1	23.2	64.0	31.5
1921	38.6	38.8	47.9	41.4

it would appear that the time has come for American interests to give careful study to the causes reflected by these returns, and possibly arrange to cultivate these and other markets much more earnestly.

It is, of course, recognized that there are great differences between the machinery supplied from these different sources and that price, design, and a number of other factors enter into the problem; also it should be noted that while the average American manufacturer exports say twenty per cent of his product, the British producer looks to foreign markets for about sixty per cent of his business, so must be more deeply interested in this trade. But notwithstanding all this the fact remains that it is perfectly possible for American producers to secure a very satisfactory volume of business in foreign markets and the indications are that these markets deserve much more consideration than they now receive. It might also be added that, properly handled, this foreign business should be the most attractive that comes into the shop.

Among the foreign markets conditions are showing signs of a change. Until recently the markets of Europe have been contracting while those of Latin America and Asia have been taking an increasing proportion of our machinery exports. Table III is presented to illustrate this situation. Although the markets of Europe show signs of absorbing regularly about $20,000,000 worth of American machinery, it would still appear to be good policy to give closest attention to the non-European markets.

TABLE III—RELATIVE IMPORTANCE OF MACHINERY MARKETS

EXPORTS OF MACHINERY FROM THE UNITED STATES

	Europe		Latin America		Asia	
1910	$14,148,759	28.8%	$13,483,948	27.5%	$3,666,244	7.4%
1913	28,118,549	32.0%	19,085,692	21.7%	4,610,045	5.2%
1915	38,218,925	53.6%	11,059,820	15.1%	3,777,440	5.2%
1919	100,396,893	35.2%	54,561,206	19.2%	61,879,671	21.7%
1920	90,730,853	28.0%	88,258,643	27.2%	65,308,252	20.1%
1921	41,100,145	19.7%	70,334,654	33.7%	55,598,449	26.6%
1922	23,236,149	20.7%	28,020,356	24.9%	31,036,614	27.6%

Although it might be possible to go further and point out that during the past year gratifying increases have been noted in the export of mining machinery, construction machinery, metal working machinery, etc., it is necessary to remember that business of this character may be expected to fluctuate widely and it is scarcely wise to emphasize too much the returns for isolated periods. On the average, American machinery manufacturers export nearly twenty per cent of their production (some export sixty per cent) and this is the real basis to be used in estimating the probable value of export trade.

Price Curves of Machine Shop Supplies Show Tendency to Flatten Out

BY ALDEN W. WELCH
Manager Business News Department, McGraw-Hill Co., Inc.

Prices of materials average thirty per cent higher than year ago—Metals market weaker—Not much change in other supplies recently

IN KEEPING with costs in general the prices of machine shop materials and supplies rose to high levels during the last year and now for several months have remained fairly stationary. Three months ago prices of non-ferrous metals began to descend toward a dull and weakened market condition, which has been reached. The reason was lessening demand. Steel, on the other hand, remained firm during this period.

The present high production of iron and steel is chiefly to fill orders already on the books. New business is small. The price of pig iron has been falling since early May; but the steel base has been maintained for the last two months, although the premium charged for immediate delivery has disappeared.

Supplies such as lard cutting oil and abrasives have taken rather sharp upward turns of late, owing to increased demand brought on by higher production schedules.

Steel.—Soft steel bars have advanced steadily since April, 1922, at which time they were $2.25 per 100 lb. at Cleveland warehouse, taking this point as being fairly representative of the general market trend. Cold finished shafting and screw stock have followed practically the same trend as steel bars. Quoted at $3.15 per 100 lb. at Chicago warehouse in April, 1922, the price advanced to $4.30, which quotation has prevailed during the last two months. The price tendency on both bars and shafting is easier and present market indications point to a slowing down in production and consequent lowering of prices.

Brass Rods.—The present price at Cleveland warehouse is 21c. per lb., in 1,000-lb quantities. This quotation has remained in effect since March of the current year and represents an advance of 5c. per lb. over the price prevailing one year ago and is ½c. per lb. under the market as of August, 1922.

Drawn and rolled brass products are experiencing a rather quiet market at the present time; curtailment in zinc mining operations having already begun in certain districts. Unusual changes in the copper market are improbable, so far as the immediate future is concerned, owing to the extensive capacities of low-cost producers.

Solder.—In keeping with the other non-ferrous metals, solder reached the peak for the current year in April and declined during the following month to its present level. The current price is 30½c. per lb. at Cleveland warehouse as compared with 22c. in July, 1922.

Drastic price declines have induced considerable purchasing of non-ferrous metals, particularly tin. Present cost levels, however, have remained fairly stable for the last two months.

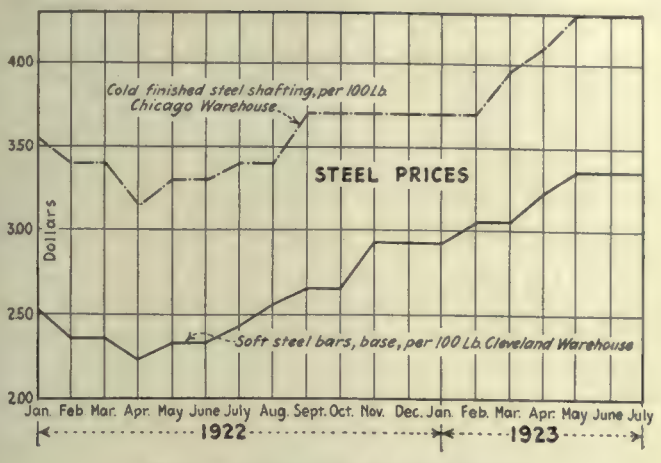


FIG. 1—TREND OF STEEL PRICES

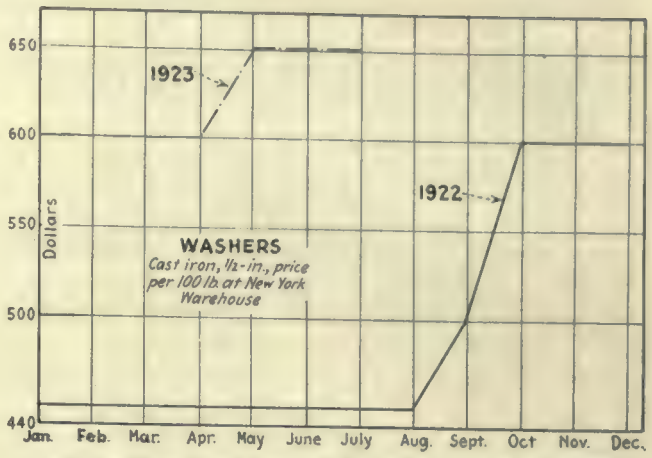


FIG. 4—TREND OF PRICES OF CAST IRON WASHERS

Washers.—Cast iron washers, ½-in., are quoted at $6.50 per 100 lb. at New York warehouses, which price has held since March of the current year. The present level is 50c. per lb. above the high peak of 1922, which occurred during the last quarter of that year, and represents a rise of $2.10 per 100 pounds above July, 1922.

Demand for iron products has picked up considerably with the beginning of July. Favorable signs are evident, particularly in the pig iron market.

Oils.—Lard-cutting oil is quoted at 65c. per gal. at New York warehouses, or at exactly the same level as prevailed between February and June of last year. This commodity, in the meantime, dropped to 50c. between December, 1922, and February of the current year. Machine and engine lubricants are in good demand but with no tendency on the part of buyers to accumulate reserves. The present price level for medium-bodied machine oil is 29.7c. per gal. at New York, against 45c., between January and June of last year. The present price is the lowest quoted since January, 1922.

Cotton Waste.—Present price levels have remained the same since February of the current year, despite curtailment in the textile mills. The current rate of 10c. to 13c. per lb. for white cotton waste at New York warehouses is about 1¼c. above the price prevailing at the opening of the year and 2¾c. higher than a year ago.

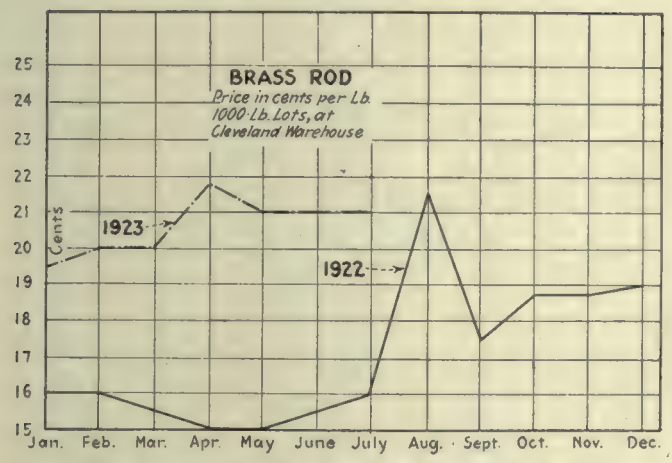


FIG. 2—TREND OF PRICES OF BRASS RODS

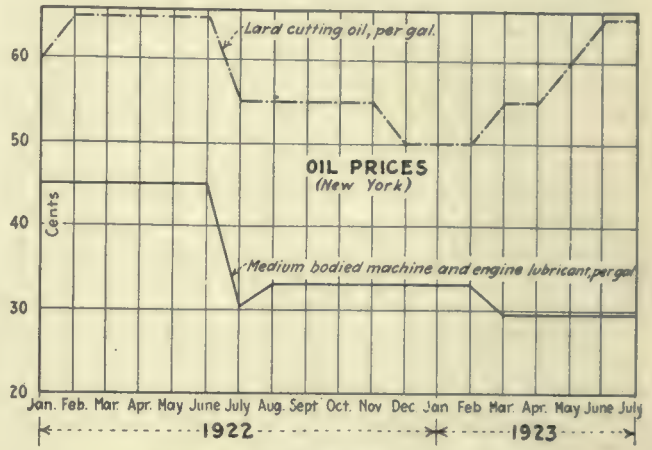


FIG. 5—TREND OF OIL PRICES

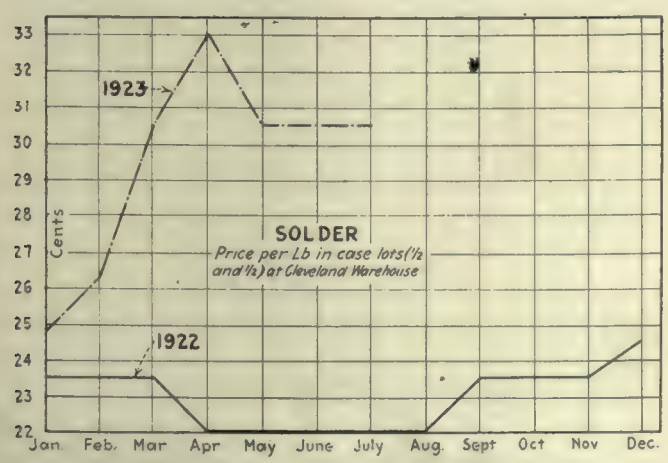


FIG. 3—TREND OF SOLDER PRICES

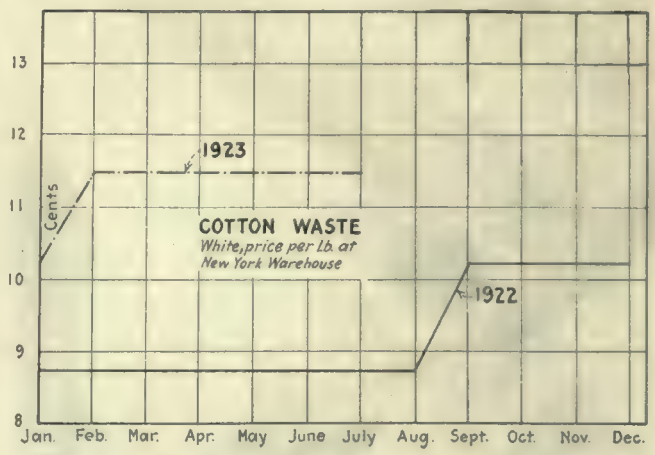


FIG. 6—TREND OF COTTON WASTE PRICES

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors
July 19, 1923

The Shop Equipment Review— A New Feature of American Machinist Service

THERE WAS a time, and not so many years ago, when an ordinary human being could keep in his head a complete index of all the machine tools in existence. The man in need of a new machine had but few makers and fewer styles to choose from. A few lathes, drill presses, planers, slotters, shapers and milling machines, with one or two vertical boring mills thrown in, comprised the entire list. Gear cutting was done by the pattern maker or in the foundry. Now it takes an expert to enumerate the different types and makes of gear cutting machines and to decide which type to use for certain requirements.

At that time grinding machines were confined to the now almost forgotten wet grindstone. Here and there an emery wheel began to show itself in a timid fashion. Now we have more varieties, styles and makes of grinding machines than there were different machine tools of all kinds at that time.

Screw machines were a promise for the future only. Now a man is often hard put to decide which type he shall use, not because of a difference in workmanship or size or price, but because they have been developed and differentiated to such a point that only the man with a thorough knowledge of them all can decide which type or make promises the greatest economy for a given piece of work.

This difficulty of choosing wisely presents itself every time a new machine must be bought. It is not reasonable to expect that a man shall have a clear picture in his mind of all the features of all the existing machine tools. And yet this is necessary if he wants the best value for his money, and especially if he wants the greatest possible production from his men and equipment.

Catalogs? Yes, they help, but most catalog files are incomplete because the collector did not know all the makes and makers and consequently could not ask for their literature. Even if he had a complete file at one time it soon became incomplete and out of date.

The salesman? Yes, he helps too, but he is not going to recommend a thread hobbing machine when he handles thread milling machines only, and vice versa.

This difficulty on the part of the user of having before him a complete résumé of all machine tools in existence and of their special features and relative values for a given piece of work was realized by the *American Machinist* and one or more pages were given to the "Condensed Clipping Index of Equipment." The idea was that the man responsible for the equipment of the shop could clip the items and file them according to his needs. The idea was good, but not good enough. If a single issue of the *American Machinist* was lost or overlooked, the file was incomplete. Besides few busy men have the time to make such a file and keep it up. Then again, unless it is made up in a very handy form, the various clippings pasted on substantial sheets, and numbered and indexed, such a file is not easy to handle. As a result enthusiasm oozes out and the whole scheme is dropped.

The *American Machinist* realized this and made a study of the possible means of putting the valuable information, contained in the "Shop Equipment News" in a form whereby it would become of permanent use to the machine tool buyer.

The present issue is the result of this study. All of the machines, attachments, gages, jigs, tools, fixtures, in short, everything which found a place in the "Shop Equipment News" of the first six months of 1923 has been collected and is reviewed in these pages. It is the intention to give such a review semi-annually. The various items are classified and an index is provided which locates the items. To still further facilitate the finding of a single item, the index gives a sub-classification. Whereas, for instance, the reading matter contains a heading "Drilling Machines," the index goes a step further and mentions "Upright Drills," "Radial Drills," etc. The individual items are placed chronologically, that is, in the order in which they were originally published in the *American Machinist* and are given reference numbers.

The entire section can be lifted out and filed. It should be an easy matter to find a resting place for these pages, a place where they can readily be found, when needed. There is no weekly clipping and filing to be done, there are no numerous little pieces of paper to be taken care of and there is no need of sorting, classifying and indexing them. Keeping the entire section on file will enable a man to see the progress of a certain kind of machine tool at a glance.

The "Review" will make it easy to keep the catalog file up to date, for every item in it calls for new literature, be it a little folder or an entirely new catalog. All that the buyer has to do is to send out circular letters to all the makers mentioned in the review, that is if their product is of interest to him, and request literature on the subject mentioned in the "Shop Equipment Review."

Looking over a few new machines or tools from week to week does not give one the perspective of the development of the machine tool. On the other hand, looking at all the things brought out in the last half year does give such a perspective. Developments come rapidly nowadays and a half year is time enough to indicate the trend. The Shop Equipment Review is the ready means of comparing and recording them. It is not a substitute for the Shop Equipment News Section or the advertising pages but a periodical compilation of the information contained in them.

It is well that the man responsible for the equipment, and consequently for the production in a shop, should have this broad view of the trend of the times, so as to allow him to get the best and latest and yet steer clear of untried and dangerous novelties. It is believed that the Shop Equipment Review will give him the means to get this broad perspective.

American Machinist Shop Equipment Review

Semi-annual résumé of machines, tools and accessories described in the Shop Equipment News section of the American Machinist during the first six months of 1923

Principal Developments of the Present Year

By L. C. MORROW
Managing Editor, *American Machinist*

BY WAY of introduction to our initial semi-annual shop equipment review let us recall in the briefest way the general changes in machine tool design taking place over a period of 35 or 40 years. It is necessary to pass from the type of light-weight, spindle leg, ornamental machine, through a continual evolution during which ornamentation was lost; weight was added; legs were strengthened or changed into bases and cabinets; bearing sizes were increased; spindles were made hollow; cones were reduced in number of steps and the steps made wider; and many similar changes were made. The limit to design was the strength of the cutting tool. Further changes resulted from the development of high speed steel. A general strengthening was necessary; single pulley and direct motor drives were introduced; the geared head came into its own; and the quick-change feed mechanism was highly developed. The more recent changes in machine design are part of a familiar story.

It can easily be seen that changes in design during a given six months might be so few and so unimportant that they could not be considered to point out any tendencies. That is not true of the first six months of 1923; there have been definite tendencies.

The machine special to war work, an outstanding feature as late as 1919, has of course, been dropped, yet there has been a noticeable increase in the use of special machinery, with the tendency away from the strictly single-purpose machine but toward fitting the machine to the job. It is a production improvement of merit. While not in any way limited to special machinery, mention must be made in connection with it of the increased use of the single pulley drive, individual motor drive, full or semi-automaticity, and transmissions of the automotive type. These features are characteristic also of 1923 so-called "standard" machines and when translated into results mean power, flexibility and convenience, long life, resistance to shock, and conservation of human power.

The automatic feature has been developed rapidly during 1923 both to make the workmen's labors easier and of necessity to get along without so many of them, since natural and legislative causes have reduced their number. January to July has seen the introduction of two outstanding automatic milling machines, six or more automatic grinding machines, semi-automatic and automatic lathes for work between centers, and several of the full automatic machines which carry the term automatic as a definitive part of their names. Related to the automatic machine is the station type which continues popular and in which development and improvement go on.

The adoption of features applicable to both automatic and hand operated machines has been noticeable. There have been increases in the development of safety devices, their importance becoming more and more recognized; in the use of brakes to quickly stop revolving spindles, a great time-saver; in the use of roller and ball bearings; in the adoption of hydraulic feeds, and hydraulic drives in the case of two broaching machines; and in the use of the rapid traverse for heads, cross-rails and tables. Fool-proof construction has been highly developed and simplicity has been kept well in the foreground. A notable example of simplicity in design is the 4-gear hobbing machine, and it is worthy of note that the design of that machine was extensively influenced by the customer interested in its purchase.

Grinding machinery has developed rapidly. The adoption of automatic operation has been mentioned. Another important tendency is the growing use of the centerless grinding method. The double-head internal machine has found a place. Automatic gaging has been extended. Maintenance machines for grinding single point lathe, shaper and planer tools, and others for the circular tools, such as hobs, have been brought out. Gear grinding machines have established their worth and reliability and further developments are on the way.

The first half of 1923 has seen increased use of the open-side planer; a leaning toward the crank press for hot pressing and hot forging (the effect of automobile practice); the development of washing machines for metal parts; steady improvement in materials handling machinery; a notable increase in number and quality of tools especially adapted to automobile repair work; and the development of machines for more economical railway work. The makers of gas and electric furnaces and hardening equipment in general have brought out important improvements.

Portable tools this year have had increased use, their reduced prices influencing sales. Multiple-spindle drilling heads have gained in favor. The progress in the standardization of jig bushings and other parts has been promising.

Measuring instruments include among the additions to their family the expanding inside micrometer, the recording scleroscope, gear tooth testing devices, gage blocks, hardness testing devices, and a number of dial gages.

Nineteen-twenty-three so far hasn't made a bad showing in the shop equipment field—better than a great many of the men behind the guns realize, perhaps. If the second half of the year produces as well, and the indications are all in favor of its doing so, there will be excuse for more than mild congratulation.

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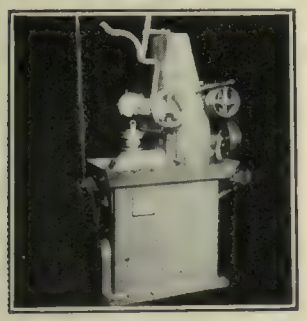
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Boring Machines

— 1 —

Lathe, Vertical, Piston, Zimmerman. *Production Machinery Co., Inc., Main & Horton Sts., Jackson, Mich.* [A. M., vol. 58, p. 316.]

The machine is intended especially for work on pistons. It is shown equipped for taking a finishing cut on the head of the piston with a tool, and then passing an

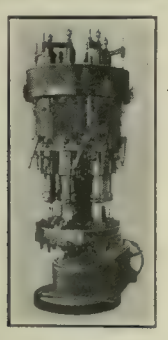


abrasive wheel over the head to give it a highly finished surface. It can be adapted for performing other operations, such as boring and facing the open end of the piston, turning, facing the head and cutting the ring grooves. All the mechanism for the operation of the machine is contained in one unit in the upper portion. The piston is held down by an air chuck mounted on the lower end of the spindle. The work can be provided with six changes of speed. A power feed unit with six changes of both vertical and cross feed can be supplied. Work up to 14 in. long by 10 in. in diameter can be handled. Floor space of single-spindle machine, 24x48 in. Weight, about 2,400 lb. net.

— 2 —

Boring and Turning Machine, Vertical, Continuous, Multiple-Spindle. *Davis & Thompson Co., Milwaukee, Wis.* [A. M., vol. 58, p. 813.]

The machine is intended for simultaneously boring and turning piston-ring pots and similar work. It is of the vertical type and consists prin-

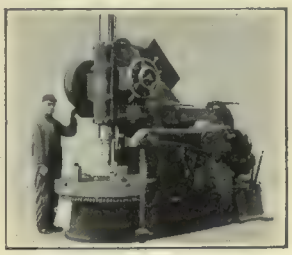


cipally of a central column around which the work table and tool spindles revolve, together with the necessary operating mechanisms. The upper part of the machine, or turret, does not index, but revolves continuously with the work table. The machine carries six tools and six rough castings, and produces six finished pieces with each complete revolution of the table. The process of chucking the work consists of but one operation. Each spindle is 5 in. in diameter and runs in a nut, which by a system of differential gearing and a tripping mechanism is caused to feed and withdraw automatically. Each spindle carries three tool bits for turning the outside of the work and three more for boring the inside. The maximum spindle travel is 18 in. on the machine shown, and the largest diameter of work that can be accommodated is 8 in. The machine can be belt or motor driven. Floor space, 4x6 ft. Weight, 9,500 pounds.

— 3 —

Boring Machine, Car Wheel, Vertical, Motor-Driven 48-Inch. *Niles-Bement-Pond Co., 111 Broadway, New York, N. Y.* [A. M., vol. 58, p. 820.]

The machine embodies a number of features tending toward increased production and safety. An automatic self centering chuck is employed. After the car wheel has been swung into place by the motor-driven crane supplied with each machine, the driving motor is started at

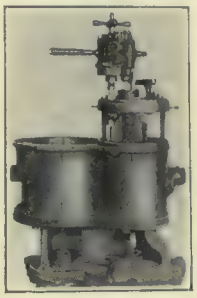


slow speed and causes a mechanism in the table to move the chuck jaws inwardly until they engage the wheel tread. When the work is firmly chucked, the table commences to rotate, and the driving force employed after the cutting operation begins serves to further lock the wheel in the chuck jaws. Upon finishing a job the motor is reversed, and the relative motion between the driving gear and table serves to loosen the jaws and withdraw them. The machine uses reversing motors.

— 4 —

Boring Bar, Portable Outfit. *H. B. Underwood & Co., Philadelphia, Pa.* [A. M., vol. 58, p. 891.]

The outfit is particularly adapted for reboring pump cylinders and air compressor cylinders, either detached or in position on locomotives. The outfit consists of a cutter head and a bearing plate that carries a boring bar, driving spindle and feed screw and that is mounted on a clamping ring. A Morse taper shank on the driving spindle fits the portable electric or pneumatic motor. The feed mechanism operates automatically. To return the cutter head to the top of the cylinder, the motor is placed on the shank of the reverse gear. A gage provides a method of setting the tool. The outfit is made in sizes. The weight of the equipment

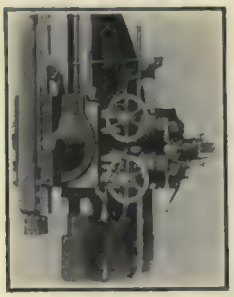


without the motor, with a capacity to bore from 8¾ to 11 in. in diameter by 12 in. stroke is 140 pounds.

— 5 —

Boring Mill, Hand Feed Levers, "Maxi-Mill." *Bullard Machine Tool Co., Bridgeport, Conn.* [A. M., vol. 58, p. 641.]

The "Maxi-Mill" boring mill has been equipped with hand feed levers mounted at both ends of the rail. The operator can thus feed the



tools by hand when starting cuts or when making heavy cuts, and at the same time he can stand in position to closely observe the cut. The length of the levers permits the operator to guide the cutter with greater ease and accuracy when following a form templet. The teeth on the hand lever engage the teeth of the clutch on the hub of the handwheel when the lever is moved forward slightly. The lever automatically disengages.

Drilling Machines

— 6 —

Drilling Machine, Upright, 20-Inch. *Superior Machine Tool Co., Kokomo, Ind.* [A. M., vol. 58, p. 638.]

Six types of the machine are available, depending upon the type of drive and feed. A grooved table for coolant and a pump can be furnished. The B1 machine illustrated is equipped with cone drive, back-gears, geared feed and both wheel and pilot hand feeds. With the back-

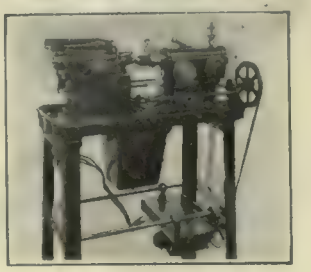


gears in use, the spindle feeds vary from 25 to 226 r.p.m.; and without, from 97 to 875 r.p.m. Six spindle feeds are possible, from 0.005 to 0.018 in. The machine occupies a floor space of 16x47 in., and 16x54 in. with a motor drive. The maximum height is 79 in. A geared motor drive is applicable to all types. Net weight of B1 machine, 790 pounds.

— 7 —

Drilling Machine, Sensitive, Automatic, with Indexing Fixture No. 59. *Kingsbury Manufacturing Co., Keene, N. H.* [A. M., vol. 58, p. 351.]

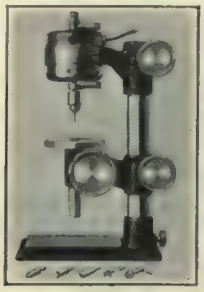
The automatic indexing fixture is here shown used in conjunction with the No. 8 automatic, horizontal, sensitive drilling machine. The complete unit is designed for cross drilling small work such as binding posts, rivets and irregularly shaped pieces. The dial feed reduces the work feeding time, while the drilling is accomplished as rapidly as on a high-speed hand machine. The automatic indexing fixture has a dial containing twelve stations and is indexed by means of a cam cut on the friction cam wheel which controls the feed of the drill. The work is laid on the dial and is automatically clamped in the drilling position. The machine is equipped with a ½-hp. motor.



— 8 —

Drilling Machine, Sensitive, Electric, Bench, "Dumore." *Wisconsin Electric Co., Racine, Wis.* [A. M., vol. 58, p. 388.]

The machine is adaptable to small work where accuracy and sensitiveness are re-

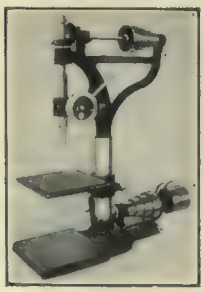


quired. The feed of the 3½-in. work table is sensitive in that it is operated by a rack and pinion feed. The center of the table is 3 in. from the vertical column of seamless steel tubing, and it is bored and reamed to fit the shanks of the drilling fixtures shown. A No. 9 Jacobs chuck is used, with a capacity up to ⅜ in. The Dumore universal motor can be raised and lowered on the column or it can be detached and used as a hand portable drill. The height over-all is 16 in. The machine is operated by means of a foot control'ed rheostat and provides six speeds.

— 9 —

Drilling Machine, Sensitive, Bench, Heavy-Duty, No. 2. *Burke Machine Tool Co., Conneaut, Ohio.* [A. M., vol. 58, p. 499.]

The frame is cast in one piece. The adjustable table is 10x10 in. inside the oil channels, has a vertical travel of 10¾ and can be swung around the column, which is 3 in. in diameter. The spindle is ¾ in. in diameter, has a ball thrust



bearing and a vertical travel of 4 in. Four-step cone pulleys are provided. The cone and drive pulley belts are, respectively, 1½ and 2 in. The drilling capacity ranges up to ⅞ in. and work up to 12 in. in diameter, can be drilled in the center. Floor space, 32x12 in. Height, 39 in. Maximum distance: spindle to table, 10¾ in.; spindle to base, 18½ in. Weight, 170 pounds.

— 10 —

Drilling Machine, Sensitive, Electric, Bench, Type A, "Dumore." *Wisconsin Electric Co., Racine, Wis.* [A. M., vol. 58, p. 643.]

The machine is adapted for fast drilling on work that requires a high speed and a sensitive drilling machine. Raising the table by means of the lever feeds the work to the drill. The machine is equipped with a Dumore universal motor. A foot-controlled rheostat provides a means for regulating the

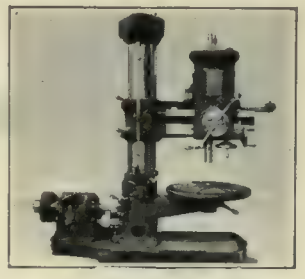


spindle speed. A No. 0 Jacobs chuck is used. The machine is capable of drilling a ⅛-in. hole in steel.

— 11 —

Drilling Machine, Radial, High-Speed, 2- and 2½-Foot. *American Tool Works Co., Cincinnati, Ohio.* [A. M., vol. 58, p. 956.]

The two sizes will drill in the centers of circles 47 and 59 in. in diameters, respectively. The head of the machine is of a double-drive,

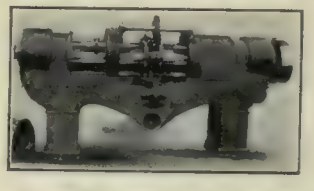


back-geared type, which provides two rates of spindle speed for each speed secured through the cone pulley or six-speed gear box. The twelve speeds thus provided cover a range of from 50 to 900 r.p.m. The head mechanism is fully enclosed in one large, oil-tight housing. Four feeds are provided from 0.0[illegible] to 0.016 in. per spindle revolution. An adjustable friction protects the feed mechanism. The speed box is of the cone and tumbler type with an automatic clutch auxiliary drive which keeps the shafts and gears running while the speed changes are made. A 5-hp. motor is recommended for motor drive. A centralized lubrication system is employed. The machine can be equipped with a constant-speed motor driving through the speed box, with a variable-speed direct-connected motor, or with a double-friction countershaft.

— 12 —

Drilling Machine, Horizontal, Multiple-Spindle, High-Production. *Davis & Thompson Co., Milwaukee, Wis.* [A. M. vol. 58, p. 88.]

The machine will drill, tap, ream, thread or box-mill the opposite ends or sides of a piece of work simultaneously. Multiple heads can be used on the spindles for drilling several holes at once in each part. The cylindrical turret carries the twelve work spindles and revolves continuously. The turret does not index, but the tools operate while the turret is in motion. The position of each spindle can be adjusted. The entire mechanism is gear-driven, any spindle or turret speed being obtainable. The barrel carrying the cam is held stationary while the turret, spindles and end plates re-

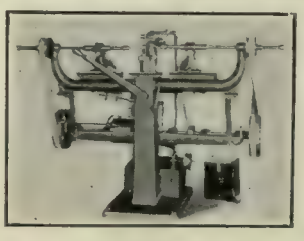


volve. The work is secured by clamps forced in place automatically by means of a wire cable. The machine is ordinarily supplied with a driving pulley, but can be furnished complete with a motor. The bearings are flooded with oil by means of a force pump. Lubricant is automatically brought to the tools through the spindles while the cuts are being taken. Floor space, 4x10 ft. Spindle travel, 14 in. Weight, 1,700 pounds.

— 13 —

Drilling Machine, Opposed-Spindle, Sensitive, Horizontal. *Francis Reed Co., 41 Hammond St., Worcester, Mass.* [A. M. vol. 58, p. 206.]

The machine is intended for drilling from opposite sides two holes placed close

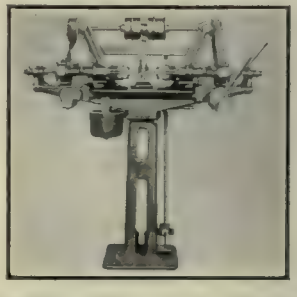


together. The speed and the ease of operation are the principal features of the machine. The spindles are fed toward the center simultaneously by means of the large lever. The adjustable compression springs prevent the pressure on the drills from becoming excessive. The positions of the heads ar adjustable horizontally and one head has a vertical adjustment. The work holder is cam operated, and is arranged to function in conjunction with the hand lever. The operator feeds the work to the fixture with one hand, and feeds the drills forward with the other.

— 14 —

Drilling and Tapping Machines, Multiple-Spindle, Sensitive. *Langelier Manufacturing Co., Arlington-Cranston, R. I.* [A. M. vol. 58, p. 606.]

Two machines have been developed for drilling and tapping the terminal boxes used on electric wiring. The machine shown drills four holes simultaneously and taps them in a succeeding movement, without removing the work from the machine. The work is held in a sliding fixture. Two opposed spindles at the front of the machine each carry a two-spindle drilling unit. The two tapping spindles at the rear of the machine also carry two auxiliary spindles each. The drilling spindles are actuated simultaneously by hand levers. The jack shaft drives the tapping spindles in opposite directions by means of short belts. The reversing clutch is connected with the



treadle. Floor space, 5x2½ ft. Weight, 1,100 pounds.

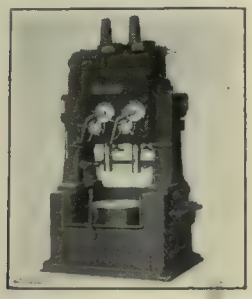
Another machine has been developed for the same class of work where there is but a single hole to be drilled and tapped. There are two vertical spindles and reversal of the tap is accomplished by a Jarvis tapping chuck. The work holding fixture slides sidewise from the drilling to the tapping spindle. The machine occupies a bench space of 1 ft. 6 in. x 1 ft. 3 in. and weighs 250 pounds.

— 15 —

Drilling Machine, Two-Spindle, Vertical, High-Duty, Nos. 101 and 102. *Foote-Burt Co., Cleveland, Ohio.* [A. M. vol. 58, p. 962.]

The machine can be used for simply drilling holes, or

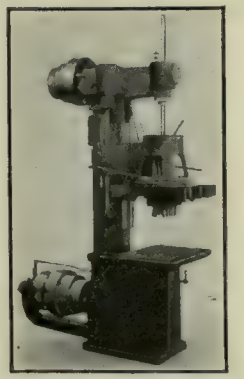
for the performance of such successive operations as drilling and spot facing or reaming. The frame of the machine consists of a base unit and a head unit, between which pedestals are fitted at each side. Four 2-in. bolts extend from the bottom to the top of the machine. When two similar operations are to be performed, a two-station fixture is mounted on the work table. This arrangement enables two pieces of work in one fixture to be under the two spindles, while the finished pieces are removed from the other fixture. Where two successive operations are being performed the table is indexed 120 deg. at each movement, the work being set up at one station, while the first operation is progressing in the second station and the final operation at the third station. Gears are provided in sets to furnish spindle speeds from 43 to 304 r.p.m. Take-off gears afford a range of feeds from 0.006 to 0.168 in. per revolution. The use of two helical pinions and racks for feeding each spindle gives a smooth feed movement. The centrifugal pump has a capacity for delivering 45 gal. of coolant per minute.



— 16 —

Drilling Machine, Multiple-Spindle, No. 12-A. *Fox Machine Co., Jackson, Mich.* [A. M. vol. 58, p. 964.]

The machine is designed especially for small high-speed drills and has a driving

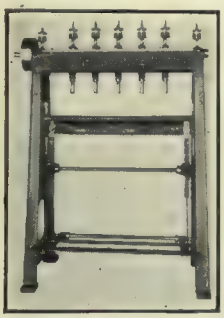


capacity of 10 hp. A motor can be mounted on a bracket in place of the lower cone pulley. In the cone pulley drive type the lower cone is carried on a countershaft which runs in Hyatt bearings and is driven by an Edgemont clutch. The yoke that carries the upper drive pulley also carries the feed gearing. There are three changes of feed by means of sliding gears. The head illustrated is 12 in. in diameter and carries 12 spindles, ⅞-in. in diameter, which can be located to drill at any point within the 12-in. circle. The head is counterbalanced by a weight carried in the column. The spindles have vertical adjustment. Weight 3,070 pounds.

— 17 —

Drilling Machine, Gang. *C. L. Hawes, 12 Adams St., Ashtabula, Ohio.* [A. M. vol. 58, p. 965.]

The spindle drive is through hardened and ground helical gears, each spindle being mounted in an individual head and equipped with ball thrust bearings. The heads



can be moved to any desired position on the cross rail, the minimum distance between spindle centers being 1¾ in. The work table is fed upward by racks and pinions and may be controlled by either hand or foot. Automatic feed can be furnished. Height from floor to center of drive shaft, 52 in. Length of table, 35 in. Maximum distance from table to spindle, 9 inches.

— 18 —

Drilling Head, Multiple-Spindle, Adjustable. *Sellew Machine Tool Co., 28 Bayley St., Pawtucket, R. I.* [A. M. vol. 58, p. 51.]

Each spindle arm of the drilling head is held in position by means of two bolts, the one about which the arm swings being permanent and the other being a removable



locating and clamping bolt. The latter bolt is inserted in the hole desired to give the correct set-up, and the arm with its spindle is then locked in place. The body of the head is attached to the quill of the drilling machine, and the central driving gear is fitted on the outside of the nose of the drilling machine spindle. The head is made in several sizes, and to suit the special requirements of the work that is being performed.

— 19 —

Drilling Machine Table and Vise, Combination. *Modern Machine Tool Co., 601 Water St., Jackson, Mich.* [A. M. vol. 58, p. 203.]

This attachment for a drilling machine serves both as a table and as vise, and can be fitted in place of the stand-

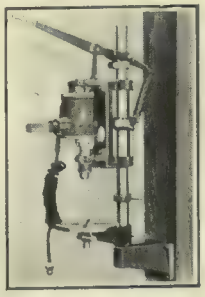


ard table. The table is 19 in. in diameter; the vise can be opened 10 in., so that the table then has a size of 19x29 in. A shank fits in the table socket in such a way that the attachment can be swiveled. It is not necessary to secure a vise to the table of the machine, as work can be clamped directly in the table. When the vise is opened only a small distance, shafts can can be laid in the groove. The table is provided with four T-slots and has hardened jaws.

— 20 —

Stand, Post, Portable Electric Drill. *Standard Electric Tool Co., Cincinnati, Ohio.* [A. M. vol. 58, p. 747.]

The stand can be mounted on a wall or post and it enables a portable electric drill to serve as both a stationary and a portable device. The bracket which holds the drill-

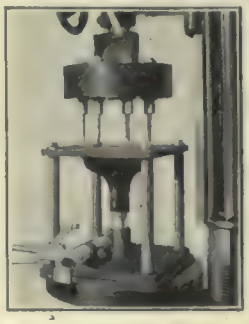


ing machine can be fitted at any point on the column. A quick return and easy feed motion are claimed, due to the method of mounting the lever and spring. The slotted 9 in. table can be adjusted to any point on the column. A vertical adjustment of 15½ in. is provided for the bracket that holds the drill, while the latter has a travel of 3½ in. Height, 36 in. Weight, 75 pounds.

— 21 —

Jigs, Drill, Quick-Acting, Universal, Types A and B. *Cleveland Universal Jig Co., 2005 Oregon Ave., Cleveland, Ohio.* [A. M. vol. 58, p. 821.]

The Type A jig not shown here takes the place of a screw bushing type of jig. By means of racks and pin-



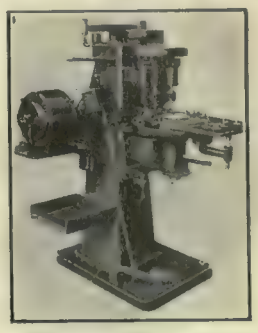
ions operated by a hand lever, two plungers can be operated up and down and locked in any position. The work is clamped under the top plate, which is mounted on the plungers and carries the drill bushing.

The ordinary leg and box type of jig is replaced by the Type B jig shown set up to drill the bolt holes in a bell-shaped casting. The top plate is bored to receive drill bushings. The same handle and rack and pinion movement is used as in Type A, but there is only one plunger moving upward to hold the work against the top plate. By changing bushings and plates many parts can be held.

— 22 —

Drilling Attachment, Automatic Tapping Machine. *Anderson Die Machine Co., 544 Iranistan Ave., Bridgeport, Conn.* [A. M. vol. 58, p. 888.]

This attachment converts the Anderson multi-spindle, continuous, dial-feed tapping machine into a drilling ma-



chine. Nuts or small parts that require to be drilled and tapped may have both operations performed on the machine. Part of the mechan-

ism for reversing the spindles when the machine is used for tapping may be removed as a unit from the top of the machine. By substituting a large spur gear the spindles are given a continuous and uniform rotative movement in one direction only. The up and down movement of the heads remains the same as when the machine is used for tapping. The starting switch is connected to the treadle, so that the machine runs only when the operator stands in his usual position.

— 23 —

Jig, Drill, Universal, Single-Pillar, Self-Clamping. *George A. Gloor.* 646 *Catherine St., Detroit, Mich.* [A. M. vol. 58, p. 891.]

Locating fixtures for any kind of work can be attached to the base of the jig, and bushings for any size hole can be attached to the top plate. The top plate slides on a vertical shaft and is held down against the work by means of a spring. Bearing down on the handle end of the lever raises the top

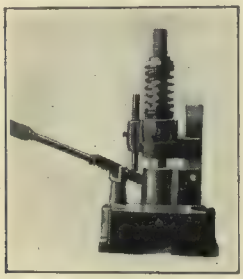
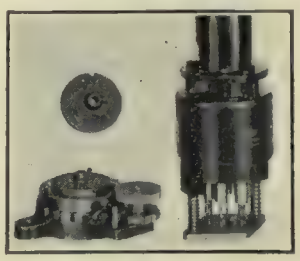


plate so that the work can be located in the jig. When the lever is released, the spring forces the top plate down onto the work and holds it in position for drilling. The jig is adaptable for a large variety of work by changing the bushing and adapter.

— 24 —

Drilling Head, Multiple-Spindle, with Work Fixture. *John H. Dorman,* 5148 *Hudson Blvd. West, West New York, N. J.* [A. M. vol. 58, p. 957.]

The drilling head and jig were designed for drilling holes in plates such as those used in meat choppers. The plate shown is 3$\frac{7}{16}$ in. in diameter, $\frac{7}{16}$ in. thick and has 160 $\frac{1}{8}$-in. holes drilled in 8 circles of 20 holes each. Since the center distances between the holes are too small for the drilling to be done in one operation, alternate holes are drilled in each circle on



opposite sides of the plate, and the drilling completed by indexing the plate 20 times. The indexing jig plate is made of machine steel and has hardened steel bushings. The housing of the head is aluminum. The speed ratio is 2$\frac{1}{3}$ to 1. Heads and jigs can be furnished with spindles spaced to suit different layouts.

See Threading Machines, Tapping.

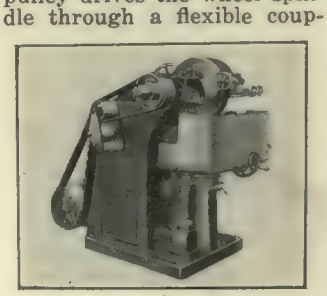
See Small Tools for Cutting Tools and Attachments.

Grinding Machines

— 25 —

Grinding Machine, Centerless, Cylindrical, Heavy-Duty, No. 4B. *Detroit Machine Tool Co.,* 6545 *St. Antoine St., Detroit, Mich.* [A. M. vol. 58, p. 819.]

The machine is intended for grinding straight cylindrical parts on a high production basis. Two abrasive wheels are used, the upper for grinding and the lower for rotating and feeding the work. The feed wheel may be pivoted to vary its angle with the grinding wheel any amount up to 10 deg., thus changing the traverse speed of the work. Control of the cut of the grinding wheel is obtained by raising or lowering the entire feed wheel unit. By means of sliding change gears, grinding wheel speeds of 33 and 44 r.p.m. are provided. The 9x8-in. feed wheel is driven direct from the change gear box; the 18x4-in. grinding wheel is driven by a belt from the change gear box pulley. The ball-bearing pulley drives the wheel spindle through a flexible coup-

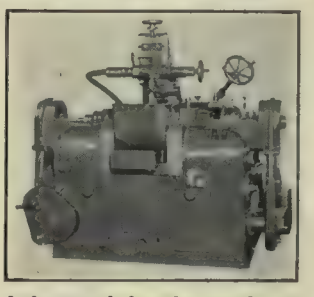


ling and does not transmit the belt pull to it. Diamond truing devices are integral parts of the machine. Either belt or motor drive can be furnished; a 10-hp 1,200 r.p.m. motor is required. The grinding capacity is up to 4 in. in diameter and 16 ft. in length. Floor space, 69x54 in. Weight, 5,000 pounds.

— 26 —

Grinding Machines Cylindrical, Automatic, Nos. 132-A and 142. *Warren F. Fraser Co., Westboro, Mass.* [A. M. vol. 58, p. 927.]

The work is fed to the grinding wheel from a stack or chute. The operation is fully automatic, a work piece being taken from the bottom

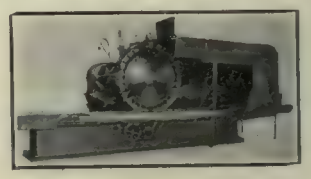


of the stack by the work carrier, placed between centers, ground to diameter and passed to the delivery chute at each cycle of the machine. Each machine has two work spindles, both turning in the same direction and at the same speed. The wheel-head of the smaller or No. 132-A machine is mounted upon a slide given an intermittent forward and backward movement by means of a cam. The wheel spindle is caused to traverse endwise for a very short distance only. The larger or No. 142 machine shown is of greater capacity. The wheel runs in eccentric bearings that are susceptible to a rocking motion to carry the wheel to and from the work. The smaller machine carries a wheel 4 in. wide, the maximum length of work, and it will handle pieces up to 3 in. in diameter. The larger machine may have a wheel 6 in. wide, and handles work larger than 3 in. in diameter. A complete circulation system for grinding compound is provided. The No. 132-A machine occupies a floor space of 6 ft. by 5 ft. 4 in.. and weighs 5,000 lb.; the No. 142 machine 7 ft. by 5 ft. 2 in. and 8,000 pounds.

— 27 —

Grinding Machine, Face, Heavy-Duty, 66-Inch. *Diamond Machine Co., 9 Codding St., Providence, R. I.* [A. M. vol. 58, p. 564.]

The machine is designed particularly for grinding large work such as boiler sections up to 60 in. in height. The abrasive wheel is of the sectional type and is 66 in. in diameter. It consists of 28 blocks of 2-in. face and 7$\frac{1}{2}$ in. depth, each held rigidly in a chuck. A wheel dresser built on the machine can be used while the machine is in operation. A driving motor of 75 hp. is used. The drive from the motor to the wheel is by a Morse silent chain, giving a speed of 180 r.p.m. to the wheel. An automatic system is provided for handling the coolant, which is stored in a

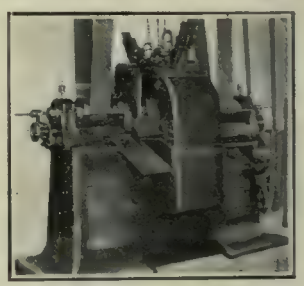


tank of large area at the rear. The table has a platen 36x110 in. in size; it has a speed of 22 ft. per min. An arrangement of belts and pulleys within the bed reverses the motion of the table. Weight, over 40,000 pounds.

— 28 —

Grinding Machine, Face, Automatic, Double, No. 2. *Gardner Machine Co., Beloit, Wis.* [A. M. vol. 58, p. 673.]

The machine has two 18-in. abrasive wheels. It is intended for the rapid grinding of pieces having two parallel sides that require finishing, such as piston rings and bearing races. The parts to be ground are carried to the working position by means of a work carrier which passes between the grinding members. The latter are offset in relation to each other, so that grinding is done on the back face of one wheel and the front face of the other. As the carrier brings the work into the grinding position,

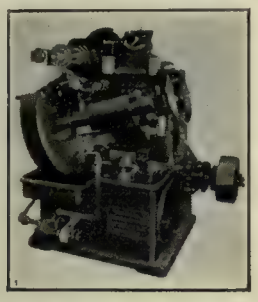


one of the grinding members automatically advances until it reaches a positive stop, being fed by spring pressure. The grinding heads are mounted on sub-bases that are adjustable for position by means of a handwheel. The grinding members consist of either steel disk wheels or abrasive ring wheels carried in "Perfection" chucks, for dry or wet grinding, respectively. Devices for truing the members are integral with the machine. For wet grinding the coolant is carried through the hollow spindles. A 15-hp. motor is used. Floor space 4x8 ft. Weight boxed, 4,250 pounds.

— 29 —

Grinding Machine, Spur Gear, Automatic. *American Grinder Co., Benson St. and Bellevue Ave., Detroit, Mich.* [A. M. vol. 58, p. 599.]

The actions of the carriage and workholding parts, in connection with the grinding wheel, generate a true involute curve, although the curve can be varied so that



practically tooth contour and dimensions can be obtained. The machine is self contained. It is designed with a view to the elimination of vibration. The work is mounted on a carriage and caused to roll over the abrasive wheel as though on a rack tooth. Change gears are provided for grinding one side of a gear tooth at the rate of either 4, 5 or 6 sec. The carriage is controlled by an automatic stop mechanism. The roll of the work spindle is used for indexing the slotted steel disk which controls the spacing of the gear. Less than one second is needed to index a tooth. A worm-driven wheel truing device is provided. The wheelhead pad is equipped with an elevating mechanism, and the wheelhead can be swiveled either side of center to any angle up to 25 degrees.

— 30 —

Grinding Machine, Internal, Hydraulically Operated, No. 72. *Heald Machine Co., Worcester, Mass.* [A. M. vol. 58, p. 311.]

The machine is of the same capacity as the No. 70, but is equipped with the hydraulically operated table move-

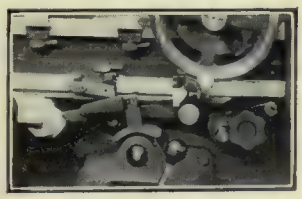


ment and several other devices to increase the speed and accuracy. Except in the oil pump, there is no toothed gearing in the machine. The headstock is driven by belt from an overhead countershaft provided with five-step cone pulleys. The table movement is controlled entirely by two small levers on the front of the base, one controlling the direction and the other the speed. Table speeds from 2 in. per min. to 36 ft. per min. are obtainable. The point of automatic reversal is determined by adjustable dogs on the front of the table. The crossfeed of the wheelhead is equipped with automatic sizing features. A diamond truing device is provided. The workhead will swing 12 in. inside the water guards, and the machine will grind holes 11 in. deep. The workhead swivels 45 deg. either way. Floor space, 6¾ x 3¾ ft. Weight, 4,500 pounds.

— 31 —

Additions to Heald No. 72 Internal Grinding Machine. *Heald Machine Co., Worcester, Mass.* [A. M. vol. 58, p. 779.]

Several features have been added to the machine. The illustration shows the mechanism by which the operator may run the wheel slide

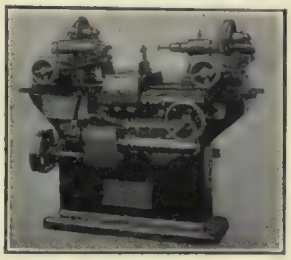


out of the way for gaging the work. To do this he merely lifts the hand lever at the left. The wheel slide will remain in the outer position until the operator tips the reversing lever by means of the ball handle. The crossfeed mechanism and sizing stop have been rearranged. A movement can be obtained corresponding to an increment of 0.0001 in. in diameter of the hole being ground. The water guard enclosing the chuck is overbalanced by a spring which holds it open unless it is held in the closed position by a catch. The diamond truing device is mounted upon a separate bridge and can be swung up out of the way of the wheel. When brought to its active position, the point of the diamond constitutes a sizing device, so that a hole cannot then be ground too large.

— 32 —

Grinding Machine, Internal, Double-Head, No. 70. *Heald Machine Co., Worcester, Mass.* [A. M. vol. 58, p. 352.]

This adaption of the No. 70 internal grinding machine is intended to carry two wheel heads and thus grind long holes at both ends simultaneously. One application is grinding the bores of cluster gears used in automobile transmissions. The machine has a long table with a wheel head at each end. The stationary work-head bridge is a special casting and is placed at the center of the machine. It is necessary to design a special work-head for each adaption, such as a Garrison chuck for holding cluster gears. Since both wheelheads are mounted on one table, one wheel enters the work at one end as the other

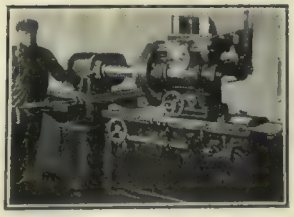


wheel is leaving the opposite end. Each wheel head is independently driven and has its individual cross feed and sizing mechanisms.

— 33 —

Grinding Machine, Cylinder, Internal. *Churchill Machine Tool Co., Ltd., Broadheath, Manchester, England.* [A. M., vol. 58, p. 637.]

This machine for grinding cylinders and holes in parts which cannot be rotated in the usual sizes of grinding machines is particularly adapted to locomotive and railroad work. It has a large table with cross adjustment only for positioning the work, the table remaining stationary during the actual grinding. The grinding wheel spindle is provided with a planetary motion adjustable while grinding is going on, and is carried in a head vertically adjustable on the column. The column is mounted on a slide having an automatic longitudinal movement on the bed and a range



of speeds. The main spindle is provided with speed changes, and various sizes of wheel spindles can be attached to it. Work having a large number of holes can be ground without disturbing the setting on the table. It is claimed that with the machine a cylinder 8 in. in diameter and 12 in. long can be ground to a finish and have 0.02 in. of metal removed in 20 minutes.

— 34 —

Grinder, Internal, Portable, "Cyl-Grind." *Allan Manufacturing & Welding Co., Buffalo, N. Y.* [A. M., vol. 58, p. 855.]

While intended for the removal of excess metal and high spots on cylindrical sur-

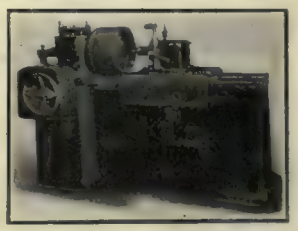


faces, the grinder may be used on flat surfaces as well. The wheel can be adjusted to suit the radius of the cylinder it is desired to finish. Two sizes are made. Type A is for automobile cylinder blocks and Type B for air, steam and water cylinders of the larger diameters. The former is for radii from 2⅛ in. to flat, has a wheel 2x1⅛ in. and requires a ⅓-hp. motor. The latter is for radii from 4⅞ in. to flat, has a wheel 4x1⅛ in. and requires a ½-hp. motor. Both types may be supplied with a motor and flexible shaft.

— 35 —

Grinding Machine, Internal, Automatic, "Teromatic." *Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.* [A. M., vol. 58, p. 928.]

The feature of the machine is the gaging mechanism, which is incorporated and correlated with the driving



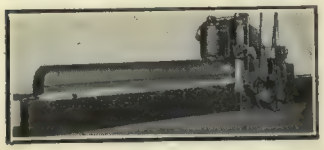
and feeding mechanism in such a way that the piece is automatically ground to the desired size before the machine stops. Holes from ¾ to 10 in. in diameter and up to 9 in. in length can be ground, the work being held by pressure between two plates. The swing is 15¾ in. over the carriage and 14¼ in. inside the water guard. The machine is motor-driven and equipped with push-button control. The carriage is reciprocated hydraulically, the pump being operated by a motor mounted on the back of the bed. The wheel spindle is driven by a separate motor mounted directly beneath it. The work is also operated by a motor. Ten roughing and ten finishing feeds are provided. Six speeds of rotation are provided for the work and six

traversing speeds for the carriage. Coolant is forced by a motor-driven pump through the center of the work spindle. The wheel dressing mechanism is located on the carriage. Floor space, 86x54 in. Weight, 3,900 pounds.

— 36 —

Grinding Machine, Surface, Planer-Type. *Reed-Prentice Co., Worcester, Mass.* [A. M., vol. 58, p. 200.]

The machine is for grinding long pieces hitherto beyond the capacity of this class of grinding machines. The bed, housings and table driving mechanism are of the standard Whitcomb-Blaisdell planer construction. The foundation plans include a

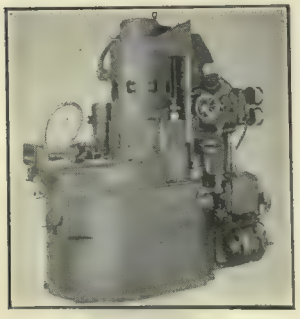


tank for the lubricant. Upon the housings is a special saddle to which is fitted a standard Blanchard motor-driven grinding head with a 20-in. wheel. The head is fitted to slide vertically on the saddle through a distance of 5½ in. Six specially built Simmons magnetic chucks are affixed to the surface of the table. The table is driven at a uniform speed of 28 ft. per min. in either direction, and the wheel grinds throughout the length of stroke in each direction. A pump supplies lubricant outside the wheel and through the hollow rotor of the head. The machine will grind pieces up to 15 ft. long, 19¾ in. wide and 10 in. high.

— 37 —

Grinding Machine, Surface, Automatic, No. 16-A. *Blanchard Machine Co., Cambridge, Mass.* [A. M., vol. 58, p. 349.]

The machine has the same capacity as the No. 16 plain machine. It is automatic in every respect and adapted especially to quantity production of small work, such as

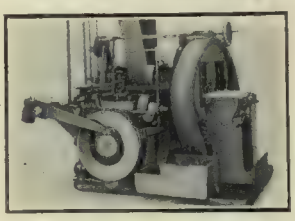


pipe wrench frames and roller and ball bearing races. The machine automatically grips the work, grinds it to size, measures it, controls the adjustment of the wheel-head, unloads, and demagnetizes the work, all without the operator's attention. The operation is continuous, the pieces are placed one after another on the chuck and form a continuous chain of work. When producing up to 1,200 surfaces per hour one operator only is necessary per machine. The rotating chuck or table is magnetic under the wheel and caliper only. The wheel-control caliper is of simple, sturdy construction. The wheel spindle is supported on ball bearings. The base forms a tank for 180 gal. of coolant.

— 38 —

Grinding Machine, Surface, Automatic, Osterholm. *Williams, White & Co., Moline, Ill.* [A. M., vol. 58, p. 925.]

The machine is adapted for production of such work as automotive parts. The wheel housing, in which is mounted the spindle carrying a 20-in. abrasive wheel, moves back and forward on guides on top of the base. A cam controls



the position of the 12¼ by 24 in. work table, and determines the velocity and amount of travel of the wheel housing toward the work. After chucking the work, all operations are carried through automatically, being controlled by the cam. The pump circulates water through the wheel spindle. The entire machine is supplied with positive oiling devices. The capacity is for pieces up to 10x40 in., and from 20 to 30 hp. are required. The stroke length can be varied from 2 to 24 in., while the time of the operating cycle varies from 10 sec. to 2 min. Floor space, 72x84 in. Weight, 7,000 pounds.

— 39 —

Sander and Grinder, Belt, Motor-Driven, Portable, Syracuse. *Porter-Cable Machine Co., Syracuse, N. Y.* [A. M., vol. 58, p. 355.]

This belt sander and grinder is for polishing and finishing parts requiring a straight grain finish and sharp edges. The machine equipped with proper abrasive belts, can be used as a surfacer on metal, wood, fiber and other materials. The 9x16-in. table is 36 in. above the floor, can be tilted 45 deg. down or 15 deg. up, and can be removed when the grinding bed is used in the horizontal position. The grinding bed, which is 10¼x 25 in. in size, can be set at any position from horizontal to vertical. The abrasive belt runs at a constant speed on a 4-in. pulley driven at 3,600

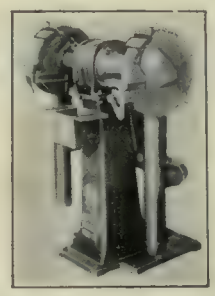


r.p.m. All moving parts are provided with ball bearings. Maximum vertical height, 5 ft. 7 inches.

— 40 —

Grinder, Roller-Bearing. *Cleveland Armature Works, Inc., 4732 St. Clair Ave., Cleveland, Ohio.* [A. M., vol. 58, p. 170.]

This direct-driven electric grinder is equipped with Timken tapered roller bearings. The motor has a high overload capacity, and motors for either a.c. or d.c. can be furnished for 1, 2, 3 or 5 hp. In the a.c. motor, both the rotor and stator are assembled and secured by means of electric welding. The control is by

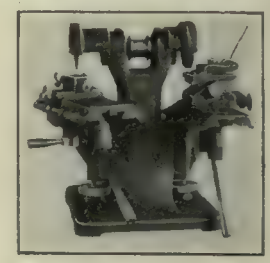


means of a quick-acting switch operated by a hand e at the front. The wheel guards and the rests are adjustable and are clamped by means of handle nuts. Heavy plate-glass eyeshields can be secured to the front of the guards. The machines can be furnished in three styles of mountings, on a floor or bench pedestal or with a post bracket.

— 41 —

Regrinding Machine, Thread Chaser, H & G. *Eastern Machine Screw Corp., New Haven, Conn.* [A. M., vol. 58, p. 425.]

The machine is for regrinding the chasers of the H & G self-opening dieheads. It stands about 18 in. high and may be used on the bench or upon a pedestal. A spindle mounted on ball bearings carries a 4x½ in. wheel at one end and a narrower wheel at the other. Upon each side of the column is fitted a vertically adjustable knee carrying a table. Upon one table is a fixture to hold the four chasers of a set, so that the rake angles can be ground. The fixture upon the other table is to hold a single chaser so presented to the narrow grinding wheel as to grind the throat. The tables are traversed by means



of hand levers at the front of the machine. Bench space, 20 in. square. Shipping weight with countershaft, 240 pounds.

— 42 —

Grinding Machine, Hob, Semi-Automatic, No. 5. *Harris Engineering Co., Bridgeport, Conn.* [A. M., vol. 58, p. 531.]

The machine is designed for sharpening hobs with both straight and right- and left-handed helical flutes, and not over 4 in. in diameter and 5 in. in length. The work-holding members are mounted on a table operated by means of a hand lever, so that the work can be moved back and forth across the face of the grinding wheel. The table travels on ball bearings. Hobs having helical flutes are automatically rotated. The indexing mechanism is semi-automatic and can be operated only at the end of the return stroke. A 7 in. diam-



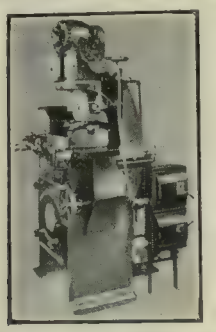
eter wheel is the maximum that can be used. The machine may be set to grind undercut hobs or cutters, and to give them top rake. The feed of the hob against the grinding wheel is rotative. Either countershaft or individual motor drive can be provided.

— 43 —

Grinding Machine, Hob, Automatic, Motor-Driven, No. 415. *Harris Engineering Co., Bridgeport, Conn.* [A. M., vol. 58, p. 674.]

A motor is mounted directly over the spindle of the grinding wheel. A diamond truing

device is attached to the wheel head, which swivels with the wheel when the latter is changed in its angular position. The table reverse, spiral generating, indexing and hob feed mechanisms are driven automatically by a

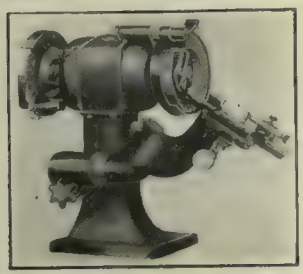


motor mounted at the rear of the base. The starting switches of both motors are of the enclosed type back of the machine. The machine grinds automatically straight fluted and either right- or left-hand helical fluted hobs, as the indexing and feeding are automatic. The rated capacity is for hobs 4 in. in diameter and 5 in. long.

— 44 —

Grinding Machine, Twist Drill, Motor-Driven, Bench, Grand Rapids. *Gallmeyer & Livingston Co., Grand Rapids, Mich.* [A. M., vol. 58, p. 676.]

The machine is equipped with a diamond truing device, which also automatically places the drill holder in the right relationship with the

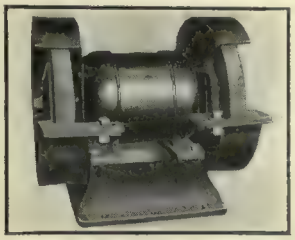


grinding wheel. The ½-hp. motor can be driven from a lighting circuit or power line. The A-7-T machine illustrated has a capacity for drills from No. 52 to ¾ in., and the B-7-T machine from ⅛ to 1½ inches.

— 45 —

Grinder, Bench, Motor-Driven, Model 102. *Forbes & Myers, 172 Union St., Worcester, Mass.* [A. M., vol. 58, p. 678.]

Welded steel guards and tool rests are incorporated and are held to the motor frame by four nuts. A fully enclosed squirrel-cage motor is supplied, for voltages of 220, 440 and 550. The grinding wheels are 10x1 in. and run at a speed of 1,800 r.p.m. Wheels of different grades



and width can be supplied. The shaft runs on L-25 Norma ball bearings.

— 46 —

Grinder, Tool, Electric. *Efficiency Grinder Co., Madison, Wis.* [A. M., vol. 58, p. 748.]

The machine is intended especially for grinding wood working tools. An attachment by which the tool can be held at the correct angle while being passed back and forth over the face of the

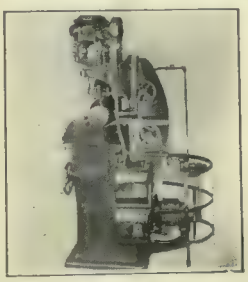


wheel is shown. The motor used is an a.c. Emerson ½ hp. running at a speed of 1,750 r.p.m. It is attached to the rear of the machine and drives the spindle at 245 r.p.m. through a worm and wheel which run in oil. Both the roughing and the finishing wheel run in oil. The machine can be supplied with or without the pedestal. Floor space, 18x20 inches.

— 47 —

Grinding Machine, Hob, Full Automatic, Motor-Driven, Improved, No. 815. *Harris Engineering Co., Bridgeport, Conn.* [A. M., vol. 58, p. 822.]

An improved motor drive, together with a handwheel

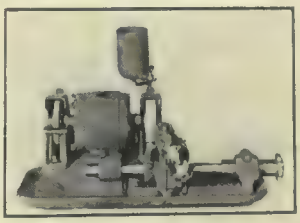


adjustment for both vertical and horizontal positioning of the grinding wheel has been installed on the machine. The entire wheel and motor unit may be swung to the required angle when grinding either right- or left-hand spirally fluted hobs. The motor is mounted on four square-headed screws which can be adjusted to take up belt slack. A motor is mounted at the rear of the machine to drive the table reverse, the index and the spiral generating mechanisms, as well as the pump. A separate switch box is furnished for each motor. Hand wheels provide sensitive adjustment of the wheel slide. The machine may also be furnished for belt drive.

— 48 —

Grinding Machine, Cutter, Engraver's Bench. *Reed-Prentice Co., Worcester, Mass.* [A. M., vol. 58, p. 955.]

The machine grinds small drills, milling cutters and engraver's tools to a predetermined angle. The motor regularly furnished is of ⅛ hp., 3,400 r.p.m., 110 volts, single-phase and 60 cycles. One wheel is used in connection with the universal head, and the other for free-hand grinding. The universal head consists of a bracket clamped on a swiveling bar. The base of the head is graduated and may be swiveled to any position. After a cutter has been clamped in the collet, the handle is used for rotating the spindle. An adjustable cam makes possible a longitudinal movement of the cutter spindle combined with the



rotative movement, so that practically any amount of relief can be obtained. The cutter spindle receives the standard No. 2 Becker milling-machine collets, having a capacity ranging from ⅛ in. to ½ in. Bench space, 24x14 inches.

— 49 —

Belt Tightener and Countershaft, Internal Grinding Machine. *Heald Machine Co., Worcester, Mass.* [A. M., vol. 58, p. 275.]

This attachment is intended for delivering greater power to the wheel spindle, and can be interchanged with the corresponding parts of the older Heald machines. The faces



of the pulleys have been widened; the vertical belt from the countershaft is 3 in. wide and the belt from the large step to the spindle is 2½ in. A swinging idler or belt-tightener presses upward against the slack side of the belt under spring pressure. The wrap of the belt is much increased, and also the driving force. Small grooves in the faces of the pulleys allow the escape of trapped air.

— 50 —

Grinding Head, Internal, for Cutter Grinder. *Woods Engineering Co., Alliance, Ohio.* [A. M., vol. 58, p. 314.]

The head can be applied to the Woods Nos. 2 or 2½ universal tool and cutter grinder. The attachment is complete in itself and replaces the regular grinding head supplied with the machine. It is mounted directly on the column, and the change re-

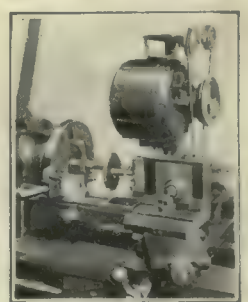


quires only about five minutes to make. The shaft driven from the overhead lineshaft is mounted on ball bearings. The spindle is mounted on four rows of ball bearings and has provision for adjustment. The spindle nose is arranged for mounting different lengths and diameters of stubs.

— 51 —

Grinding Attachment, Multi-Graduated, Improved, 1923 Model. *Precision & Thread Grinder Manufacturing Co., 1 South 21st St., Philadelphia, Pa.* [A. M., vol. 58, p. 387.]

The machine can be used on a variety of work, though particularly intended for



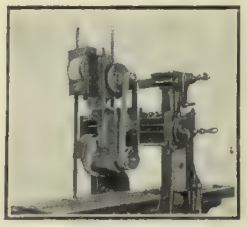
thread grinding on a lathe. The grinding spindle has been redesigned; it is heavier and the rear bearing is so constructed that should there be an elongation of the spindle due to an increased tem-

perature, the bearing may float. A ¼-hp., fully enclosed, ball-bearing motor is used. Other features are ball bearings in the idler pulleys, an improved index for setting the helix angle, and the oiling devices.

— 52 —

Grinding Attachment, Planer, Motor-Driven. C. L. *Hawes, 12 Adams St., Ashtabula, Ohio.* [A. M., vol. 58, p. 967.]

The device can be mounted directly on a planer. It is equipped with a 1½ hp., three-phase induction motor intended to be run at 3,600 r.p.m. The wheel spindle is 1 in. in diameter and is



equipped with Timken roller bearings. The drive is through belt. The device is very compact, measuring but 30½ in. from the bottom of the bearing housing to the top of the motor base. The switch box, wheel and guard can be furnished to suit conditions.

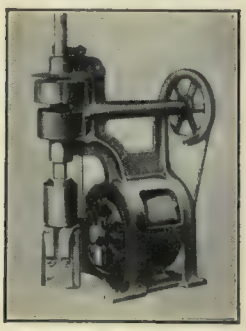
See Lathes, Special.

Honing and Lapping Machines

— 53 —

Refinishing Machines, Cylinder, Boring and Honing, "Stormizing," Models R, M and S. *Storm Manufacturing Co., 406 Sixth Ave. South, Minneapolis, Minn.* [A. M., vol. 58, p. 127.]

The machines are for refinishing the cylinders of automotive engines. The worn cylinder is trued up by a boring or reaming operation, and then by honing the surface is given a fine finish. The finishing head has a capacity from 2⅝ to 8 in. in diameter and is self-centering and automatic. It is shown in an electric-driven



unit. The Model R heavy-duty machine has been equipped with a finishing spindle unit mounted in an inverted position. Its capacity is for diameters from 2⅝ to 12 in. and up to 20 in. deep. Either belt or motor-driven machines can be furnished. The Model M can be employed on its stand or can be removed and fitted to motor cylinders left in place in the automobile. The Model S portable machine is for work on cylinders while the motor block is in place in the car.

— 54 —

Lapping Machine, Automotive Cylinder. *R. M. Clough, Meriden, Conn.* [A. M., vol. 58, p. 462.]

The machine is used in conjunction with the hand reaming fixture furnished by the same maker. The fixture is for reaming the bore of any automotive engine hav-



ing a removable head, without dismounting the engine from the car. The lapping machine is attached to the cylinder block and is driven by a ½-hp. constant-speed electric motor. To the lower end of the spindle an expanding copper lap is attached by means of a floating connection. The spindle is rotated at 112 r.p.m. and reciprocated at 49 strokes per min. After the lapping has been completed upon a bore, a piston and rings may be substituted for the lap for running in.

— 55 —

Lapping Machine, Vertical, Fraser. *Bethel-Player Co., Westboro, Mass.* [A. M., vol. 58, p. 888.]

The machine is for lapping piston pins and similar work that requires a high degree of accuracy and finish. The parts to be lapped are fitted on a spider and held between the surfaces of a stationary and a revolving lap, meanwhile being given an irregular motion that sweeps them over the entire surface of both laps, which are made of fine-grained cast iron. The work pieces have a combined rolling and sliding movement. The upper member is stationary, except for the vertical movement to lift it out of the way, and it is held by a floating connection. The lower lap is fastened to the upper end of the hollow ver-

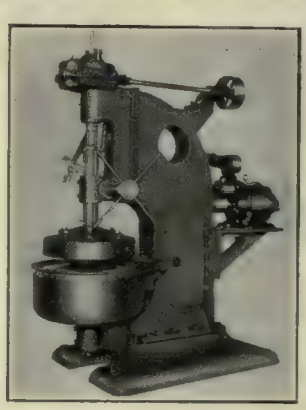


tical spindle. A speed of 60 r.p.m. is recommended. The capacity is for work pieces up to 1½ in. in diameter by 4 in. long. Floor space, 2½x5 ft. Weight, 2,000 pounds.

— 56 —

Lapping Machine, Vertical. *Bethel-Player Co., Westboro, Mass.* [A. M., vol. 58, p. 926.]

The machine laps round work, either parallel sided or tapered, up to 3 in. in diameter by 8 in. long. It is similar in principle to the Fraser lapping machine just described, but is of larger capacity and has the working parts inverted. The stationary lap is at the bottom, while the upper lap is revolved by a spindle, to which it is attached by a floating



connection. Inside the spindle is a shaft by which a gyratory motion is imparted to the work. When the lap is lowered into contact with the work, the splash guard is automatically raised to enclose completely the revolving parts. The machine can be driven by belt or by individual motor. Floor space, 5x8 ft. Height, 7 ft. Weight, 6,800 pounds.

— 57 —

Lapping Machine, Ring, Vertical. *Bethel-Player Co., Westboro, Mass.* [A. M., vol. 58, p. 963.]

The machine is intended especially for lapping piston rings and similar work and resembles in general appearance the Fraser machine just described. Both laps are stationary and are made of a special grade of cast iron. The lower lap is supported on brackets extending from the base of the machine, while the upper one is suspended by a floating connection from the vertically adjustable upper spindle. The work carrier is a steel plate with cut-out openings of a diameter a trifle larger than that of the rings to be lapped. The lower spindle drives the work carrier to give it a

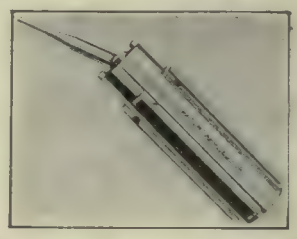


movement that is a series of short circular sweeps combined with slow rotation. The upper lap is borne by the work at the commencement of the operation and gradually comes to rest upon the three-point bearing provided. The upper lap may be raised from the work for inspection or reloading. Floor space, 2½x5ft. Weight, 2,000 pounds.

— 58 —

Hone, Automotive Cylinder. *Auto-Hone Co., Inc., Buffalo, N. Y.* [A. M., vol. 58, p. 352.]

The hone is made in two sizes for cylinders from 2⅛ to 4½ in. in size. It consists of a center arbor of aluminum carrying four honing stones. The stones are held in trays and their position is adjustable. Because of their length of 8 in. the stones bridge the area of wear and grind the full length of the cylinder wall. Spring pressure keeps the stones against



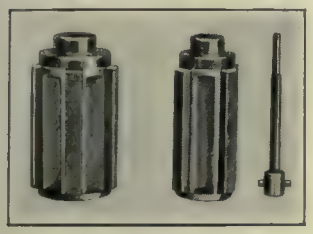
the work. Two sets of stones are provided, one for quick cutting and the other for fine honing. The driving shank can be attached to an ordinary portable electric or pneumatic drill. In manufacturing processes the hones are held

on the spindles of multiple drilling machines, so that all the cylinders of an engine are finished at the same time.

— 59 —

Hone, Automotive Cylinder, Foster-Johnson. *Foster-Johnson Reamer Co.*, 1112 *Beardsley Ave., Elkhart, Ind.* [A. M., vol. 58, p. 564.]

The tool is designed for repair shops as a finishing and polishing device for automotive cylinders which have been previously reamed to a size to fit oversize pistons. The body of the hone is made of aluminum. The smaller hones have four abrasive stones and the larger ones five stones. The stones are mounted in slots in which are set springs to provide adjustment and resiliency. The

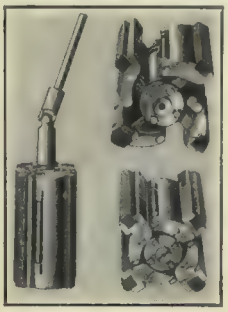


honing operation consists simply of the slow movement of the hone up and down while it is rotating within the cylinder. The hones are made in seven sizes whose minimum diameters range from 2⅜ to 4¼ in. Each size can be enlarged ¼ in. in diam.

— 60 —

Hone, Automotive Cylinder, Ammco, "Centrimatic." *Automotive Maintenance Machinery Co.*, 549 *W. Washington Blvd., Chicago, Ill.* [A. M., vol. 58, p. 924.]

The tool is so constructed that the faces of the hones are all held at the same distance from the center of the



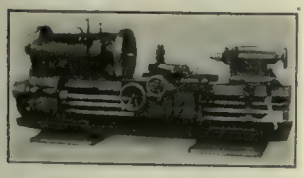
spindle. The tool is expanded by centrifugal force only. Each stone is mounted in a steel channel that forms a support for its entire length. The self-adjusting and self-centering features of the tool require no attention, as the operator needs only to watch the diameter of the bore. At the right side of the illustration the tool is shown expanded in the top and contracted in the bottom view. The range is from 2 1/16 to 4 in. in diameter. A set of extension blocks is provided for use with cylinders from 4 to 5 in. in diameter, as shown at the bottom of the figure.

Lathes

— 61 —

Lathes, Geared-Head, Heavy-Duty, 25- and 27-Inch. *R. K. LeBlond Machine Tool Co., Madison and Edwards Rds., Cincinnati, Ohio.* [A. M., vol. 58, p. 90.]

The improved lathe is made in two sizes with lengths of bed required to suit the work. The headstock is of the selective-speed type and provides sixteen changes of spindle speed by the manipu-

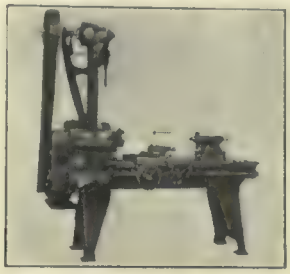


lation of two levers. The multiple-disk clutch is operated by a lever on the headstock and another on the carriage. The bed is of large depth, heavily braced, and the "compensating V" construction is employed for the ways. The speeds furnished range from 8 to 300 r.p.m. Both longitudinal and transverse feeds are engaged by means of a single positive jaw clutch. Forty-eight feeds are provided having a range from 0.003 to 0.184 in. per revolution, and the forty-eight threads range from ¾ to 46 per inch. Motor drives can be furnished in three types, a belted motor drive, a constant-speed geared motor drive and a variable-speed geared motor drive. All standard attachments such as a taper attachment can be furnished. Weight of 25-in. lathe with 12-ft. bed, 10,000 lb.; 27-in. lathe, 10,520 pounds.

— 62 —

Lathe, Gap, Quick-Change, Motor-Driven, 16-Inch. *A. V. Carroll Machine Tool Co., Montgomery Rd., Norwood, Cincinnati, Ohio.* [A. M., vol. 58, p. 124.]

The lathe is intended for automotive and general repair work. The "invisible gap" allows a swing of 19 in., and by raising the headstock on special blocks a swing of 22 in. may be obtained without altering the gear box or intermediate gears. Either three- or four-step cones and single or double back-gears may be furnished. The carriage is fitted to receive a taper attachment. The machine has an interlocking

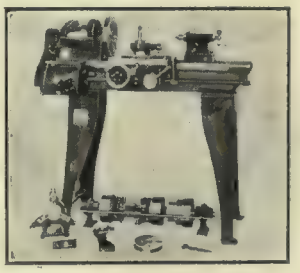


feeding device, and right- or left-hand feed arrangement. The quick-change gear box gives twenty-four feed changes by shifting one lever, and removable change gears can be used for any odd thread. The tailstock has the set-over feature and self discharging center. Bed lengths, 6, 8, 10 and 12 ft. Six-ft. lathe: 40 in. between centers; weight, 1,950 pounds.

— 63 —

Lathe, Gap, Quick-Change, 12 Inch. *A. V. Carrol Machine Tool Co., Montgomery Rd., Norwood, Cincinnati, Ohio.* [A. M. vol. 58, p. 125.]

The lathe is made for belt drive with a three-step cone and single back-gear. One gear-shifting lever gives twenty-four feed changes. The bed is so made with an "invisible gap" that chuck or faceplate work up to 14 in. in diameter may be turned. The headstock is of the bowl type with all gears covered. Raising blocks may be placed

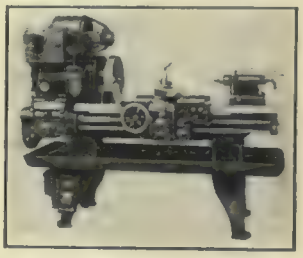


under it to give additional swing without altering the gear box and intermediate gears. The carriage has a thread indicator, and is arranged for a taper attachment. The reverse for right- or left-hand feeds is obtained from the apron. The compound rest has taper gibs throughout and a large graduated base. Three lengths of bed 3 ft. 8 in., 4 ft. 8 in. and 5 ft. 8 in. are regularly made.

— 64 —

Lathes, Heavy-Duty, 13- and 15-Inch. *R. K. LeBlond Machine Tool Co., Madison and Edwards Roads, Cincinnati, Ohio.* [A. M. vol. 58, p. 497.]

The lathe can be supplied with either a three-step cone head or with a single-pulley-drive geared head. It can be motor driven as shown, or by a motor mounted back of the legs, and it can be fitted with any of the standard types of rests, toolposts and attachments. The cone-head lathe is equipped with double friction back gears. The spindle nose is 2⅝ in. in diameter and has 5 U.S.S. threads per inch. Eighteen spindle speeds ranging from 16 to 375 r.p.m. are provided. The single-pulley-drive geared headstock provides nine changes of speed from 20 to 350 r.p.m. The bed of the machine has the "compensating V" construction which provides a bearing surface at right angles to the tool pressure and auto-



matically compensates for the wear of the carriage and the bed. Thirty-two feeds ranging from 12 to 184 are provided. Threads from 3 to 46 per inch can be cut. The 13-in. lathe has a swing of 15 in. over the shears, and the 15-in. lathe of 16½. Tool sizes are ½x⅝ and ⅝x1 in. Shipping weights, 1,800 and 2,015 lb., respectively.

— 65 —

Lathe, Engine, Heavy-Duty, 14-Foot. *Niles-Bement-Pond Co.*, 111 *Broadway, New York City, N. Y.* [A. M. vol. 58, p. 500.]

The lathe is for work on parts for large machines such as turbines and generators. It has a bed 11 ft. wide and 50 ft. long. Its faceplate is 12 ft. in diameter. It swings 14 ft. 6 in. over the bed and 11 ft. 6 in. over the carriage with



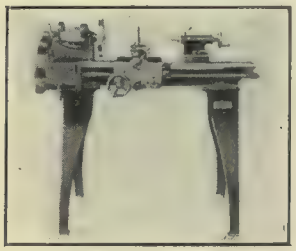
the removable track for the tool carriage in place. The maximum distance between centers is 34 ft. The driving gears in the headstock give the main spindle four quick mechanical changes of speed. The d.c. driving motor is of 50 hp. with a speed range of 500 to 1,500 r.p.m., and with the aid of the mechanical

speed changes drives the faceplate at from 0.23 to 24 r.p.m. A power traverse along the bed is provided for the tailstock. The tool carriage extends entirely across the bed. Lateral, cross and angular power and hand feeds are provided for the tool slides. An independent motor and controller mounted on the carriage are used for the rapid traverse of the carriage in either direction.

— 66 —

Lathe, Engine, 10-Inch. *Myers Machine Tool Corp., Columbia, Pa.* [A. M. vol. 58, p. 604.]

The gear box provides for cutting 25 threads from 6 to 52 per inch. The threads on the lead screw are employed only when thread cutting. A three-step cone pulley is used and the back-gears have a ratio of 7 to 1. A thread-

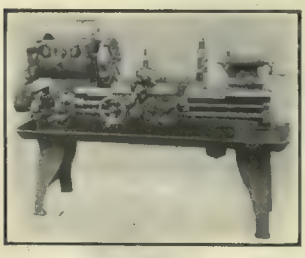


ing dial is provided. A number of attachments can be supplied. The lathe has a distance between centers of 24 in., a swing over the ways of 10½ in. and a swing over the compound rest of 6½ in. A No. 2 Morse taper is provided for the spindle and the tailstock. The machine can be furnished for use on either the floor or a bench. The floor type weighs 400 lb. and the bench type 360 lb.

— 67 —

Lathe, Engine, Geared-Head, Automatically Oiled, 12-Speed. *American Tool Works Co., Cincinnati, Ohio.* [A. M., vol. 58, p. 815.]

The geared heads are made for all sizes of "American" lathes up to and including the 36-in. medium pattern lathe. All the gears in the

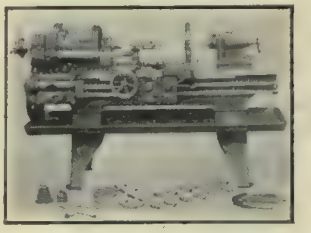


head are made from heat-treated manganese steel, and all speed change gears are hardened. Only three shafts are used in the head and consequently large diameter gears. The head is under control through either of two levers, one at the right side of apron, and the other at the left side of the head. The pulley is bronze bushed and mounted on a long steel sleeve which takes the belt pull from the driving shaft. A gear-tooth clutch is used on the high-speed drive in place of the jaw clutch. An automatic oiling system is employed to lubricate the head. It is stated that the lathe will accommodate a 20-hp. motor up to its full capacity.

— 68 —

Lathe, Engine, Toolroom, 15-Inch. *R. K. LeBlond Machine Tool Co., Cincinnati, Ohio.* [A. M., vol. 58, p. 966.]

Either geared-head or cone-pulley drive machines can be supplied. The usual attachments are furnished to make the machine a complete toolroom lathe. A lever-operated or a handwheel type draw-in attachment can be supplied. Collets can be supplied in any size from ¼ to 1 in. A feature of the lathe is the universal relieving attachment. By the use of only two cams, any relief from zero to ¼ in. can be obtained, and it is possible to do external, cylindrical, internal, end and angular relief. For angular relief the attachment is swiveled

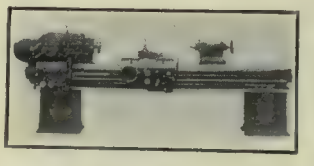


to the proper angle and the taper attachment is connected. Some specifications are: Swing; over shears, 16¾ in., over carriage, 11¼ in. Capacity between centers, with 6 ft. bed, 2 ft. 7 in. Spindle speeds, 9 from 20 to 350 r.p.m., or 18 from 15 to 350 r.p.m. Size of tools, §x1 in. Feeds, 32 from 12 to 184. Threads, 22 from 3 to 46. Shipping weight with 6 ft. bed, 2,015 pounds.

— 69 —

Lathe, Engine, Geared-Head, 18-Inch. *Mueller Machine Tool Co., Cincinnati, Ohio.* [A. M., vol. 58, p. 967.]

The machine has an apron control for 16 changes of spindle speed with forward or reverse motion. All changes are made without stopping the driving pulley. The long lever shown in front of the head controls four changes of speed from the main driving shaft, acting through friction clutches. The four changes are transmitted direct to the spindle with the back-gear pinion withdrawn from the spindle gear and with the sliding clutch gear on the spindle engaged. Triple back-gears are employed. All bearings are bronze bushed and self-oiling, and all jaw

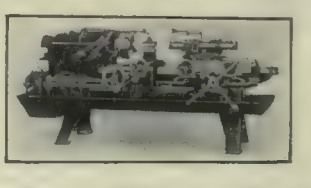


clutches are of nickel steel and hardened. The gears have a 20 deg. pressure angle and are of stub tooth form. The reversing attachment is a separate unit. A number of adjustable dogs on the front of the lathe bed trip the automatic feed at any desired position. The lathe can be furnished with motor drive.

— 70 —

Lathe, Turret, Flat, Universal, No. 2. *Acme Machine Tool Co., 4955 Spring Grove Ave., Cincinnati, Ohio.* [A. M. vol. 58, p. 50.]

The machine is adapted for either bar or chucking work, swinging chucked work up to 20¾ in. in diameter and taking bar work up to either 2½ or 3¼ in. in diameter. The all-geared head, single-pulley drive provides twelve spindle speeds from 18 to 318 r.p.m., changed by one continuous movement of one lever. The side carriage spans the ways of the bed. Power feed is provided in either direction for both side and main turrets, and longitudinal rapid traverse in either direction for the main turret. The side head has one adjustable stop and the main turret

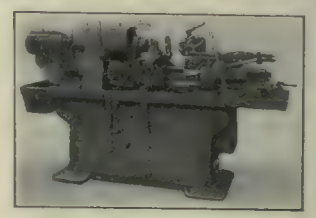


twelve longitudinal stops. A thread-chasing attachment is in the regular equipment, and a taper turning attachment for the side head can be furnished. A 5-hp. motor may be mounted on the rear of the head-end leg. Floor space, 3 ft. 9 in. x 10 ft. 8 in. Weight, 5,000 pounds.

— 71 —

Lathe, Turret, Motor-Driven, Selt-Contained. *Wood Turret Machine Co., 316 S. Alabama St., Brazil, Ind.* [A. M., vol. 58, p. 56.]

This self-contained lathe is mounted on a cabinet base, with the driving motor on the rear cover plate inside the cabinet. A silent chain connects the motor with the main drive shaft running through the center of the cabinet. A cone friction clutch of the full-floating type is incorporated in the drive, as well as a change-gear box with six changes of speed on the plain head machine. When a friction back-gear is used, twelve changes of speed are obtainable. A reverse is provided for every forward speed. In the drive from the gear box the pull of the belt is always down on the headstock. All the controls are

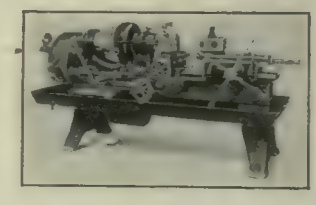


centralized in the operating position at the front. Either d.c. or a.c. motors of constant or variable speed can be employed. The machine may be driven by a belt as a single-pulley machine by mounting a jack shaft on the rear cover plate.

— 72 —

Lathe, Turret, Universal, No. 1. *Acme Machine Tool Co., Cincinnati, Ohio.* [A. M., vol. 58, p. 126.]

The lathe is made in two models and has eleven tool stations for boring, facing, turning and forming. It is a high-production machine for the manufacture of parts from bar stock, castings or forgings. Two or more tools can be in operation at the same time. Both the main and cross-slide turrets have separately controlled feeds. One model of the lathe has a cone-pulley driven head, and the other a single-pulley driven all-geared head. The latter is of the sliding gear type, giving twelve changes of speed from 18 to 318 r.p.m. The longitudinal movement of the main or hexagonal turret carriage has six independent

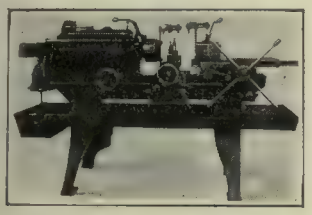


stops. The square turret can be indexed to four positions. Eight feeds may be given either turret carriage, varying from 13 to 333 revolutions of the spindle for each inch of carriage travel. The machine will take 1½ in. round, 1⅛ in. square or 1⅛ in. hexagonal stock. Work up to 9 in. in length and 18 in. in diameter can be machined.

— 73 —

Screw Machines, All-Geared-Head, Nos. 3, 5 and 7. *Foster Machine Co., Elkhart, Ind.* [A. M., vol. 58, p. 387.]

The three sizes, Nos. 3, 5 and 7, have capacities, respectively, of 1 5/16, 1 7/8 and 2 1/2 in. for round bars. The head mechanism is entirely geared and driven from a single pulley. The No. 3 machine shown

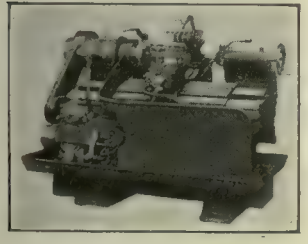


has eight spindle speed changes from 29 to 500 r.p.m. The total cross and longitudinal travels of the slides are, respectively, 8 1/4 and 10 in. The swing over the bed is 14 3/8 in. Six power cross feeds are available for the cross slide, ranging from 0.0027 to 0.025 in. On the Nos. 5 and 7 machines eight spindle speeds are also provided, ranging from 24 to 414 r.p.m. and from 20 to 333 r.p.m., respectively. The swings over the bed are 17 1/2 and 20 in. for these types. In general the specifications are identical with those of the friction head machines of similar size. Full equipment can be furnished.

— 74 —

Lathe, Multi-Cut, Semi-Automatic, No. 12. *R. K. LeBlond Machine Tool Co., Madison and Edwards Rds., Cincinnati, Ohio.* [A. M. vol. 58, p. 52.]

The machine is for simultaneously turning and facing such parts as gears and shafts, and is made in various bed lengths with center distances of 18, 26, 34 and 42 in. The maximum turning capacity is for work 12

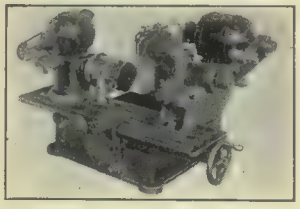


in. and the facing capacity 10 1/2 in. in diameter. The power rapid traverse for the turning carriage and facing slide automatically stops the spindle when the feed of the tool is stopped, and the submerged rotary pump is automatically shut off. The front shear, on which the turning carriage is mounted, is placed at an angle. The rear shear, on which the facing slide operates and on which the headstock and tailstock are mounted, is in a horizontal plane. The motion of the facing slide is derived from the profile plate on the rear of the bed. The machine can be driven from the lineshaft or by a 7 1/2 to 15-hp. a.c. or d.c. motor. The headstock spindle has six speed changes from 50 to 250 r.p.m. Feeds of turning carriage and facing slide 0.002 to 0.203 in. per spindle revolution.

— 75 —

Grinding and Turning Machine, Piston, Bench. *Franklin Machine & Tool Co., Springfield, Mass.* This concern has since been taken over by the *Van Norman Machine Tool Co., Springfield, Mass.* [A. M., vol. 58, p. 202.]

The machine is intended especially for turning and grinding automotive pistons, but may be used for general automotive repair shop work. Both tapered and parallel

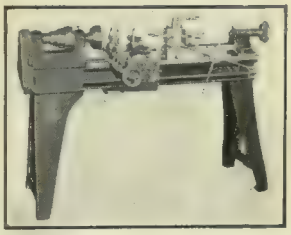


work may be performed, as well as boring and internal grinding. The work head at the left end of the table carries a 1/4-hp. motor. The spindle will hold faceplates, draw-in collets, piston adapters and lathe chucks. A tailstock that has a set-over for doing taper work can also be mounted on the bed. An arm or bracket on the front of the base carries a cross slide operated by a feed screw and fitted with a toolpost. The wheelhead consists of a 1/3-hp. motor driving a 10-in. wheel by belt.

— 76 —

Lathe, Metal and Wood, Combination. *Little Giant Co., Mankato, Minn.* [A. M., vol. 58, p. 607.]

By the use of both metal and wood working attachments many metal and wood working operations may be

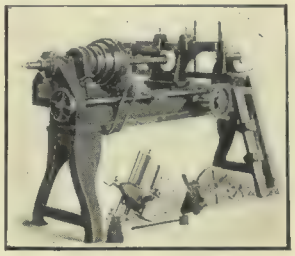


performed. The standard bed is 48 in. in length, making the greatest distance between centers 25 in. Eight spindle speeds are possible, ranging from 30 to 360 r.p.m. Both hand and automatic feed carriages can be provided. All combinations ranging from 1/48 to 1/8 in. are available. Attachments which make the machine adaptable for many metal-working operations are the turret, milling, gear cutting, thread cutting and grinding attachments. Other attachments include a band saw, saw table, jointer, planer, mortiser, sander and buffer for wood working operations. The floor space occupied by the lathe when on floor legs is 24x50 in.

— 77 —

Lathe and Cylinder Grinding Machine, Multi-Purpose. *S. K. Landis Co., Lancaster, Pa.* [A. M., vol. 58, p. 642.]

The machine is especially intended for small jobbing and automobile repair shops. It not only does the work of an engine lathe, but with the special attachments provided can perform the operations usually carried out on drilling and milling machines, shapers and turret lathes. The carriage for lathe work holds the combined compound rest and semi-circular turret. The grinding attachment is arranged so that a cylinder block may be ground with

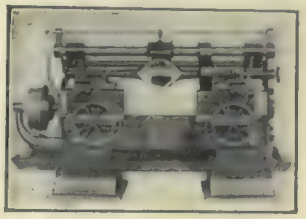


one setting. Cylinders up to 10 in. in diameter and 40 in. long can be ground without resetting, by using special equipment. A variety of attachments can be furnished. The lathe has a distance between centers of 52 in. and swings 18 in. over the ways. Floor space, 28 in. x 8 ft. Weight, 1,655 pounds.

— 78 —

Lathe, Turning, Double-End, Sundstrand. *Rockford Milling Machine Co., Rockford, Ill.* [A. M. vol. 58, p. 498.]

The lathe is built for such work as turning automobile axle shafts, rear axle housings, camshafts and similar parts which can advantageously be turned at both ends simultaneously. It is suitable for turning short pieces also, such as four-arm spiders and universal joint crosses. Two overhanging arms carry the tailstocks and also support the center drive mechanism. The center drive is through gearing from the main drive shaft. The feed shaft transmitting motion to the front carriages is driven from the center drive shaft by a sprocket and chain. Feed changes are made by means of removable change gears located at the end of the bed. When the feed is engaged the carriages work toward each other. The rear tool slides operate simultane-

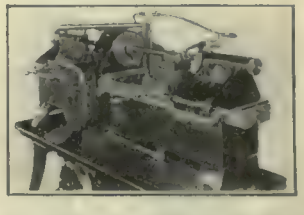


ously with the front carriages, but independent feeds are obtained by means of removable change gears. The lathes are furnished in two sizes, 36 and 60 in. The former occupies a floor space of 42x87 in., is 62 in. in height and weighs 5,100 lb. The latter occupies a floor space of 42x105 in., is 62 in. in height and weighs 5,500 pounds.

— 79 —

Lathe, Center-Drive, Double-End. *Porter-Cable Machine Co.,* 1708 *N. Salina St., Syracuse, N. Y.* [A. M., vol. 58, p. 961.]

The machine is for turning axle shafts, camshafts and parts that can be turned at both ends simultaneously. The headstock, which is placed in the center of the bed, has a hardened and ground spindle 6 3/4 in. long with a 2 3/8-in. hole through it. The spindle is mounted on ball bearings and has a right-angle drive through worm gearing. The expanding clutch is arranged to stop the machine the instant that it is disengaged. A 3-hp. a.c. or d.c. electric motor, fastened to the underside of the oil

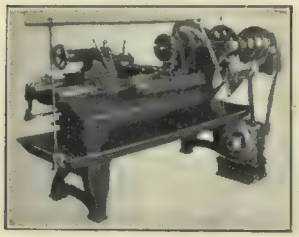


pan, furnishes the drive. The carriages are cam operated. and both straight and tapered work can be turned with them. The operator is relieved of movements other than loading and unloading the work and starting and stopping the machine. The tailstock at the right is foot operated. The machine can take work 32 in. between centers. Weight, 1,500 pounds.

— 80 —

Motor Drive, Cone-Head Lathe. *Hendey Machine Co., Torrington, Conn.* [A. M. vol. 58, p. 494.]

The drive mechanism, shown attached to a 16-in. lathe, is applicable to Hendey 12-, 14-, 16-, 18- and 20-in. lathes of both past and present designs. The countershaft unit is mounted on a base bracket clamped to the

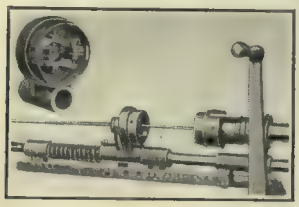


V of the lathe bed. The mechanism can be readily attached. It carries tight and loose pulleys that are belted to the motor, a completely enclosed reducing gear and a countershaft with a cone pulley. The countershaft can be moved toward or away from the lathe spindle, thereby either loosening or tightening the belt. The motor base is adjustable and provides a means of keeping the motor belt at the desired tension. A constant-speed a.c. or d.c. motor running at 1,200 r.p.m. is recommended.

— 81 —

Feeder, Bar-Stock, Continuous, Screw Machine. *Pearson-Scott Co.,* 1525 *East Washington St., Indianapolis, Ind.* [A. M. vol. 58, p. 601.]

The device is for application to hand screw machines and is intended to eliminate the necessity for resetting

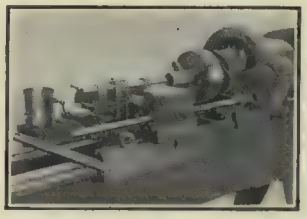


the collar or pusher on the hand-feeding mechanism. The gripping mechanism is shown at the top. In it are two bronze jaws, each carrying a tool-steel pawl. As the hand lever is pushed backward, the jaws release and slide on the bar; and as the lever is pulled forward, the jaws grip the stock and pull it along. The stock is held central between the pawls by means of two screws that can be adjusted to provide the necessary clearance.

— 82 —

Oil-Grooving Attachment, Engine Lathe. *Mueller Machine Tool Co., Cincinnati, Ohio.* [A. M. vol. 58, p. 714.]

The attachment will oil groove any diameter of work which can be made to revolve in the lathe on which the attachment is placed. Worm gearing transfers power to a splined shaft, at the end of which is an adjustable graduated cross bar that acts as a crank to move a crosshead for any stroke required from 1¼ to 6 in. This crosshead carries the cutter bar, which is provided with a double-pointed cutting tool. The cutting tool cuts grooves forming single or double figures of eight without rechucking the piece. Taper holes or shafts are grooved

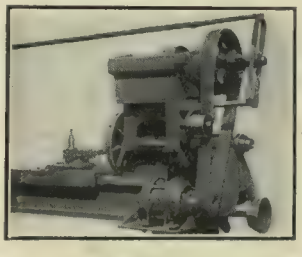


by swiveling the compound rest slide. A chain drive is regularly furnished. When attached to a Mueller lathe the driving shaft of the attachment enters the lathe head through the hole shown in the headstock casting.

— 83 —

Motor Drive, Cone Headstock Lathe. *John Steptoe Co., Cincinnati, Ohio.* [A. M. vol. 58, p. 749.]

This compact motor-drive arrangement is applicable to the "Standard" 14-, 16-, 18-, and 20-in. engine lathes. The arrangement can readily be attached, as very little machine work is required. The countershaft unit is bolted over the cone pulley of the lathe. The cone pulley on this countershaft can be moved away from the lathe spindle to tighten the belt connecting the cone pulleys. The belt from the motor to



the countershaft is kept tight by an idler pulley. A clutch pulley is mounted on the countershaft. A constant-speed motor of 1,100 to 1,200 r.p.m. is recommended.

See Woodworking Machines, Lathes.

See Threading Machines.

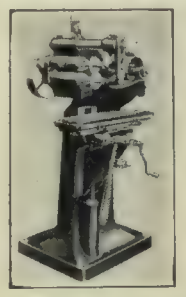
See Small Tools for Cutting Tools and Attachments.

Milling Machines

— 84 —

Milling Machine, Hand, Double-Spindle. *United States Machine Tool Co., Cincinnati, Ohio.* [A. M., vol. 58, p. 389.]

The machine is intended for milling the step slots in piston rings and for similar work such as opposite keyways in small shafts. The

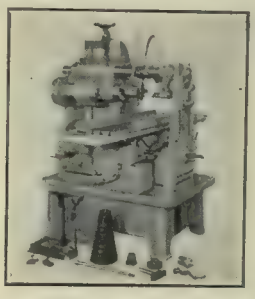


feed movements are operated by hand only. The upper spindle is adjustable from the lower a distance of 1¼ in. to allow for wear of the cutters. The two spindles run in opposite directions. The machine requires 2 hp. The working surface of the table is 7x23 in. with a longitudinal movement of 6 in. by a crank. A 5-in. hand cross feed and 15¾-in. vertical feed are provided. Weight, 950 pounds.

— 85 —

Milling Machine, Manufacturing, Automatic, No. 33. *Brown & Sharpe Manufacturing Co., Providence, R. I.* [A. M. vol. 58, p. 602.]

This machine is for the automatic milling of duplicate parts in large quantities. The automatic control of the spindle and table is obtained

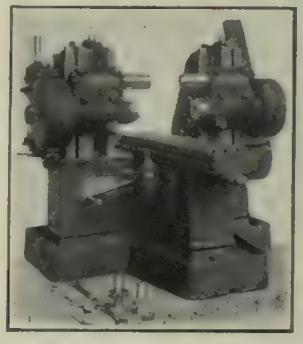


by means of dogs located at the front and rear of the table. The automatic action applies to the variable feed, constant fast travel and stopping of the table, as well as to the starting, stopping and reversing of the spindle. The movements are controlled independently. The machine is driven from a single pulley. Twelve changes of spindle speed are provided from 22 to 180 r.p.m. There are eighteen table feeds ranging from 0.38 to 24.54 in. per min. The table has an automatic longitudinal feed of 34 in. and a transverse adjustment of 5¾ in. The spindle can be adjusted vertically 15 in. Provision is made for enclosing a constant - speed motor within the base for a motor drive. Automatic lubrication is provided for all operating parts within the frame. The working surface of the table is 52x12½ in. Weight, 6,200 pounds.

— 86 —

Milling Machine, Automatic, Worm-Driven, 48-Inch. *Cincinnati Milling Machine Co., Cincinnati, Ohio.* [A. M. vol. 58, p. 645.]

The machine is made in three types, the Duplex, Widened Duplex and Plain. The duplex machine, here illustrated, has two spindle driving units or headstocks mounted on the bed, one on each side of the table. It is especially adapted for machining parallel plain surfaces, using face mills. The widened duplex machine per-



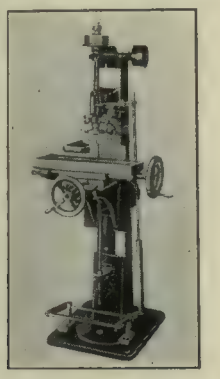
mits a greater distance between the spindle ends. The plain machine has but one headstock and an arbor support. The table is mounted directly on the bed. The headstocks may be adjusted by means of screws. The spindles are carried in brackets adjustable vertically. On the duplex machine one pulley drives both spindles. Power is transmitted through gears to the worm drives at the spindles. The table feed and quick return mechanisms are controlled by dogs. Sixteen feed changes are provided through quick change gears. The total working travel of the table is 48 in. and the working surface is 12x59 in. The duplex machine weighs about 8,500 pounds and the plain machine about 500 pounds less. Suitable fixtures and attachments can be furnished.

— 87 —

Milling Machine, Vertical, with High-Speed Attachment. *R. M. Clough,* 327 *Colony St., Meriden, Conn.* [A. M. vol. 58, p. 56.]

The machine is the same as the regular No. 1 machine,

except for the attachments. Handwheels are fitted on the table screw and cross screw instead of ball handles. A treadle controls the feed, and the stop gage for the spindle is placed on the sleeve above the head. The high-speed attachment is clamped on the lower end of the spindle

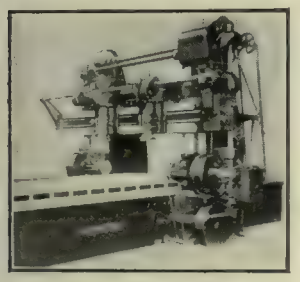


sleeve. It is driven by a round belt running in a V-groove pulley mounted on the spindle. The speed is four times the speed of the spindle of the machine, so that up to 10,000 r.p.m. can be obtained. The spindle has a draw-in rod, and a small watch chuck is used to hold milling cutters $\frac{3}{16}$ in. or smaller in diameter.

— 88 —

Milling Machine, Planer-Type, Heavy-Duty, "Multi-Miller," Newton. *Consolidated Machine Tool Corporation of America, 17 East 42nd St., New York, N. Y.* [A. M. vol. 58, p. 954.]

Duplicate sets of control levers permit the machine to be operated from either side

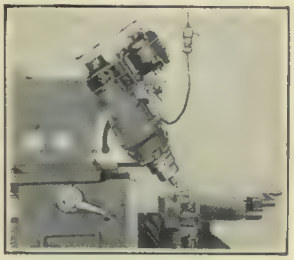


with equal facility. The bed is of one-piece box construction with closed top. The table is of double-plate construction, 8 in. thick over the ways and having a bearing 7 in. wide on each way. The power rapid traverse moves the table at the rate of 12 ft. per min. in either direction. The 18 table speeds are entirely independent of the spindle speeds and range from 1 to 33 in. per min. The box-section housings are reinforced at the top by an 18-in. tie-beam. The one-piece cross rail can be run either up or down by power rapid traverse at the rate of 3 ft. per min. Two vertical spindles and two horizontal spindles are supplied. They are driven by phosphor-bronze worm wheels. The feeds range from $\frac{1}{2}$ to $16\frac{1}{2}$ in. per min. The machine can be arranged for either belt or motor drive through a 12-speed gear box mounted on the right hand upright. It is built in several sizes.

— 89 —

High-Speed Attachment, "Duplex" Milling Machine. *Van Norman Machine Tool Co., Springfield, Mass.* [A.M. vol. 58, p. 356.]

High spindle speeds can be obtained for small milling cutters by the attachment of an auxiliary spindle to the "duplex" milling machine. The cutter spindle can be set to cut at any angle from vertical to horizontal. The attachment is adapted particularly to work which requires both light and heavy

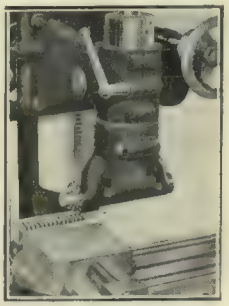


milling on the same piece, as the work need be clamped on the machine only once. It comprises a separate ball-bearing spindle within the main cutter spindle and is driven by a high-speed, ball-bearing motor adjustably mounted on and moveable with the main cutter head. It requires about five minutes to set up or take down the attachment. The high-speed spindle is adapted to carry No. 5 B & S taper-shank end milling cutters.

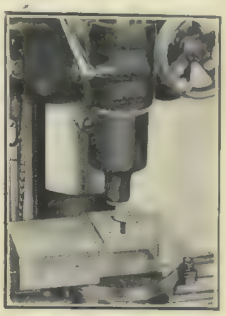
— 90 —

Milling Attachments; Horizontal, High-Speed and Slotting; Milling and Drilling Machine. *W. B. Knight Machinery Co., St. Louis, Mo.* [A.M. vol. 58, p. 958.]

The attachments are for use on the Knight Nos. 2



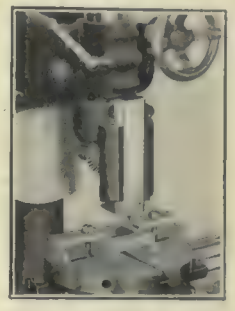
and 3 vertical milling and drilling machines. The horizontal milling attachment has a horizontal spindle which can be used in a plane parallel with the longitudinal movement of the table or in a position at a 90-deg. angle to this movement. In the first position the attachment is



used for such work as rack cutting. In the other position it can perform machining operations in the same manner as a horizontal milling machine. The spindle runs in two bronze bearings, one of which is tapered. Weight, approximately 30 pounds.

The high-speed vertical milling attachment is for work requiring the use of small cutters running at high speed, such as die-sinking and profiling. The device is slipped on over the nose of the spindle, and after the driving gears are meshed the housing is clamped to the stationary spindle sleeve. The drive is accomplished by means of an arbor which fits into the main spindle. The lower part of this arbor is an internal steel gear that drives by means of an idler gear, the small gear cut on the end of the high speed spindle. The high-speed spindle is provided with a No. 4 B & S tapered hole for holding standard $\frac{1}{4}$- to $\frac{7}{16}$-in. end mills. The spindle revolves at a speed $4\frac{1}{2}$ times the main spindle speed. Weight, approximately 16 pounds.

The slotting attachment is for use in tool and die making, and in such apparatus as forming square holes, cutting internal keyways and internal gears. It is clamped around the stationary spindle sleeve of the machine. A pair of steel bevel gears carry the drive from the arbor inserted in the spindle of the machine to the driving crank, on the end of which is a tool-steel bearing operating in the ram.



The ram has a 2-in. stroke. The toolholder takes a $\frac{3}{8}$-in. round tool and has a clapper box to give clearance for the return of the tool. Weight, 40 pounds.

See Threading Machines.

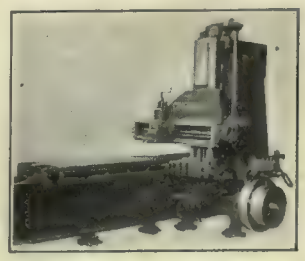
See Small Tools for Cutting Tools and Attachments.

Planers, Shapers and Slotters

— 91 —

Planer, Open-Side, 30x30-Inch. *Cincinnati Planer Co., 3820 South St., Oakley, Cincinnati, Ohio.* [A. M., vol. 58, p. 51.]

The table of the machine is gibbed on the right side and is so fitted between the two V's that it will not be twisted



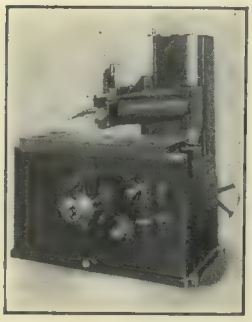
out of its ways. An auxiliary work support can be provided. The bed is closed between the V's and made very heavy on the right side. Forced lubrication delivers oil into the V's of the bed directly under the tool point. The table is of very heavy box type with the bottom entirely closed. The T-slots are planed from the solid and stop holes are drilled and reamed throughout the entire surface. Herringbone gears are used for the first speed reduction; the large gears are semi-steel and the pinions steel forgings. The pulleys are aluminum. Work from 6 to 10 in. longer than the rated capacity may be planed. A special "tu-speed" countershaft is furnished and a variable-speed d.c. motor drive is recommended.

— 92 —

Planer, Crank, Open-Side, 26-Inch. *Whipp Machine Tool Co., Sidney, Ohio.* [A. M. vol. 58, p. 496.]

The machine has been redesigned and improved. It is fitted for work that requires either a planer or a shaper. The table is $46\frac{1}{2}$x $17\frac{1}{2}$ in. in size. The length of stroke of the table can be quickly adjusted by means of the crank mechanism. The

crank arm is mounted on a bearing pin at the bottom of the bed, the upper end and table adjusting nut being connected by heavy double links. The cross rail provides 25 in. traverse for the head. There are cross, verti-

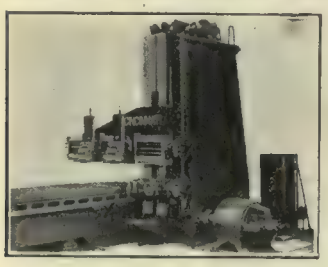


cal and angular power feeds. Six changes of table speed are obtained by the use of quick change gears. The speeds vary from 7 to 70 table strokes per min. The feed control mechanism is like that used on planers. Horizontal feeds up to $\frac{3}{8}$ in., vertical feeds up to $\frac{1}{16}$ in., and angular power feeds are provided. Weight, 4,600 lb. net.

— 93 —

Planer, Open-Side, Motor-Driven, 72-Inch. *Cincinnati Planer Co., Cincinnati, Ohio.* [A. M. vol. 58, p. 957.]

One of the chief features is the gravity lubrication to the bearings in the bed. This system is in addition to the forced lubrication to the Vs. All oil is strained, settled and filtered several times before

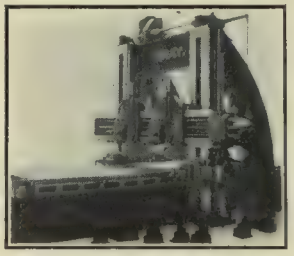


returning to the bearings. The bed is of box-type construction. Besides being bolted and doweled to the bed, the column fits on a large tongue cast integral with the bed. A box-type table is employed. A power elevating device raises and lowers the rail by means of screws mounted on ball bearings. Besides the feeds a rapid power traverse in all directions is provided for the heads. All control levers are within easy reach of the operator. The width of the table is 62 in., while the working dimensions are 72x 72 in.x12 ft. The drive is by a 35-hp. motor. A clamp prevents the table from lifting out of the Vs when the work overhangs.

— 94 —

Planer, "Maximum Service," 60- and 72-Inch. *G. A. Gray Co., Gest and Depot Sts., Cincinnati, Ohio.* [A. M. vol. 58, p. 964.]

The parts are built with heavy sections to insure rigidity under heavy cutting strain. Control is centralized at the right of the machine to eliminate much walking for the operator and to give speed of operation. To raise the rail the stirrup is pushed up. The rail stops without drifting, so that it may be set to a line. Each rail head is moved into position by simply shifting one lever at the end of the rail. Between the slide and harp on the rail head and between the saddle and the rail are "twin-purpose gibs." A turn of the

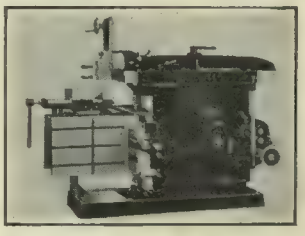


handle in one direction adjusts the gib to the operating position, while a turn in the other direction rigidly locks the parts. The standard "cantslip feed" is used. A turn of the wrist gives any feed from zero to 1 in. in steps of 0.01 in. All the gears, which are helical throughout, run in a bath of oil. Oil is pumped to all the drive-shaft bearings and to the Vs. Oiling and filtering are done automatically.

— 95 —

Shaper, Crank, 32-Inch, "Dreadnaught." *Ohio Machine Tool Co., Kenton, Ohio.* [A. M. vol. 58, p. 237.]

The machine has a stroke of 32 in. and can be arranged for either single-pulley belt drive or individual motor drive by an alternating or a direct current motor mounted at the rear of the machine.

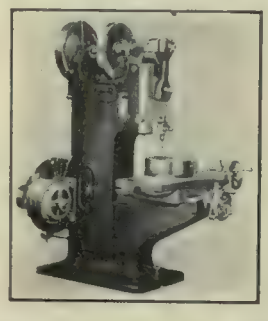


The shaper is of large proportions, to meet the requirements of plants where the work is particularly heavy. The bearing surface of the ram is rectangular and is $2\frac{1}{2}$ in. high. The width of the ram is 13 in., while its length is 62 in. The control levers are all positioned on the operator's side of the machine. The shaper has a back-gear ratio of 28 to 1. The crank arm is $42\frac{1}{2}$ in. long and the center of the bull-gear is located considerably above the center of the crank arm.

— 96 —

Slotter, Die, Motor-Driven, Bossert. *John Steptoe Co., 2961 Colerain Ave., Cincinnati, Ohio.* [A. M. vol. 58, p. 713.]

The slotter is made in two sizes, one having a maximum stroke of 4 in., and the other of 6 in., and it is intended especially for use in making round, square and irregular shaped punches and dies. The ram is driven by means of a crank, the length of the srtoke being variable by moving the crankpin on the disk. The ways are hinged on the upper end in such a way that they can be set at a slight angle to obtain clearance when finishing die openings. The lower end of the way may be connected to a toggle-joint mechanism to move the ram over a curved path on the down stroke. The ma-

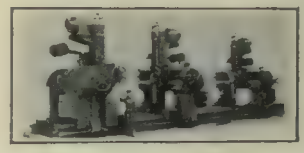


chine can be furnished with cross, longitudinal and circular hand feeds and also with power feeds. A variable-speed gear box gives three changes of speed. A circular table is regularly furnished.

— 97 —

Slotter, Locomotive Frame, Motor-Driven. *Niles-Bement-Pond Co., 111 Broadway, New York, N. Y.* [A. M., vol. 58, p. 818.]

The chief feature of the machine is the method used for the main drive of each unit. A reversing motor is mounted on each head, which motor, driving through one pair of gears only, rotates a vertical screw that directly engages the cutter bar. Motors of 20 hp. are employed, each with a 4-to-1 speed range. The cutting and return speeds are controlled independently, the desired cutting speed being set on one dial on the contactor panel and the return speed on the other. The motor is reversed by automatic contac-



tors governed by a pilot switch, which is actuated by the tripping of adjustable dogs on the cutter bar. The maximum stroke of the bar is 38 in. Each head has its own motor for feeding and traversing the head along the bed and the saddle along the crossrail. By means of change gears and swing arms, combinations of the longitudinal and the cross feeds may be effected, to slot any angle up to and including 145 deg. The slotter is built with from one to three heads and in any desired length of bed. The machine illustrated has a bed length of 60 ft. The openings in the yoke are 61 in. wide and 41 in. high, and accommodate six 6-in. frames or four 8-in. frames set on the bed for simultaneous slotting. The crossrail can be swiveled for cutting angles.

Presses

— 98 —

Press, Arbor, Screw, Hand, "High - Speed." *Weaver Manufacturing Co., Springfield, Ill.* [A. M., vol. 58, p. 124.]

This hand-operated forcing press is for general use in garage repair shops and is equipped with a mechanism that enables it to be operated as a plain arbor press, as well as a screw press. In the former capacity, it is operated by a lever on the central housing. Both the handwheel and screw can be lowered 2 in. This mechanism is used for pressure under 2,000 lb., while for a greater pressure the screw can be employed. The ratchet lever is dropped into position on the handwheel, and pressure applied by pulling down on the lever.

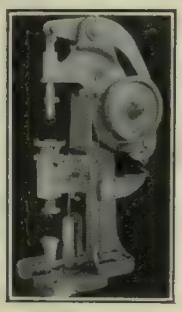


The pressure can be built up to 60,000 lb., then instantly relieved by one reverse stroke of the lever.

— 99 —

Press, Arbor, Cam-Operated, Motor-Driven, Greenerd, No. 24. *Edwin E. Bartlett, Nashua, N. H.* [A. M., vol. 58, p. 494.]

The press is intended for manufacturing work, to take the place of a hand-operated press. A maximum movement of the ram of 5 in. is possible, obtained by means of a cam and rocker arm. The cam is operated by a quick-acting Horton type of clutch. The gear reduction is 45 to 1, from a ½-hp. motor and a complete cycle is made every 3 sec. The ram has a quick return. The knee is

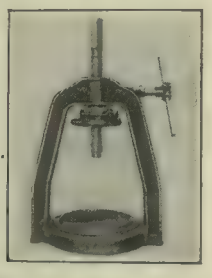


adjustable as to height. The working table or abutment is yielding, its resistance to pressure being adjustable by a screw which compresses a helical spring. There is a 2½-in. opening through the abutment. The machine occupies a floor space of 24x42 in., is 73 in. in height, and weighs 1,575 pounds. The movement of the ram may be reduced by means of a collar, which prevents the complete return of the ram.

— 100 —

Press, Arbor, Rack and Screw, Hand, Kimkin. *Kimmerle Bros., 683 Golden Gate Ave., San Francisco, Calif.* [A. M., vol. 58, p. 532b.]

The press is applicable to gear, bushing and armature work that is done on a bench. The frame and base are cast integral. The arms of the frame are 16. in apart and



work up to 16 in. in. height can be pressed. A 10-in. hole is provided by removal of the surface plate. A speed ratio of 26 to 1 is obtained by using the rack and pinion; by using the screw the ratio is 980 to 1. The ram is 2 in. in diameter. Weight, 200 pounds.

— 101 —

Press, Arbor, Hand. *Little Giant Co., Mankato, Minn.* [A. M., vol. 58, p. 748.]

By the use of special attachments that are furnished many operations such as punching, shearing, straight-



ening, broaching and assembling may be performed. The machine is made in five sizes for work from 10 to 42 in. in diameter. Model A handles work 10 in. in diameter, has a travel of 9 in., weighs 140 lb. and occupies a space of 7x15 in. The base to which the press is shown attached is 33 in. high, weighs 100 lb., and occupies a floor space of 11x15 in. The leverage ratio is 40 to 1, so that one man can exert a pressure of 5 tons when the press is geared and 3 tons when not geared.

— 102 —

Press, Hydraulic, Broaching and Assembling, Vertical, Gooseneck. *Oilgear Co., Milwaukee, Wis.* [A. M., vol. 58, p. 532a.]

The machine is operated hydraulically and employs an Oilgear variable delivery pump. It is suitable for push

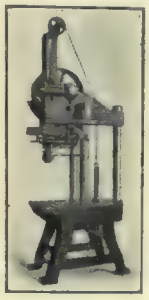


broaching and for such assembling as pushing in bushings. The ram speed and direction of travel can be controlled either automatically or manually at any point in the stroke. On production work, each new cycle is started manually by the operator and the rest of the action is automatic. The press is self-contained and requires no accumulator nor outside pressure system. The variable delivery pump should be driven by a 7½-hp. motor. The machine is built in four sizes: 3½, 6, 10 and 14 tons. Each size has a maximum stroke of 18 in., a throat depth of 8 in., a working height of 19¼ in., and an overall height of 7 ft. 2 in. The ram diameters vary from 2⅜ to 4¾ in. in the different machines, and the maximum ram speeds from 36 to 9 ft. downward and 90 to 23 ft. upward.

— 103 —

Press, Power, Flexible, 20-Ton. *General Manufacturing Co., Detroit, Mich.* [A. M., vol. 58, p. 531.]

The machine is flexible in its operation, being capable of pressures varying from a few pounds up to 20 tons. The head is mounted on three posts. The table is 22 in. wide and 30 in. from the floor. The ram is driven in one direction at a constant speed. The nut revolves with

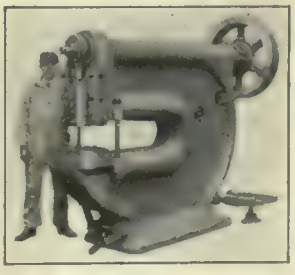


the ram until pressure is applied on a pedal. The pressure tightens the brake to stop the nut, and the ram passes down through the latter. The return stroke is obtained by means of a spring connected by a cable to the top of the ram. The maximum stroke of the ram is 12 in. and the greatest opening between the table and the ram is 18 inches. Floor space, 32x45 in. Height, 110 inches.

— 104 —

Press, Punching and Shearing, Deep-Throated, P-43. *Ferracute Machine Co., Bridgeton, N. J.* [A. M., vol. 58, p. 167.]

The machine is intended for punching and shearing bar metal. The distance from the center of the ram back to the frame is 42 in. The frame is of I-section and heavily reinforced. It is intended to withstand a pres-



sure of 35 tons. It is capable of shearing flat iron or soft steel ⅝ by 5 in. in size, of punching a 1-in. hole in metal ⅞ in. thick, or of cutting off 1¼-in. round bars. The main shaft has bronze bearings, is 3½ in. in diameter and is forged with a large solid collar on which the clutch mechanism is mounted and which serves as the brake wheel. The press has a stroke of 1½ in. and a ram adjustment of 3 in. Stay rods and a motor shelf can be furnished. The press is 35 in. wide, 48 in. long, and has a height of 83 in. Weight, 5,350 pounds.

— 105 —

Press, Drawing and Deep-Stamping, Double-Crank, Toggle. *Toledo Machine & Tool Co., 549 W. Washington St., Toledo, Ohio.* [A. M. vol. 58, p. 54.]

The press is made in a variety of sizes and is intended for all kinds of drawing, deep stamping and forming operations, particularly when forming such parts as metal automobile bodies and fenders. Its chief features are the smoothness of action, the exact timing that can be obtained, the dwell on the movement of the blank-holder slide, the high speed and the small floor space. Two trains of machine-cut gearing serve to drive the machine. The large twin gears at each end of the



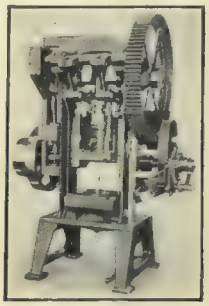
crankshaft operate the inner slide or drawing plunger. The outer or blank-holder slide is operated by cranks. When the toggle is straightened out the entire pressure on the work is held directly through the frame of the press and no power is required. A friction clutch enables the operator to start or stop the machine at any point of the stroke. A power elevator for the plunger slide is furnished, as is also a forced-feed lubricating system to oil all the main bearings from the floor.

— 106 —

Press, Drawing, Toggle. *J. M. Robinson Manufacturing Co., Cincinnati, Ohio.* [A. M., vol. 58, p. 637.]

The improved blank holding mechanism is the feature of the press. The pressure is maintained constant during the full working period and tearing of the metal due to variation of the pressure

of the blank holder on it during the dwell is thus eliminated. The main frame is a one-piece casting. A friction clutch is regularly fitted. The press is made in six sixes, capable of punching holes from 6 to 16 in. in

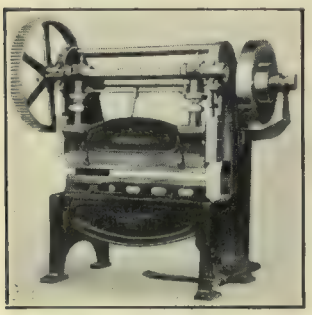


diameter, weighing from 5,700 to 35,000 lb., requiring from 3 to 10 hp. to drive and making from 34 to 10 strokes per min. The No. 205 press illustrated has a weight of 11,000 lb. and requires a 5-hp. motor.

— 107 —

Press, Brake, Forming, Gap. *J. M. Robinson Manufacturing Co., Cincinnati, Ohio.* [A. M., vol. 58, p. 641.]

The press is suitable for plants manufacturing metal furniture or moldings. It can also be converted into a gang punch. The cast-iron main frames of the machine are made with a deep gap, so that long work can be handled. The cranks of the steel crankshaft are fitted



close against the main bearings. A friction clutch controls the press, in conjunction with a brake. The press is made in three sizes. An overall height of 8 ft. 1 in., a gap depth of 12½ in., and a gear ratio of 8 to 1 are provided for all three. The distances between the housings are 4 ft. 6 in., 5 ft. 6 in., and 6 ft. 6 in., while the weights are 6,600, 7,300 and 8,000 lb., respectively. The slide has a stroke of 3 in. and an adjustment of 2 in. for all types.

— 108 —

Press, Hot Forging, Straight-Sided, No. 512. *Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.* [A. M., vol. 58, p. 493.]

The machine is a single-crank press of steel-tied frame construction and is modified for hot forging work. A double-disk friction clutch and double back-gears are provided. There is an automatic dial feed of the ratchet type. The dial has an unusually long period of rest to make deep forming operations possible and to give the heated blank the necessary time under the pressure of the dies. The blank adheres to the punch as the latter rises, but is stripped off automatically, and a sweep swings out to direct the fall of the forging to the rear of the press. A relief mechanism is provided in case of

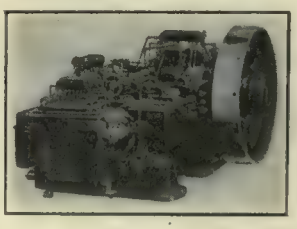


overload. It consists of a hydraulic cylinder and plunger under the bed and is fed by water pressure. If a cold blank should be fed into the die, the bolster is thus depressed due to the overload. When the pressure is relieved, the bolster rises in time for the next stroke, so that there is no delay in the work.

— 109 —

Heading Machine, Bolt and Rivet, Semi-Hot, Automatic-Feed, 1-Inch. *National Machinery Co., Tiffin, Ohio.* [A. M., vol. 58, p. 354.]

The machine has been designed so as to increase the strength of the bed frame over that of the former model; to perfect the gripping mechanism; to prevent premature wear and breaking down due to small size of working parts; to eliminate wasted time in the alignment of the grip dies with the heading tool; and to provide a means for adjusting the gripping or holding time of the machine. The steel bed frame

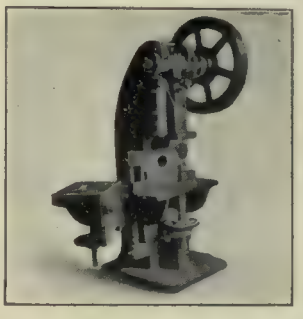


is only half as long as in previous designs. The shearing cut is made at an angle to prevent distortion. To assist in the control of the stock, a bender or straightening device is supplied. An automatic tripping device is provided on the feeding rod, so that, in case of a "sticker" in the gripping dies, the rolls are automatically raised. Weight, 31,500 pounds.

— 110 —

Press, Horning and Wiring, Two-Bed, No. 25. *Adriance Machine Works, Inc., 80 Richards St., Brooklyn, N. Y.* [A. M., vol. 58, p. 315.]

The arrangement facilitates press work where two sets of dies are required for the work. There are two adjustable swinging beds. One set of dies can be swung out of the way while the other is in use, although it is conveniently available when it is required. The height of each bed can be adjusted by means of the screw. The press itself is adaptable to a variety of operations such as cutting, blanking and forming. The No. 25 machine can handle

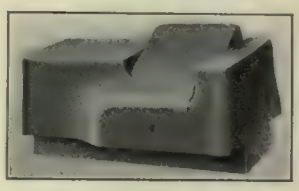


diameters up to 14 in. and depths up to 17 in. The plain machine has a floor space of 48x39 in. and a weight of 5,100 pounds.

— 111 —

Die, Hammer, Rocking-Face. *Beaudry & Co., Inc., 45 Bromfield St., Boston, Mass.* [A. M., vol. 58, p. 89.]

The die is for use on power hammers for drawing tapers and can be furnished to fit any make or size of trip, air or steam hammer. One end

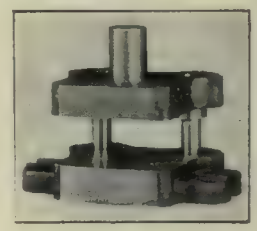


of the die has a tilting face. The operator adjusts the position or angle of the work and strikes a light blow to adjust the tilting face to the angular position. Heavy blows can then be struck to form the taper. Any tapered form can be completely finished and smoothed up without hand finishing.

— 112 —

Die-Sets, Punch Press, Standard, Style B. *Danly Machine Specialties Co., 1613 N. Lincoln St., Chicago, Ill.* [A. M., vol. 58, p. 93.]

The standard die-sets are made in sizes to fit standard makes of presses. They are ready for the die layout, and are suitable for holding dies of practically all types. The die-sets are made in four types, covering a large range of sizes. All are equipped

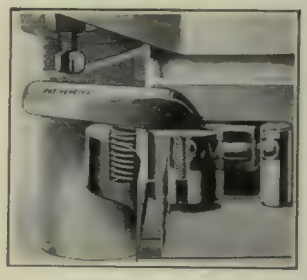


with leader pins to insure perfect alignment between the punch and die. Leader pins and bushings are hardened and ground to within 0.0002 in. of the listed sizes, and the bushings are lapped. All parts are interchangeable with those of sets of the same size and type.

— 113 —

Gage and Stop for Die-Sets. *Danly Machine Specialties Co., 1613 N. Lincoln St., Chicago, Ill.* [A. M., vol. 58, p. 496.]

This work gage and stop device is applicable to almost any type of blanking die. The device is a self-contained unit



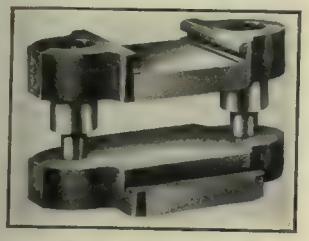
that can be attached to either a simple, progressive or compound die. To attach the stop to the die, it is merely necessary to drill three holes and cut a groove connecting two of them. The assembly of the stop in a stripper plate is done by fitting two small screws.

— 114 —

Die-Set, Punch Press, Type-Z. *Danly Machine Specialties Co., 1613 N. Lincoln St., Chicago, Ill.* [A. M., vol. 58, p. 603.]

The device is intended especially for punch presses used by adding machine and typewriter companies and other manufacturers requiring stampings of accuracy. The die-set has a "floating" punch shank. Hardened, ground and lapped bushings which never leave the leader pins guide the punch. The

adapters, which take the place of the punch shank, can be made up for either solid swivel, spring knock-out or positive knock-out. They



need not be removed from the ram when changing dies. A range of sizes is obtainable to accommodate dies from 4 to 10 in. square.

— 115 —

Feeding Device, Dial, for Punch Press. *S & S Machine Works,* 4522 *Lexington St., Chicago, Ill.* [A. M. vol. 58, p. 50.]

The feeding mechanism can be applied to any make and size of open-back inclinable punch press, and is useful especially in the manufacture of electrical goods. The parts being worked upon are carried under the punch to receive second or third operations. Two or three consecutive operations can be performed with only one handling. The dial feeds are built in seven sizes to suit various sizes of machines. The radial and thrust bearing in the center of the dial plate has a special mounting to



provide accuracy of feed and durability. The adjustable friction brake can be set to give the minimum amount of friction needed to bring the dial to rest.

— 116 —

Guard, Safety, Punch Press, "D & M Junior." *Taylor-Shantz Co.,* 478 *St. Paul St., Rochester, N. Y.* [A. M., vol. 58, p. 495.]

The device is for the protection of the press operator.

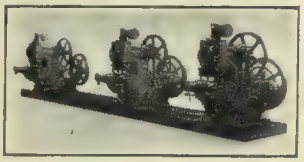


It is of simple construction having only nine parts. The guarding arm of the safety device is automatically driven by the ram of the press. It sweeps across the bolster of of the press and passes the dies before they close. Adjustments of the guard can be easily and quickly made. No changes are required in the press to which the guard is attached, and practically any size of press can be fitted with it.

— 117 —

Group Mounting, Punch Press, Combination. *Cleveland Punch & Shear Works Co., Cleveland, Ohio.* [A. M., vol. 58, p. 777.]

The mounting is intended for presses punching steel angles such as used in oil derricks and roof trusses which have groups of holes at each end and at the center. Air cylinders are used to hold the angles firmly against the gage blocks in a straightened condition. An end gage is furnished. The machines punch angles up to 26 ft. in length. One end machine is stationary, while the other two are adjustable along the base by hand. Each machine has punch attachments which

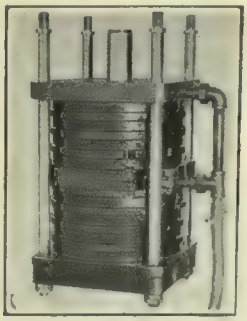


are adjustable to permit distances of from 2 to 20 in. between them. The machines may be operated individually, or all three simultaneously from either end. The mounting can be provided for machines of various capacities.

— 118 —

Cushions, Die, Pneumatic, Punch Press. *Marquette Tool & Manufacturing Co., Chicago, Ill.* [A. M., vol. 58, p. 778.]

These cushions produce a uniform pressure on the blank regardless of the unevenness



of the blank or the thickening of the metal during the operation. The sizes range from cushions having a piston 6 in. in diameter suitable for drawing shells to a depth of 2 in., to cushions which have a piston 25 in. in diameter for presses drawing shells to a depth of 8 in. The cushions may be applied to a press singly or in batteries. Both single- and double-acting cushions may be furnished, with two methods of operation for each. In one method, the piston remains stationary, while the cylinder rises vertically and applies pressure to the drawing ring. In the other method, the cylinder remains stationary and the piston is forced upward. The cushions may be utilized in making double-acting presses serve as triple-acting.

— 119 —

Spacing Table, Hand, Punch Press, 40-Foot. *Cleveland Punch & Shear Works Co., Cleveland, Ohio.* [A. M., vol. 58, p. 782.]

The table may be used with practically any open-gap single punching machine or regular I-beam type machine. It is of the open-side single-



rail type and permits of loading and unloading directly from the front. The movable rail is guided between rollers located on the stationary tie rails and is fitted with clamps to hold the work. A 36-in. handwheel propels by means of a rack and pinion the movable rail. The material supporting rollers are raised and lowered individually by means of a crank. The stopping of the table may be accomplished by either adjustable steel stops, hardwood pins or notched wooden templets. At each stop a hole is punched in the work. The table will handle a 24-in. I-beam with the material supporting rollers in their lowest position.

— 120 —

Pump, Hydraulic, High-Pressure, Vertical, Class SS. *Hydraulic Press Manufacturing Co., Mount Gilead, Ohio.* [A. M., vol. 58, p. 968.]

The pumping unit is for a hydraulic wheel press or tire forcing press and is intended for long service. A one-piece steel forging with renewable



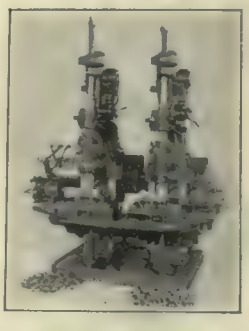
bronze seats screwed in for valves, forms the cylinder block. Secured to the cylinder block is a one-piece crosshead guide with babbitted bearings. An adjustable spring-loaded safety valve is provided. The pump is furnished in either two- or three-plunger types, the latter being provided with one low- and two high-pressure plungers. Both types are provided with automatic knock-out valves of the spring-loaded type. The eccentric shaft is located a considerable distance from the crossheads to reduce angular thrust in the crossheads. Either direct-connected motor drive or belt drive can be provided. The pump is made in three sizes from 7½ to 15 horsepower.

Threading Machines

— 121 —

Drilling and Tapping Machine, Gang. *Barnes Drill Co.,* 814 *Chestnut St., Rockford, Ill.* [A. M., vol. 58, p. 204.]

This gang drilling machine is fitted for production work when tapping small parts such as spuds for steel barrels. Each spindle of the machine is provided with a two-spindle auxiliary drilling head and carries two Rickert-Shafer collapsing taps of 2-in. pipe size. A geared thread leading feed corresponds to the pitch of the taps used. Coil springs on the spindles automatically return them upon the tripping of the taps, and the chasers are reset on the upward thrust of the spindle. On the table of the machine are two air-operated two-position jigs. The machine is provided with all-geared driving and feeding mechanisms, and has self-oiling features. Each unit of the machine is independent and is equipped with eight changes of speed and ten



changes of feed. It will handle twist drills from ⅛ to 2 in. in diameter at suitable speeds and feeds. It is stated that the unit when attended by one operator can produce 700 pieces per hour.

— 122 —

Tapping Machine, Semi-Automatic, Three-Way. *Fox Machine Co., Jackson, Mich.* [A. M., vol. 58, p. 853.]

The machine has two side heads that tap holes in the ends of an automotive cylinder block, and a rear head that taps the holes in the side of the block. One 10 hp.

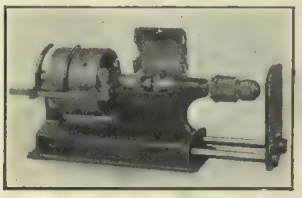


motor located on a base behind the rear head drives all three heads. By means of the lever on the front of the bed, the motions of all the heads can be started, stopped and reversed simultaneously. The heads advance at the same rate as the taps feed in the work. The reversing is automatic. The tapping speed is about 20 ft. per min., obtained by change gears. All the spindles are mounted on Fox cluster plates. Weight 6,350 pounds.

— 123 —

Tapping Machine, Bench, Horizontal. *William L. Procunier, 18 South Clinton St., Chicago, Ill.* [A. M., vol. 58, p. 855.]

The clutch is of the ring type that engages instantly when the machine is reversed. It can be easily replaced when worn out. A hardened steel "double-jaw" chuck provides the gripping mechanism. The tap is gripped on the

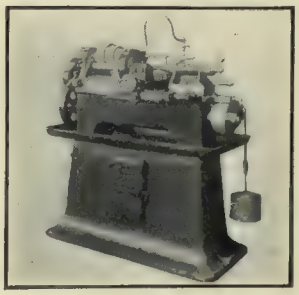


squared end with one pair of jaws, and on the round shank with the other. Should the tap hit the bottom of the hole, the safety friction members slip and prevent breakage. The machine can be furnished in four sizes having jaw capacities up to ⅝ in., and with or without the safety friction attachment.

— 124 —

Threading Lathe, Generating, Automatic. *Automatic Machine Co., 113 East Washington Ave., Bridgeport, Conn.* [A. M., vol. 58, p. 960.]

The machine is for cutting small screws and nuts of coarse pitch, either single or multiple threads, worms and helical gears. To obviate the necessity for reversing the direction of rotation of the machine at each pass of the tools, a cam is employed instead of a master screw. The pitch of the thread being cut is not dependent upon the amount or rate of rise of the cam, but upon the relative rotative speeds of cam and work. The forward and back movement of the cross slide is actuated by a single-throw crankshaft. The feeding movement of the tools takes place automatically during the return stroke of the carriage and is actuated by a spring. The threading tools are of the "duplex" type; one tool cuts one side and a part of the bottom of one thread while the other tool cuts the other side and remaining part

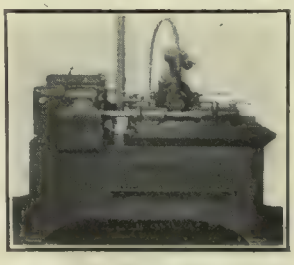


of the bottom of the same thread. The machine may be built of any required size. It is mounted on a cabinet pedestal in which is contaned the tank for the supply of cutting compound.

— 125 —

Thread Generator. *Fellows Gear Shaper Co., Springfield, Vt.* [A. M., vol. 58, p. 923.]

The machine operates on the molding-generating principle, and uses a helical cutter such as is employed on a gear shaper. The work rotates on an axis at right angles to the axis of the cutter. The cutter rotates in harmony with the work, as the two are geared together. The cutter is carried in a head retained in a slide that is traversed longitudinally. As the cutter is rolled in mesh with the work, it pro-

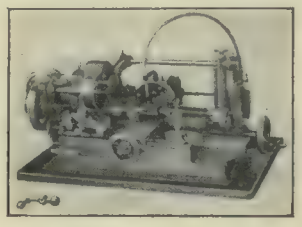


duces the thread. Change gears and the differential mechanism take care of rotation of the cutter with relation to the translating motion. The maximum capacities of the No. 1 machine shown are: A length of thread of 12 in., a center distance of 18 in., a pitch of ⅝ linear or 5 diametral, a helix angle of 23 deg., a pressure angle of 14½ deg. and an outside diameter of 23 inches.

— 126 —

Milling Machine, Thread, Relieving, Bench. *Waltham Machine Works, Waltham, Mass.* [A. M., vol. 58, p. 94.]

The machine has been adapted to relieving work on taps, hobs and milling cutters. The compound taper attachment is arranged to travel forward and back, actuated

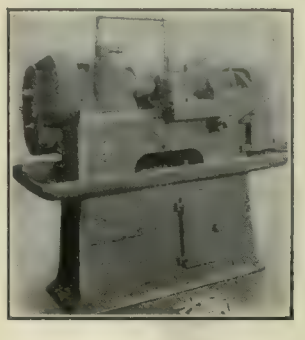


by a cam through levers adjustable for the amount of relief. The device can be set to mill concentrically, or with the ordinary relief, or with a combination of both. By means of a special driving mechanism, the relieving attachment may be operated on different numbers of flutes. Two starting levers are provided, one for relieving and the other for ordinary threading work. Work having either straight or helical flutes can be relieved, and multiple as well as single threads can be machined. For multiple cutter work the gear connection may be disengaged and an indexing device used for spacing the cuts. The movements are automatically operated.

— 127 —

Hobbing Machine, Thread, Duplex, Coulter. *Automatic Machine Co., 113 East Washington Ave., Bridgeport, Conn.* [A. M., vol. 58, p. 952.]

The machine was designed primarily for hobbing threads upon the jaws of pipe wrenches, where the cutting is done upon opposite sides of a bar to form an interrupted thread. The work is supported and driven at one end by a two-jawed, lever-operated chuck. The outer end of the work is centered in the usual way by a tail center. The two hob spindles are supported by the carriage and move lengthwise of the machine with it. One hob lies before and the other behind the center line of the machine,

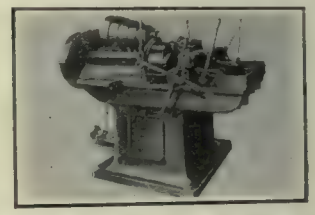


and their carriers are capable of adjustment for different sizes of work. The rotation of the work spindle is comparatively slow, as it is only the feeding movement of the work to the cutters. A work piece is completed at each cycle, which corresponds to each half-revolution of the work spindle, and the machine automatically goes out of action. The operator replaces the finished piece with a blank and again starts the machine. Floor space, 5½ x 2½ ft. Shipping weight, 5,000 pounds.

— 128 —

Threading Machine, Pipe and Nipple, Internally Tripped Die-Head. *Landis Machine Co., Waynesboro, Pa.* [A. M., vol. 58, p. 958.]

The feature of the improved machine is the internally tripped die-head, which automatically insures a uniform length of thread on the nipples and also elim-

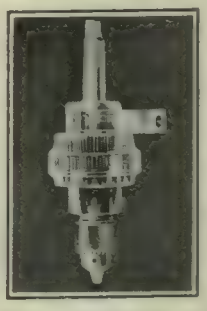


inates the necessity of gaging them by hand. The machine threads, reams and chamfers pipes and nipples. The head can be set to open automatically when the thread has been cut to the desired length. It employs the Landis high-speed steel chasers and chamfering reamers. The machine is made in ⅛, 1¼, 2 and 4 in. sizes and may be furnished in both single- and double-spindle types.

— 129 —

Tapping Device, Sensitive, High-Speed, Jarvis. *Geometric Tool Co., New Haven, Conn.* [A. M., vol. 58, p. 532a.]

The device is intended for light work using high speeds. The body of the device is of



aluminum and weighs a little less than 2 lb. To prevent the breaking of taps at the instant of reversal, the machine is fitted with a shock absorber which acts on the reverse gears to decrease the

shock of reversal. The device is made in two styles. Style OA has a positive ball drive and is intended for use when tapping through the piece. Style OAN has a cone friction drive with ball reverse and is for work in blind holes. Their capacities are $\frac{3}{16}$ in. or smaller.

— 130 —

Die - Heads, Self - Opening, Hardened, "Namco." *National Acme Co., Cleveland, Ohio.* [A. M., vol. 58, p. 608.]

The heads are made in both the non-revolving type, shown at the left, and the revolving type, shown at the right. The non-revolving type is used on hand screw machines and turret lathes where the threading tool is not revolved. Seven sizes are available, with capacities for straight



threads ranging from $\frac{3}{16}$ to 3 in. The revolving type opens and closes automatically while running. It is used on automatic screw machines and where the die revolves. Five sizes are available with a capacity for straight threads from $\frac{3}{16}$ to $2\frac{1}{2}$ in. The body and shank are made in one piece, as are also the cam and cup. All the working parts are hardened, ground and made of alloy steel. An inside trip can be furnished. A screw in the side of the head provides for varying the diameter.

— 131 —

Dies and Die - Holders, Screw - Cutting, Adjustable, "Threadwell." *Wells Corp., Greenfield, Mass.* [A. M., vol. 58, p. 778.]

The die is made in a range of sizes from $\frac{1}{4}$ to 1 in. diameter, with six changes of outside dimensions. It is hexagonal in shape and adjust-



able for size by means of a screw. Aluminum stocks are provided to hold the dies. For use upon the screw machine or turret lathe two forms of holders are made. One has a shank as shown to be fitted to the turret, while the other is designed as an adapter to go into already existing holders. The full length holder incorporates the releasing or "slip-off" feature employed for cutting threads up to a predetermined length. Considerable freedom of movement of the die is allowed in the holder. Holes in the body provide for a free flow of cutting compound. The holders are made in six sizes.

See Drilling Machines.

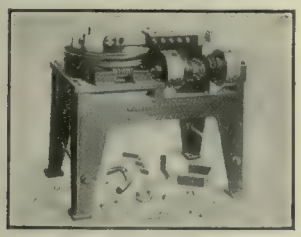
See Small Tools for Cutting Tools.

Other Machines

— 132 —

Bending Machine, Power-Driven, No. 15. *Wallace Supplies Manufacturing Co., 412 Orleans St., Chicago, Ill.* [A. M., vol. 58, p. 495.]

The machine is intended for the hot and cold bending of metal bars and structural shapes. It is controlled by a hand lever and is provided with an adjustable stop mechanism. A number of pieces

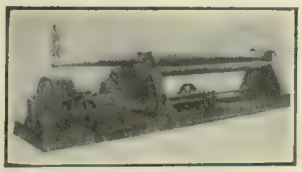


can be bent identical in shape to any desired number of degrees. The table rotates at 6 r.p.m. A circle 8 in. in diameter is the largest that can be formed. For cold bending, these sizes are maximum: squares and rounds, 1 in.; flats, $\frac{3}{8}$x2 in.; and angles, 2x2$\frac{1}{4}$ in. For hot bending, the maximum sizes are, squares and rounds, $1\frac{1}{2}$ in.; flats $\frac{3}{4}$x2 in.; and angles $2\frac{1}{2}$x$2\frac{1}{2}$x$\frac{5}{16}$ in. A 3-hp. motor is sufficient to drive the machine. Floor space, 3x4 ft. Weight, 950 pounds.

— 133 —

Bending Roll, Pyramid-Type, Power Driven, No. 2. *Cleveland Punch and Shear Works Co., Cleveland, Ohio.* [A. M., vol. 58, p. 821.]

The machine has a space between housings of 10 ft. 2 in., and is directly connected to a motor. This motor is arranged to lower



and raise the top roll, which is 11 in. in diameter. One of the lower rolls, which are 8 in. in diameter, has three splines, while the other has two splines and a flanging groove. None of the gears protrude into the foundation to require a pit. The outer hinge can be dropped after lifting the cover plate from the shoulder bolts. The roll can then be tilted for removing the completed cylinder.

— 134 —

Broaching Machine, Hydraulic, Pull. *J. N. Lapointe Co., New London, Conn.* [A. M., vol. 58, p. 887.]

The broach is pulled by a hydraulic cylinder and piston, operated by oil pressure derived from a motor or belt-driven pump. The pump and driving motor are mounted upon an extension to the right pedestal, which is the reservoir for free oil. A separate pump supplies cutting compound to the broach,



and the tank for this system is in the left pedestal. The cast-iron trough under the broach is supported by a hinge and may be swung back out of the way. The pressure pump runs continuously at a constant speed, and requires a maximum of $7\frac{1}{2}$ hp. Variable cutting speeds of the pull-rod are obtained by means of valves, which may be set and locked to provide a constant speed of pull. The maximum pull obtainable is 35,000 lb. The amount of stress upon the pull-rod is shown by the gage on the cylinder. The maximum rate of travel of the pull-rod is 25 ft. per minute in either direction. The length of the stroke is 56 in. Floor space. 13 ft. 6 in. by 2 ft. 3 in. Weight, 3,500 pounds.

— 135 —

Broaching Machine, Duplex, Pull, Improved, No. 4. *Lapointe Machine Tool Co., Hudson, Mass.* [A. M., vol. 58, p. 890.]

The machine has been improved so that the number of working parts has been reduced. A single-speed machine is available, as well as the two-speed machine formerly made; it can be furnished with speeds of 48, 72 or 96 in. per minute. Tight and loose pulleys are provided and no countershaft is needed. The two pull screws are entirely independent of each other in operation. They are $2\frac{3}{4}$ in. in diameter and can be regulated to take broaches up to 50 in. long. Positive driving clutches are used, and friction clutches to give a quick return at four times the cutting speed. The capacity in steel is for key-



ways up to 1 in. wide, and square holes up to $3\frac{1}{4}$ in. across the flats from drilled holes. A 10-hp. motor is recommended. Floor space, 180x40 in. Weight, 5,000 pounds.

— 136 —

Bundling Machine, Scrap-Metal, Rotary, Tempus, No. 3. *Samuel H. Garrett, 234 N. 13th St., Philadelphia, Pa.* [A. M., vol. 58, p. 201.]

The machine is for tightly compressing into bundles, without shearing, miscellaneous metal scrap, such as tangled wire, cotton ties, bushy turnings, bicycle frames, upholstery springs, and sheet metal parts from automobile bodies. On the base is mounted a 5-hp. motor when individual drive is required. All moving parts of the drive mechanism are inclosed. The winding mandrel is driven through a reversing friction movement and worm gearing. The wormwheel runs in oil and has a ball



thrust bearing. There are rotating disks at each side of the machine, against which the ends of the bundles are formed. The curved surface on which the bundle is formed is chilled. The winch head is provided for drawing the material to the front of the machine, and also for unloading it from trucks.

— 137 —

Combination Machine Tool, Floor-Type, Improved. *Triplex Machine Tool Corporation, 18 East 41st St., New York, N. Y.* [A. M., vol. 58, p. 499.]

The floor stand and chip pan can be removed if the

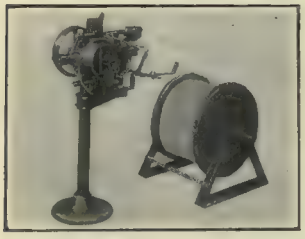


machine is desired on a wooden bench. The distance between centers and the swing over the carriage have been increased from 11 to 14 in. and from 8 to 10 in., respectively, with a corresponding increase in weight to 535 lb. Also, S.K.F. ball bearings are used instead of bronze for the change gear shafts. The starting box is mounted on the head. The maximum speed of the motor is 1,050 r.p.m. and the minimum speed 90 r.p.m. Other minor changes have been made in the design.

— 138 —

Cutting Machine, Measuring, Cable, Automatic, K. N., No. 3. *Artos Engineering Co., 306 Milwaukee St., Milwaukee, Wis.* [A. M., vol. 58, p. 747.]

The machine will cut heavy flexible and semi-flexible materials such as copper and steel wires, cables and straps up to 3 in. in width into lengths varying from 14 in. to 14 yd. The cutter head



rotates and pulls the cable from the reel, the cable being held between the clamp base and one clamp. The knives on the levers cut with a scissor effect against blades mounted on the base. The length of cut is decided by the position of the gage. When cutting pieces 14 to 28 in. in length, both knife levers are in action. For pieces 28 in. in length one of the knives is brought out of action. The machine automatically measures, cuts and records the number of pieces cut. It is power driven and has a clutch pulley.

— 139 —

Filing Machine, Bench, Power-Driven. *Hugold Anderson, 201 Eddy St., Providence, R. I.* [A. M., vol. 58, p. 237.]

The machine is especially intended for shaping dies, forming tools and fly-cutters.

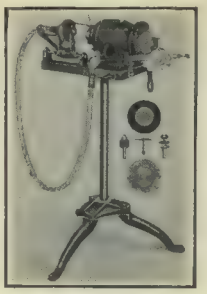


It is ordinarily driven by belt at a speed of from 350 to 400 r.p.m. It is provided with tight and loose pulleys and with a spring lock for the belt-shifting device. The slide reciprocates vertically and the stroke is 1½ in. in length. The file-holder is adjustable and can hold standard machine files up to ¼ in. in size. The table can be tilted either backward or forward to about 30 deg. It is 7 in. square and has a height of 10 in. above the bench.

— 140 —

Flexible Shaft Outfit, Motor-Driven, Sioux, No. 802. *Albertson & Co., Sioux City, Iowa.* [A. M., vol. 58, p. 114.]

The outfit is adapted for a number of uses such as valve grinding, carbon cleaning, tool and small part grinding and drilling. In conjunction with its attachments it is intended especially for repair shops and service stations. A ¼-hp. a.c. motor provides the power to the shaft. The shaft has a universal joint and spindle control and is made of strands of piano wire, wound compactly one on top of the other. A feature of the shaft is the use of roller bearings about 6 in. apart throughout its length to prevent contact of the shaft and housing when bent. The device is started and stopped by a clutch and has a variable speed by means of a 3-step cone pulley. The attachments include an abra-

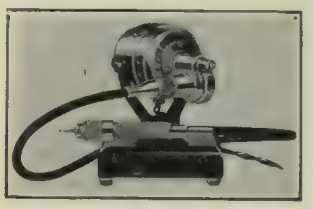


sive wheel, a 4-in. wire brush, a ¼-in. Jacobs chuck, a valve grinding attachment and a carbon cleaning brush. A 6-in. wheel is permanently attached to the motor.

— 141 —

Flexible Shaft Outfit, Utility Tool, Motor-Driven, Geared, "Dumore." *Wisconsin Electric Co., Racine, Wis.* [A. M., vol. 58, p. 566.]

The tool is intended for delicate drilling, engraving and die-sinking work. A feature of the outfit is the aluminum hand-piece, fitted with a double row of S.K.F. ball bearings. A No. 0 Jacobs chuck is used. It will hold tools from ⅛ in. down to a No. 80 drill, and rotates at speeds from 500 to 2,000 r.p.m. The speed is controlled by a 5-speed rheostat in the base of the unit. A motor which operates on either alternating or direct current drives the shaft through worm and gear. The



motor pivots in brackets attached to the base. A No. 7 S. S. White hand-piece with a special adaptor and coupling, and a foot controlled rheostat can be furnished.

— 142 —

Hammer, Smithing, Power, General Utility, "Mechanical Helper." *Blacker Engineering Co., Inc., Grand Central Terminal, New York, N. Y.* [A. M., vol. 58, p. 91.]

The hammer is intended for use on forging work ordinarily performed under hand swung sledges and too small to be done under steam



hammers. Material up to 2½ in. thick is handled, although larger sizes can be cared for. The maximum blow is four times that delivered by a human striker, and 140 blows can be struck per minute. The force of the blow varies directly with the depression of the treadle extending around the anvil. The hammer has a lateral motion controlled by a winged foot lever, thus enabling the head to be traveled along the face of the anvil. An anvil and a block of special design to suit the hammer are furnished. The hammer can be driven by a 1-hp. motor or can be run by belt. The motor is mounted on a small stand on the base and geared to a large driving gear placed on the main shaft. Weight: hammer, 1,300 lb.; special anvil, 560 lb.; stand, 336 pounds.

— 143 —

Hammer, Drop, Board, Power-Driven. *Erie Foundry Co., Erie, Pa.* [A. M., vol. 58, p. 855.]

Among the features of the hammer are the wedge adjustment of the frames across the anvil, the use of bolts and separators between the frames at the top and bottom, and an improved type of latch. The use of the wedges eliminates the screw adjustment. The point of knock-off can be conveniently changed. Anvil blocks are available in the ratio of 15 to 1 or of 20 to 1 to the weight of the ram. The sow block is of forged steel and is held in the anvil by planing the side opposite to the key to a V-shape. The anvil

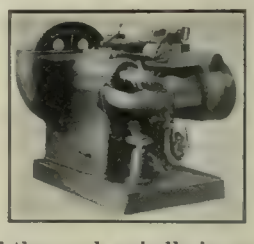


and frame are made from semi-steel, but can be furnished as open-hearth steel castings. The ram is available in either forged or cast steel, and the pulleys in wood, paper or steel. The hammer is built in seventeen sizes having rams weighing from 200 to 4,000 lb., and with ram areas from 7x9 in. to 26x24 inches.

— 144 —

Hobbing Machine, Gear, Simplified. *Cincinnati Gear Cutting Machine Co., Cincinnati, Ohio.* [A. M., vol. 58, p. 712.]

The machine was designed to produce very accurate gears of a given size in large numbers. The hob of the machine has no movement except that of rotation, since the work is carried on a spindle and fed out over the hob. The arrangement gives simplicity of design. The 34-in. master indexing gear is mounted directly on the end of the work spindle, and the proper relation between the rotation of the cutter spindle



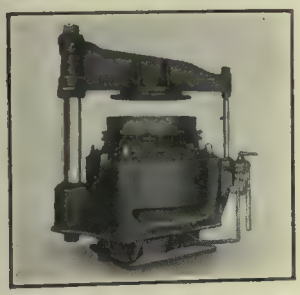
and the work spindle is maintained through four gears. The feed movement is obtained by means of a lead screw running in a nut inside the work spindle, and the rotation of the spindle in indexing advances the work. The feeding mechanism is arranged for rapid traverse also. The cutter spindle is driven by an 8-thread worm.

A flywheel weighing 300 lb. is mounted directly on the end of the cutter spindle. The machine will cut gears up to 7 in. in diameter, 4½ in. face and 4 d.p. in steel. It weighs 6,000 pounds.

— 145 —

Molding Machine, Railroad Car Wheel. *William H. Nicholls Co., 2 College Place, Brooklyn, N. Y.* [A. M., vol. 58, p. 814.]

This combination jolt, squeezer and stripping molding machine produces sand

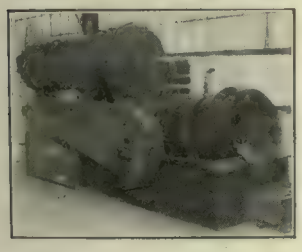


molds for standard 33-in. railroad car wheels. It is intended for use instead of a plain jolt machine. The machine first jolts the mold about six times, after which the pattern table is elevated, thereby bringing the mold in contact with the top platen. On this platen is a tucking plate, so that when the pressure is exerted the sand is evenly distributed throughout the flask. The pattern is then drawn on the exhaust stroke of the squeezing piston. The mechanical operations require about 13 sec. A press of 30,000 lb. capacity is incorporated in the machine. The total weight is in excess of 11,000 pounds.

— 146 —

Quenching Tank, Rotary, Automatic. *W. S. Rockwell Co., 50 Church St., New York, N. Y.* [A. M., vol. 58, p. 313.]

The design is based upon the principle of the Rockwell automatic rotary furnace, with which it is shown mounted. After the material being treated has been slowly brought up to temperature and discharged from the furnace, it slides quickly into the submerged end of the



quenching tank. Here it is automatically picked up in small batches by the internal thread of the rotating tank and conveyed through the quenching fluid as it is raised to the discharge spout at the front. The quenching fluid flows through both the outer tank and the rotating tank. Each piece of the work is given the same treatment. The only labor required is that for supervision. The tank is made in two sizes, the larger one being 8 ft. long, 6 ft. wide and 4 ft. 6 in. in height, and the smaller one 6x4x3 ft. 6 inches.

— 147 —

Riveting Machine, Vibrating, Rotary, No. 4. *Grant Manufacturing & Machine Co., Bridgeport, Conn.* [A. M. vol. 58, p. 638.]

The machine is capable of handling a wide variety of work because of the depth



of throat and other features provided. Motor drive or belt drive can be furnished. When a cylindrical drum is to be riveted, a suitable horn is fitted to the machine. Control is by means of a treadle. The throat depth is 18½ in., which permits of riveting in the center of a 36-in. circle. Rivets up to $\frac{5}{16}$ in. in diameter can be headed.

— 148 —

Riveting Machine, Pneumatic, Portable, 150-Ton. *Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.* [A. M. vol. 58, p. 676.]

The machine is for use particularly when riveting the plates forming the volute

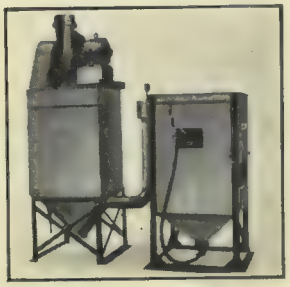


of the casing and penstock on a hydraulic turbine. The frame can be revolved around on the spindle out of its vertical plane, and also tilted upward or downward to an angle of 30 deg. from the horizontal. When the frame is revolved or tilted the center of gravity of all the parts hanging from the crane hook is neither raised nor lowered, due to the method of suspension with the crane hook directly above the center of gravity of the machine. Revolving and tilting are performed by two reversible pneumatic motors of 2 hp. each. Roller and ball bearings are employed at all points of rotation. The riveting mechanism mounted on the machine consists of a combination of toggles that develop a predetermined maximum pressure, and hold it during the last half of the piston stroke and last 1 in. of die travel. Complete manipulation of the machine is possible from one position at the head. The machine has a reach of 118 in. and a gap of 30 in. Total weight 57,750 pounds.

— 149 —

Sandblasting Unit, Barrel-Type, Complete. *Pangborn Corp., Hagerstown, Md.* [A. M. vol. 58, p. 889.]

The machine is for cleaning small work and a small volume of parts such as produced in moderate sized plants. The unit has an exhauster, cloth-screen dust arrester and motor drives for the barrel and exhauster. The parts are shipped fully assembled and ready for operation by connecting with a

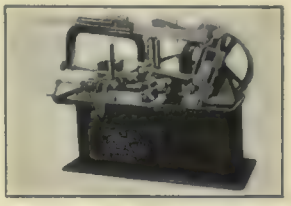


ventilating pipe and compressed air. A single nozzle is used in the drum. Two sizes of drum are available. The No. 1 barrel has a drum 20 in. in diameter and 16 in. long, and together with the dust arrester occupies a floor space of 3 ft. 3 in. x 7 ft. A drum 30 x 20 in. is provided for the No. 2 barrel, which occupies an overall floor space of 3 ft. 7½ in. x 7 ft. 5½ in. The overall height of each is 8 ft. 10 inches.

— 150 —

Hack Saw, Power, "Kwik-Kut," No. 7A. *E. C. Atkins & Co., Indianapolis, Ind.* [A. M. vol. 58, p. 205.]

The machine is intended for precision work when sawing materials. It has a solid cabinet base, which contains the settling tank and reservoir for the cutting compound. A plunger pump is provided. The length of the stroke can be adjusted. The saw frame travels on a T-bar. The blade holder is equipped with a gage to indicate whether the blade is adjusted perpendicularly to the bottom of the vise. The feed of the machine is controlled by a hydraulic dash-pot, so that the amount can be varied by simply turning

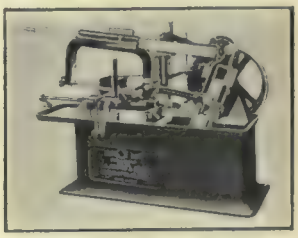


a cock in the bypass. The dash-pot serves also as a cushion to the raising device, so that the blade is lowered into the cut without a jar.

— 151 —

Hack Saw, Power, Improved, "Kwik-Kut," No. 18. *E. C. Atkins & Co., Indianapolis, Ind.* [A. M. vol. 58, p. 959.]

The machine has a solid cabinet base containing settling tank, reservoir and pump. An automatic adjust-



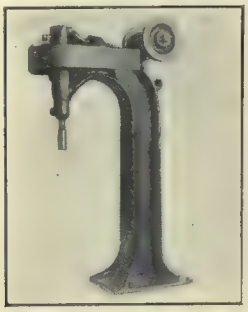
ment of the length of stroke is provided. The blade holder is self-adjusting, so that the blade is always kept straight in the frame. The mechanical feeding device is controlled by a hydraulic dash-pot, that allows the amount of feed pressure to be varied. A cushioning effect is also produced to prevent jarring when the blade is lowered into the cut. Bronze link-blocks and bushings are used on the driving crank. With a solid vise the capacity is 8 x 8 in. The belt-driven machine occupies a floor space of 60 x 26 in., has an overall height of 40 in. and weighs 950 lb. Motor-driven machines can also be supplied, and 1½ or 1½ hp. is necessary.

— 152 —

Screwdrivers, Power-Driven, Bench. *Hergi Manufacturing Co., 250 Fifth St., Bridgeport, Conn.* [A. M. vol. 58, p. 425.]

These belt-driven screwdrivers are for the rapid setting of screws in small assembling work. The machine is made in three sizes, and screws up to ¼ in. may be tightly set. The vertical machine shown can be fitted with an elevating table to hold fixtures. The idlers may

lead the belt from an overhead countershaft or from below the bench. The pulley at the top of the spindle runs continuously and the spindle itself is ordinarily stationary. As the work is pressed upward the protecting sleeve recedes and allows the blade



of the screwdriver to enter the slot in the head of the screw. Further pressure engages the friction in the hub of the pulley to start the spindle and drive the screw. The same mechanism can be mounted in a horizontal position.

— 153 —

Shear, Angle-Iron, Hand-Operated, No. 4. *Whitney Metal Tool Co.*, 91 *Forbes St., Rockford, Ill.* [A. M. vol. 58, p. 388.]

The machine is intended for shearing angle iron up to 2 x 2¼ in. in size, will operate without the necessity of clamping the angle and will shear without distortion. The frame is a solid steel casting and the cutting is done by

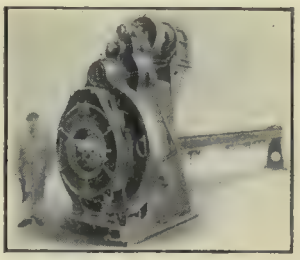


means of inserted tool-steel knives. A rest pad for the angle iron is cast integral with the frame of the machine, so that the iron can be sheared without distortion. By means of the eccentric gear, uniform leverage is obtained with the handle at any position. The machine is supplied with a short socket handle, so that a 1-in. iron bar or section of pipe can be used for a handle. Weight, 41 pounds.

— 154 —

Shearing Machine, Tube and Pipe, Power-Driven. *Tube Shear Co., Marquette Bldg., Chicago, Ill.* [A. M. vol. 58, p. 953.]

The principle of operation is one of shearing over a mandrel with a non-rotating ring shearing-knife. It is not necessary to chuck or grip the tubing, as neither the shear knife nor the tubing rotate. The machine is a back-geared, single-revolution shear, operated by a treadle through positive clutch mechanism, and is handled the same as a standard plate or bar shear. It has a fixed stroke with adjustments for the knife and also for the knife alignment. The shearing angle depends upon the difference in diameter between the shear knife and the outside diameter of the tube, and is controlled by the main knife adjustment. The comparative flexibility of the mandrel due to its length is compensated for by supports which position automatically as the tube is

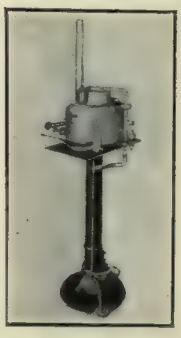


being fed out on rolls. Shearing up to the last inch of the work is possible, since chucking is eliminated. The shearing knives are plain hardened rings and easily accessible for removal.

— 155 —

Soldering Machine, Commutator, "Allatonce." *P. E. Chapman Electrical Works, 10th and Walnut Sts., St. Louis, Mo.* [A. M. vol. 58, p. 128.]

The machine is for soldering all the joints of small commutors at once. A large volume of melted solder is carried in a bath in the machine, heated by a gas burner and surrounded by a protective jacket. The commutator

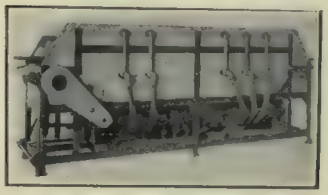


is held in a container above the bath. The height of the solder is then raised to the joints by depressing the treadle. The machine is ordinarily made in two sizes. The larger size can be fitted for soldering two commutors at once. Small machine: capacity for commutors ⅜ to 2 in. in diameter, up to 2 in. in length; floor space, 15 x 18 in.; weight, 130 lb.; capacity, 30 lb. of solder. Large machine: capacity for commutators, 2 to 4 in. in diameter, and 3 in. in length.

— 156 —

Washing Machine, Metal-Parts, Improved, "Autosan." *Colt's Patent Fire Arms Manufacturing Co., Hartford, Conn.* [A. M. vol. 58, p. 605.]

The machine is made on the unit principle with a frame work of light structural steel, and can be furnished in practically any desired length by joining units. The pumping units are self-contained, each being provided with a centrifugal pump, driving motor and independent control, all mounted upon a cast-iron base. The control lever stops the movement of the conveyor without stopping the sprays. Should a piece of work catch in the conveyor, the machine will stop and remain inoperative until the piece is dislodged. The conveyor is made up of links ¾ in. thick and is supported by a series of rollers. The spray chambers are mounted

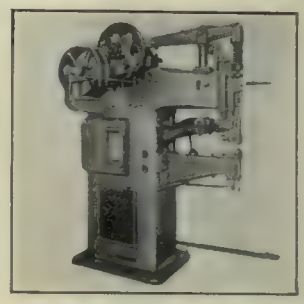


from the outside of the hood. Large tanks hold the soda solution and rinsing water, and each tank has a steam coil. Ten sizes are made.

— 157 —

Welding Machine, Spot, Electric, Automatic, Power, No. 75. *Thomson Spot Welder Co.*, 161 *Pleasant St., Lynn, Mass.* [A. M. vol. 58, p. 532.]

The machine is for work on disk wheels, crankcases and similar heavy pieces. Its normal capacity is two $\frac{5}{16}$-in. iron or steel plates, but it will stand an overload up to ½ in. thickness of metal. A



spring provides a maximum pressure of 2,000 lb. per sq. in. on the die points. The dies or electrodes are of large diameter and have water-cooled die-blocks. The throat depth is 2 ft. A drop horn may be supplied. A hand lever elevates the upper welding head 1¾ in., in addition to the ¾ in. normal opening of the electrodes. The machine is provided with a trip clutch and may be operated in cycles of one spot or continuously. Automatic make-and-break switches are provided. The machine has an electric capacity of 100 kva. and 75 kw. at 75 per cent power factor. Floor space, 67½x29½ in. Height, 81 in. Weight, 4,200 pounds.

Measuring, Gaging and Testing Equipment

— 158 —

Rule, Stainless Steel, 6-Inch. *Brown & Sharpe Manufacturing Co., Providence, R. I.* [A. M. vol. 58, p. 315.]

The steel from which this 6-in. pocket rule is made is of such nature that it will not stain, discolor nor rust. The rule is furnished with scales



graduated in eighths, sixteenths, thirty-secondths and sixty-fourths of an inch. The graduations can be more easily read than on the ordinary rule because of the fact that the rule always has a bright finish, and does not become blackened from use.

— 159 —

Rule, Stainless Steel, 12-Inch. *Brown & Sharpe Manufacturing Co., Providence, R. I.* [A. M. vol. 58, p. 678.]

Except for the length, the 12-in. rule is the same as the 6-in. rule described on page 315 and just mentioned here.

— 160 —

Micrometer, Inside, Improved. *J. T. Slocomb Co., Providence, R. I.* [A. M. vol. 58, p. 532.]

The tool is similar to the former Slocomb micrometers. It cannot be put out of adjustment by careless handling, because it must be taken apart to make adjustments. It can be locked with a bind-



ing screw to preserve the setting. Three sizes of the micrometer are available, 3 to 4 in., 4 to 5 in. and 5 to 6 in. Each can be provided

with caps to increase the length, so as to measure internal diameters larger than marked on the tool.

— 161 —

Measuring Tape, Outside Diameter, "Out Slide Mikes." *Schaap Co.*, 344 *Cumberland St., Brooklyn, N. Y.* [A. M. vol. 58, p. 462.]

The device is for measuring outside diameters on work such as pistons, and reads directly in fractions of an inch and thousandths of an inch oversize. It is made of one piece of sheet steel and



measures diameters from 2⅝ to 5 1/16 in. The fractional size is read at the point where the arrow matches the scale, and the thousandths of an inch over the fractional size are obtained by matching the graduations on the two ends of the device, as when reading any instrument having a vernier. The graduations are large. A smaller instrument measuring diameters from ⅝ to 2⅝ in. is also made.

— 162 —

Gage Set, Micrometer Setting, 0.0001-Inch. *Van Keuren Co.*, 362 *Cambridge St., Allston, Boston, Mass.* [A. M. vol. 58, p. 781.]

The set is intended mainly for checking micrometers, and for direct use on parts being machined. It contains thirty-five gages. The sizes provided are: A ten-thou-



sandths series of ten gages from 0.1000 to 0.1009 in., a thousandth series on ten gages from 0.101 to 0.110 in.; a hundredth series of nine gages from 0.12 to 0.20 in.; and additional gages of 0.3, 0.5, 1, 2, 3 and 6 in. Over 140,000 combinations are available. The range of the set is up to 14 in. in length.

— 163 —

Gage, Dial, Simplified, No. 55. *B. C. Ames Co., Waltham, Mass.* [A. M. vol. 58, p. 350.]

The device embodies several improvements in construction over the previous type. It has only 39 parts. Both the rack wheel and the take-up wheel with the spring are on one large staff, and only one bridge is required



to support these parts and the center pinion. It is claimed that the gage can be badly abused and yet retain its smooth spindle action and accuracy. A tolerance of only 0.0005 in. plus or minus is allowed by the manufacturer in the entire spindle travel, which is 0.3 in. The dial is usually graduated into 100 parts reading 0.050 in. each way, but can be divided into 50 parts.

— 164 —

Indicator, Dial, Test, Attachment No. 729. *Brown & Sharpe Manufacturing Co., Providence, R. I.* [A. M. vol. 58, p. 203.]

By the use of the attachment, a dial indicator can be employed for testing internal surfaces and those not easily reached with the regular



straight spindle of the indicator. The attachment can easily be secured to the indicator. The arm is a bronze casting. The testing bar, which makes contact directly with the plunger of the indicator, is made of steel and accurately balanced. No adjustments are required, which reduces the possibility of inaccuracy.

— 165 —

Indicators, Dial Models D and D-D. *Federal Products Corp.*, 15 *Elbow St., Providence, R. I.* [A. M. vol. 58, p. 889.]

The features of the new models are the large sized dials and the increased amplification of movement, show-

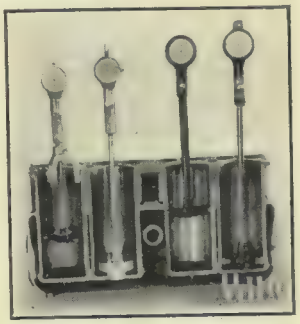


ing but 0.020 instead of 0.050 in. variation plus or minus from zero. The dial may be set to give a zero reading for any position of the pointer, by turning the knurled bezel ring, which may be locked against accidental disturbance. The diameter of the dial of the Model D instrument is 2⅛ in. and of the Model D-D on the left 2¾ inches.

— 166 —

Gages, Cylinder, Testing, Indicating. *Federal Products Corp.*, 15 *Elbow St., Providence, R. I.* [A. M. vol. 58, p. 642.]

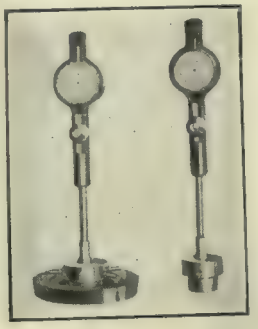
The gages are for testing automotive cylinders, both for manufacturers and service stations. The gage at the left is intended for the manufacturer of cylinders, as its range is limited to ¼ in. changes in diameter. The centralizer is rested on the



end of the cylinder. The three feelers are withdrawn by a thumb button so that the tool may be entered in the bore. Upon release they contact with the cylinder walls and thus indicate the diameter of the bore upon the dial. The second gage from the left covers a range of ⅞ in. in diameter, and is for manufacturers who make more than one diameter of cylinder. The second gage from the right is similar to the first instrument described, but its two-point measurement adapts it to other than round work. At the right is a two-feeler gage to measure diameters from 2 1/16 to 6 in. Several sets of interchangeable feelers or extensions are employed.

— 167 —

Hood, Dial Gage. *Federal Products Corp.*, 15 *Elbow St., Providence, R. I.* [A. M. vol. 58, p. 780.]



This protecting hood is used in connection with the Federal cylinder gages just described. The hood surrounds, but does not touch the indicator. The recess is somewhat larger than the diameter of the indicator and its depth greater than the thickness of the latter. Although the dial is plainly visible, it is well protected from blows.

— 168 —

Gage, Dial, Micrometer. *Federal Products Corp.*, 15 *Elbow St., Providence, R. I.* [A. M. vol. 58, p. 643.]

The tool consists of a bench stand for holding a dial indicator at any desired

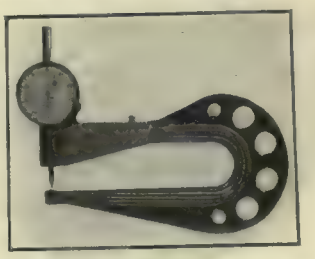


angle, and a pair of micrometer jaws between which the work is inserted. It has a capacity from zero to ⅝ in. A collar holds the jaws open at a point just under the required diameter of the work to be gaged. An adjustable pin may be set to allow the work to enter to its full diameter between the jaws. The dial is graduated to read to 0.020 in. plus or minus in increments of 0.0005 in. The zero line is brought to the pointer by turning the bezel, which is provided with a clamp.

— 169 —

Gage, Dial, Thickness. *Federal Products Corp.*, 15 *Elbow St., Providence, R. I.* [A. M. vol. 58, p. 678.]

The gage is for indicating variations in thickness of material above and below a



set standard. The frame is of steel with a wide rib around the throat. The measuring points may be made of any desired shape to suit the work. The tool will register variations from zero to ⅝ in. The dial is station-

ary and is graduated in 100 divisions, each representing 0.001 in. A "second hand" registers the number of complete turns made by the pointer, and the thickness of the work may be read in decimals from the positions of the two pointers. The gage can measure the thickness of wall of pistons under the ring grooves.

— 170 —

Gage, Dial Indicator, Micrometer. *Federal Products Corp.*, 15 *Elbow St., Providence, R. I.* [A. M. vol. 58, p. 777.]

The instrument is for inspecting or checking errors in size of small parts. The jaws are opened by a pressure of the finger on the button at the top of the dial, and

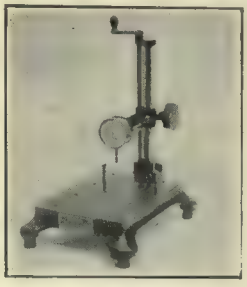


then closed upon the work by the action of the spring. The direction and amount of variation from standard are shown by the position in which the pointer comes to rest above or below the zero line. The diameter of the dial is 2½ in., and the regular graduation is to 0.001 in. The instrument will gage any dimension up to ⅞ in. It rests ordinarily on the small legs shown.

— 171 —

Comparator, Dial. *Federal Products Corp.*, 15 *Elbow St., Providence, R. I.* [A. M. vol. 58, p. 782.]

The instrument is intended for checking errors of dimension during the process of manufacture of small parts that are required to be within close limits of accuracy. It is primarily a

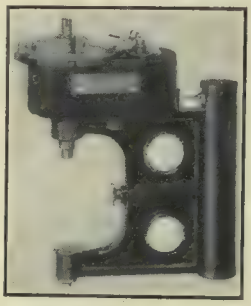


comparator for indicating the amount of departure from predetermined sizes. The base forms a table upon which to lay the work to be inspected, and is provided with tapped holes for attaching fixtures, which can be furnished to suit the work. An arm carries a dial indicator graduated to 0.0005 in. and registering a total variation of but 0.020 in. for each complete turn of the pointer. The arm may be elevated by means of the screw and crank handle and then clamped. Weight, 15 pounds.

— 172 —

Microgage, Gage, Indicating. *Microgage Co., P. O. Box* 1,126, *Boston, Mass.* [A. M. vol. 58, p. 856.]

This precision tool is intended to supplant snap and limit gages as applied to repetition or production work. The tool is a gaging rather than a measuring in-

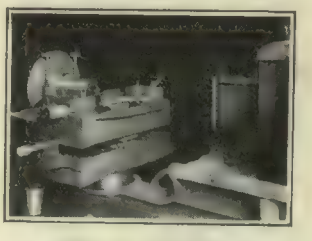


strument and its office is that of a comparator. A micrometer screw is turned into contact with the work by the tension of a spiral spring, and the pressure of contact is always uniform. With a standard piece between the points the zero line of the dial is set to correspond to a mark on the pointer. Any deviation of the work from standard is shown, both in amount and direction, by the position of the zero line of the dial in relation to the stationary pointer. The microgage is a "one-hand" tool. As the work touches the central button, the measuring spindle is moved forward automatically until it contacts with the work, in which position it is locked. The tool is made in sizes from 1 to 5 in., the range of each being ½ inch.

— 173 —

Comparator, Optical, Gear and Thread, Hartness. *Jones & Lamson Machine Co., Springfield, Vt.* [A. M. vol. 58, p. 353.]

The usefulness of the machine has been increased over the former model, as the machine will accommodate



both small and large diameter threads and gears up to 20 in. in diameter. The shadow of the work is projected on a 20x24-in. mirror, and reflected back to a 36x44-in. ground-glass screen at the side of the machine. The fixture shown is used to mount centered work, such as taps, gages or hobs. A tooth is projected into a true outline on the screen and any error in form can be detected. An error in lead can be detected by inserting a size block equal to the lead between the anvils of the micrometer on the base and carriage. Screws for production work are mounted in cradles and the thread projected 200 times enlarged on a tolerance chart 5 ft. from the operator. The entire light source and lens system are in a self-contained unit. Lenses are supplied in three powers.

— 174 —

Testing Machine, Gear-Tooth. *Lees-Bradner Co., Cleveland, Ohio.* [A. M. vol. 58, p. 640.]

The machine measures the accuracy of that portion of the gear-tooth contour that conforms to an involute curve, and also measures the spacing of the teeth. It is capable of indicating errors as small as 0.0001 in. A disk on the work arbor is of the same diameter as the base circle of the gear to be



inspected. As the slide frame is rotated upon the work arbor, a tangent bar rolls about the base circle, and the point of the contact lever traces the involute of this base circle. If the tooth curve is a perfect involute the hand of the indicator attached to the contact point will stand at zero while the point travels from the base circle to the top of the tooth. The error can be read at any point of the contour. When testing the tooth spacing the indexing fixture shown at the side is placed on the machine. If the spacing is not uniform, the indicator shows the magnitude of error to 0.0001 inch.

— 175 —

Micrometer, Thread, Internal, Improved. *John Bath & Co., Inc., Worcester, Mass.* [A. M. vol. 58, p. 168.]

The combination of the sliding-wedge-operated jaws with the micrometer screw gives a minute adjustment of diameter. The space between figures on the thimble corresponds to a variation of 0.001 in. at the measuring jaws, each division being subdivided into ten equal spaces. The outer flange protects the jaws and acts as a pilot, the thread of which is 0.020 in. smaller in pitch diameter than the nominal size of the tool. Four grooves cut across the periphery of the pilot assist

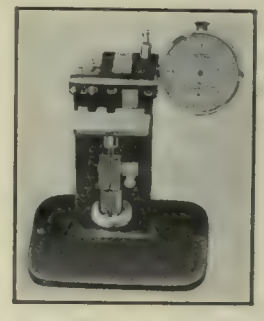


in cleaning out the threads to be measured. Each size of micrometer is supplied with a master ring recessed upon both sides, with holes through the web. By a recess half way down, the threaded portion is divided into two equal parts, to avoid "bell-mouthing" of the gage. The micrometer can be supplied in all commercial sizes from ¾ to 8 in. The capacity of each is from 0.020 in. below to 0.020 in. above size.

— 176 —

Gage, Thread Lead, Indicating. *Federal Products Corp.*, 15 *Elbow St., Providence, R. I.* [A. M. vol. 58, p. 678.]

An elevating platen or table is provided on the front of the column upon which to lay the work. The capacity of the tool is for diameters up to 2 in., and pieces of any

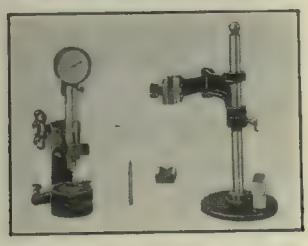


length may be tested. The measuring point at the left is fixed, while the other point may be inserted in any one of the four holes in the bar to include lengths of ¼, ½, 1 or 2 in. between the threads to be tested. To test a thread, a master is first laid on the platen and the dial turned to bring the zero line under the pointer. When substituting a work piece for the master, the pointer indicates the variation from the true lead.

— 177 —

Scleroscope, Recording, Dial, Model-D. *Shore Instrument & Manufacturing Co., Van Wyck Ave. and Carll St., Jamaica, N. Y.* [A. M. vol. 58, p. 169.]

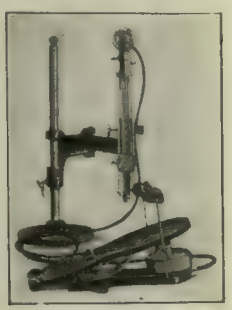
The instrument is similar to Model C1 in employing a hammer dropped on the work, but it indicates the hardness on a circular dial and also gives a permanent record of the value. The hammer is considerably longer and heavier and is allowed only a ¾ in. drop. The height of rebound is proportional to the hardness of the piece. The mechanism for catching the hammer at the top of the rebound consists of a sensitive, one-way ball clutch and pilot sleeve. When the hammer is released, the pilot sleeve and clutch fall with it and cause it to be held in position at the top of its rebound. When the hammer is brought again to its upper or starting position, it actuates a rack and pinion and hair-spring pointer mechanism to indicate on the dial the amount of rebound, and therefore the hardness of the specimen. The instrument can be mounted on the swinging arm of the stand at the right.



— 178 —

Scleroscope Pedal, Pneumatic, "Sico." *Shore Instrument & Manufacturing Co., Van Wyck Ave. and Carll St., Jamaica, N. Y.* [A. M. vol. 58, p. 203.]

The Model-C scleroscope can be operated by means of the pneumatic pedal which takes the place of the hand-operated bulb. It provides the sensitiveness and responsiveness that can be obtained by means of the hand bulb. The pedal mechanism is secured to the floor. Its chief feature is the fact that it leaves both hands of the operator free to handle the work. Pressing the pedal downward releases the hammer of the scleroscpoe by the pneumatic action. The required suction and compression are obtained by the use of a para rubber diaphragm so mounted that practically all wear due to chafing is eliminated. The pad which goes over the top of the operator's foot is adjustable in position.



— 179 —

Tester, Hardness, Pendulum. *Edward G. Herbert, Ltd., Chapel St., Levenshulme, Manchester, England.* [A. M. vol. 58, p. 817.]

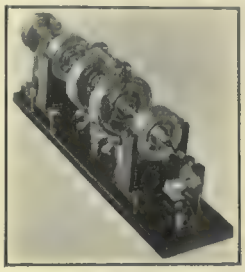
The instrument can test the hardness of substances ranging from lead to sapphire. It consists chiefly of a ball 1 mm. in diameter held at the center of the device, and six screw - actuated weights by which the center of gravity of the whole instrument is adjusted to coincide with the center of the ball. Above the ball is a graduated cylindrical weight mounted on a screw. By raising or lowering this weight, the center of gravity of the instrument can be brought to a predetermined distance above or below the center of the ball. If the instrument is tilted to the right until the bubble comes to zero on the scale at the top, it will swing as a pendulum. The position of the bubble on the scale at the end of the first swing shows the hardness by the "scale test." The time in seconds taken in making ten swings on any substance represents its "time hardness number." The instrument is made in weights of 2 and 4 kg. It is 12 in. long and will span flat surfaces 6 in. wide or cylindrical specimens 8 in. in diameter. The equipment includes a levelling table, the universal ball vise shown, a stop watch and extra balls.



— 180 —

Testing Machine, Fatigue, Farmer Type. *F. H. Bultman Co., Cleveland, Ohio.* [A. M. vol. 58, p. 675.]

The machine records the number of alternations of stress which may be applied to a specimen before it is destroyed. It consists of a housing in which are mounted ball bearings for carrying the specimen in a horizontal position. The specimen is driven by a motor or belt. Two suitably mounted ball bearings are also provided which are put on the specimen to carry the weights that apply the load. At one end of the machine is a revolution counter, so arranged that when failure occurs the counter will stop. Weight, packed for shipment, 54 pounds.



— 181 —

Testing Machine, Impact, Izod. *F. H. Bultman Co., Cleveland, Ohio.* [A. M. vol. 58, p. 677.]

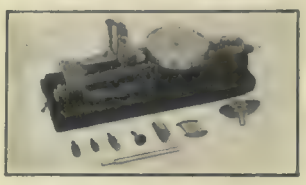
The machine tests the ability of the specimen to withstand a sudden shock or blow. A pendulum 4 ft. long and weighing 60 lb. is mounted on ball bearings, swings between two frames, and is provided at its lower extremity with a hardened tool-steel bar for breaking the specimen. A standard specimen is first placed in the vise. After raising the pendulum, it is released by the trip and allowed to swing and strike the specimen. The breaking of the specimen absorbs some of the energy of the pendulum and causes the latter to fail to rise to the full height of its unimpeded swing. The dial at the top thus reads directly the number of foot-pounds of energy used in breaking the specimen. A floor space of 4 x 10 ft. is required for operating the machine. Weight, 1,200 pounds.



— 182 —

Tachograph, Hand, Speed Recording, O-Z. *O. Zernickow 15 Park Row, New York, N. Y.* [A. M. vol. 58, p. 168.]

The tachograph is essentially a tachometer with an attachment by means of which charts can be made to graphically record the speed of a mechanism. Fluctuations of speed, whether as slight as 1 or 2 per cent of the total speed, or of greater variation, can be recorded. The speed of travel of the paper can be varied by a lever on top of the clockwork. The time is indicated along longitudinal lines and the speed by the vertical height. The disks draw parallel longitudinal lines on the strip of paper. A pen draws a line indicating the relative speed of the work. The actual speed in the test is shown by the dial. A second pen draws a small vertical line every second, being caused to operate by a clockwork mechanism. The ranges of the tachometer are controlled by the thumb slide on the instrument itself. A range from 60 to 8,000 r.p.m. is furnished, although a range from 30 to 24,000 r.p.m. can be supplied.



— 183 —

Watches, Time-Study. *A. R. & J. E. Meylan, 552 Seventh Ave., New York, N. Y.* [A. M. vol. 58, p. 202.]

These Swiss watches are made in a number of styles and have jeweled movements. Timers indicating in ⅛ sec. can be furnished with either 11, 15 or 18 jewel movements. In the timer illustrated, divisions of $\frac{1}{10}$ sec. are indicated and the movement makes 36,000 vibrations per hour. The hand makes one complete revolution every 30 sec. A hand on a small dial indicates the number of minutes that have elapsed. This type can be furnished as a chronograph for indicating the time also, as on an ordinary pocket watch. It can also be supplied with two hands to make a double-acting instrument. A timer of the fifth-second type is made for service in research work when timing intermittent operations.



— 184 —

Level, Precision, 15-Inch. *Pratt & Whitney Co., 111 Broadway, New York, N. Y.* [A. M. vol. 58, p. 94.]

The level is for use in setting up machines, and is 15 in. in length and of trussed frame construction. When

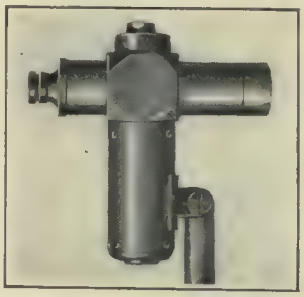


applying the level to the work, the thumb of each hand grasps the insulated grips, the finger tips touch the work first and then the level is gently brought into contact. For general shop use, a 10-sec. level is employed, with each division of 0.1 in, indicating a variation from the horizontal of 0.0005 in. in a 1-foot length. A 3-sec. level can be furnished. An adjusting screw is provided on the top of the device. A case is furnished for the level.

— 185 —

Pyrometer, Radiation, High-Temperature, Ardometer. *Bacharach Industrial Instrument Co., Pittsburgh, Pa.* [A. M. vol. 58, p. 780.]

The device consists of a telescope, with objective and ocular lenses, between which is located a small thermal element in a sealed glass bulb. When the temperature of an incandescent body is to be taken, the instrument is sighted directly on this body, the total radiation of a definite area of the body being concentrated upon a blackened platinum disk by the objective lens. Thus the hot junction of the thermo-couple is heated and the emf. generated sends through the circuit a current which causes a deflection of the galvanometer pointer. Standard scales having maximum read-



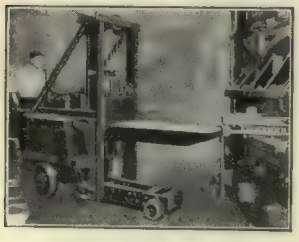
ings of from 2,200 to 4,600 deg. F. are available. The Ardometer may be permanently installed or used as a portable instrument. The glowing area must possess a diameter of a least 2.6 in. when 3 ft. from the instrument. Weight, 1 pound.

Material-Handling Equipment

— 186 —

Truck, Platform, Elevating, Electric, "Hy-Lift." *Baker R. & L. Co., 2180 West 25th St., Cleveland, Ohio.* [A. M. vol. 58, p. 93.]

The machine is for use in lifting, carrying and stacking heavy materials. The standard truck has a lift of 72 in., but it can be furnished with lifts of 48 and 60 in. The maximum capacity is 4,000 lb., lifted at a speed of 5 ft.



per min., while without load the elevating speed is 11 ft. per minute. Cable wound on drums is employed to lift the platform. One motor is furnished for lifting purposes and another for the motive power of the truck. The speed varies from 6 miles per hour without load to 4½ miles per hour with the rated load. The controller supplies three speeds forward and reverse. Overall length, 121½ in. Width, 38 in. Height, 100 in. Weight without battery, 3,710 pounds.

— 187 —

Truck, Elevating, Industrial, Electrical. *Eleveyor Industrial Truck Co., 56 Huntington St., Brooklyn, N. Y.* [A. M. vol. 58, p. 461.]

The machine may be used as an ordinary platform truck, or as an elevating and tiering machine. The forward end of the frame is carried on two large helical springs. The platform is one piece of pressed steel, supported by two helical springs, in the ends of the supporting arms. The arms extend from the carriage, which has widely spaced rollers that travel in



the vertical guides. The truck is designed to carry 2 tons, and the platform can be elevated through a distance of 70 in. A 2-hp. motor is employed for driving. All four wheels are steered by means of long lever arms, while only two are provided with driving power. A hoist driven by a separate motor elevates the platform by means of a chain. A 24-volt Exide storage battery is usually employed. The controller has three speeds each way. Model A has a platform 70x38 in. in size. Model B has a 60x28 in. platform.

— 188 —

Tote Box, Lift-Truck. *Clark Tractor Co., Buchanan, Mich.* [A. M. vol. 58, p. 601.]

The box is made from hard wood and is held together by angle irons. The standard box has a capacity of 11 cu.ft. and is built to hold loads up to 4,000 lb. A floor space of 38x28 in. is occupied by it and it is 32½ in. in height. The boxes can be carried by either power-driven or hand lift trucks. A clearance of 11½ in. above the floor is pro-

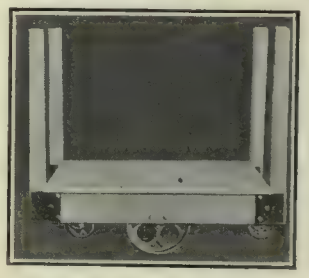


vided between the legs on the side of greatest length for the power trucks, and of 7½ in. on the narrower side for hand trucks.

— 189 —

Truck, Shop, "Leader." *Tucker & Dorsey Manufacturing Co., Indianapolis, Ind.* [A. M. vol. 58, p. 604.]

The truck is of hardwood with cast-iron wheels and metal fittings. The swiveling end wheels are held be-

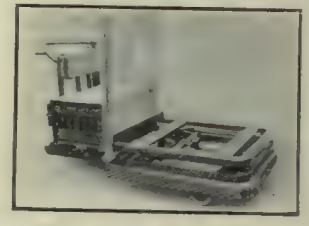


tween the end sills and the center platform girder by a heavy stamped-steel form. A rigid construction is obtained which prevents buckling under of the end wheels. The platform is triple nailed to a frame of 1⅝x6 in. section. The parts are firmly bolted together with heavy stamped-steel corner sockets into which hardwood removable stakes are inserted.

— 190 —

Elevating Attachment, Power-Driven Truck. *Plimpton Truck Co., Elm Court, Stamford, Conn.* [A. M. vol. 58, p. 965.]

The attachment can be furnished to fit the low loading platforms of practically any form of non-lift truck, thus providing elevating advan-

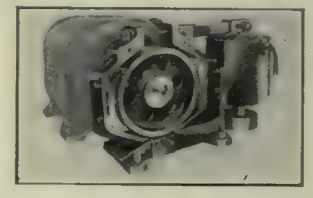


tages when it is desired to move loaded platforms. A downward 90 deg. movement of the handle elevates loads up to 3,000 lb. to a maximum height of 2 in. Descending loads are controlled by the retarding action of a hydraulic check. A storage chamber above the piston tube insures an excess of oil for operating. The symmetrical spacing of the roller bearing elevating wedges in each corner is stated to give load stability, ease of operation and good service.

— 191 —

Brake, Crane, Solenoid, Electric, Type-C. *Whiting Corporation, Harvey, Ill.* [A. M. vol. 58, p. 95.]

The electric solenoid brake is intended for crane service, and is suitable for heavy-duty



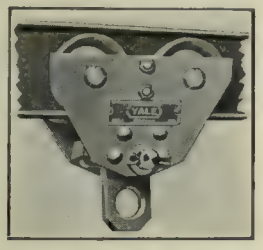
work where an automatic braking action is required. The shoes are easily removable. The arms are so pivoted that the shoes both bear and release equally at all points without dragging action. On d.c. brakes the large diameter plunger of soft iron gives a fast operating solenoid, even at light loads. The coils cause the brake to operate at about 40 per cent of the full-load current. The plunger on the a.c. brake is of laminated iron. The coils are wound with cotton-covered enameled magnet wire sufficiently large to carry the inrush of current.

— 192 —

Trolley, Roller-Bearing, Steel-Plate, Yale. *Yale & Towne Manufacturing Co., Stamford, Conn.* [A. M. vol. 58, p. 566.]

A reserve strength of seven

times its rated capacity enables the trolley to withstand great shocks and strains. The flexible construction permits each wheel flange to take a position suited to the curve of the I-beam flange. It is said that a 1-ton trolley will run easily on a 21-in. radius curve. The trolley has four



wheels with chilled-iron treads. The wheel axles are set parallel to the angled surfaces of the I-beam flanges. The axles are mounted on cylindrical roller bearings. Either a shackle, eye or clevis can be supported.

— 193 —

Derrick, Portable, Hand-Operated, 1-Ton, Barrett. *Barrett-Cravens Co., 1328 West Monroe St., Chicago, Ill.* [A. M. vol. 58, p. 748.]

The device consists of n beam having a reach of 3 ft. 4 in. , a hoisting mechanism and a stand. There are sheaves at the end of the beam, which permit the load



to be carried with one, two or three strands of cable. The hoisting is done by means of two cranks. The block has a ball-bearing swivel shackle to prevent twisting of the cable. One operator can conveniently lift 300, 600 and 1,000 lb. by using, respectively, one, two and three strands of cable, with speeds of 50, 25, and 17 ft. per min. The standard type derrick, equipped with a 50-ft. cable, weighs 285 lb. The drum is capable of holding 300 ft. of cable.

— 194 —

Hoist, Electric, Mono-Rail, "Lo-Hed." *American Engineering Co., Philadelphia, Pa.* [A. M. vol. 58, p. 854.]

A feature of the hoist is its low headroom. A fully enclosed ball-bearing motor is employed. A dust- and moisture-proof controller is provided, which is normally held in the "off" position by a return spring. Hyatt "high-duty" type roller bearings are used throughout the hoist. The end housing contains the automatic lowering brake. The automatic holding brake is operated by a cam on the controller shaft and has asbestos brake band lining. A four-part rope block is supplied. The hoists are made in two types. Type H has either a plain or motor trolley, with capacities ranging from 2,000 to 12,000 lb. Type B can be furnished without a trolley or with the plain trolley; its capacities range from 1,000 to 6,000 lb. They are regularly equipped with rope operated, a.c. controllers

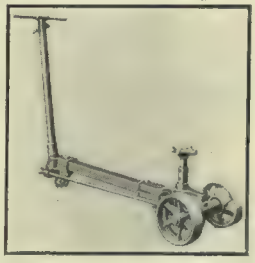


but dynamic lowering or remote-control types of controllers can be furnished. The headroom required ranges from 10 in. on a 1-ton hoist to 14 in. on a 3-ton hoist.

— 195 —

Jack, Garage, "New Way," Model B. *Weaver Manufacturing Co., Springfield, Ill.* [A. M. vol. 58, p. 129.]

The jack is intended for lifting and transporting automobiles where it is necessary to maneuver the machines sideways. It is both heavier and longer than the former model. The lifting standard can be telescoped, and gives heights from 8 to 17½ in. The standard is operated by raising and lowering the main handle of the jack. The front of the jack is supported on two wide-faced wheels

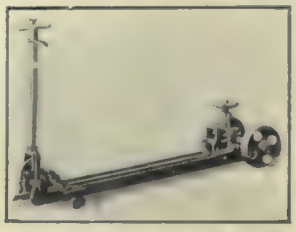


that run on an axle held in ball bearings in a pivoted housing. The axle can be swung by turning the handle top. The handle normally is held in an upright position. A large leverage is provided in the mechanism. Maximum lifting capacity, 5,000 pounds.

— 196 —

Jack, Garage, "High-Speed." *Manley Manufacturing Co., York, Pa.* [A. M. vol. 58, p. 239.]

This jack is for use in garages when lifting and moving automobiles and motor trucks. The device is made from malleable iron and steel, and rubber tires can be provided. The post of the jack is operated by means of the handle through racks and pinions. Only a small movement of the handle need be employed when lifting is being done in close quarters. The post itself can be traversed through a distance of 5¾ in. By means of a screw adjustment in the post, an additional increase in height of 4½ in. can be obtained. Rapid lowering can be obtained by lifting the release button on the top of the frame member is only 3¼ in.



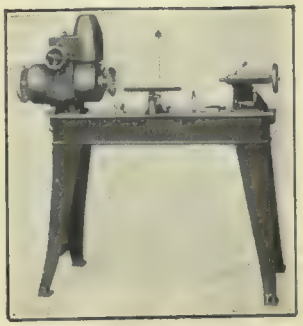
above the floor. The over-all length is 55 in. when the handle is raised; the handle is 48 in. long. Weight, 115 pounds.

Woodworking Machines

— 197 —

Lath, Speed, Motor-Head, A.C., Wood-Turning, No. 51. *Oliver Machinery Co., Grand Rapids, Mich..* [A. M. vol. 58, p. 204.]

The lathe is similar in general characteristics to the former model, except that a greater speed range is provided. The motor can be operated on single-, two- or three-phase current, and provides the same flexibility of operation as obtained in a lathe driven by direct current. It is of the series-compensated type and can be fur-



nished for any frequency from 25 to 60 cycles. The entire controlling mechanism is contained in the same housing as the motor. A push-button switch and handwheel control are provided. The speed of the motor can be varied by simply turning the control wheel, even while the motor is running. The machine may be arranged to carry a hand-operated tool carriage having a cross feed and a compound swivel rest. It will swing 12 in. over the bed, and take work 24 in. long between the centers with a 48-in. bed and 36 in. long with a 60-in. bed. Weight, plain with 48-in. bed, 600 pounds.

— 198 —

Lathe, Motor Headstock, Woodworking. *Little Giant Co., Mankato, Minn.* [A. M. vol. 58, p. 715.]

The lathe swings over the bed and toolrest 12 and 10 in., respectively. It occupies a floorspace of 24x50 in., and has an overall height of 48½ in. A ½-hp. motor equipped with ball bearings forms the headstock. It has four speed variations ranging from 570

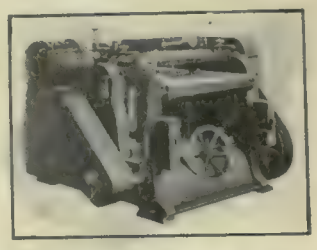


to 3,450 r.p.m., which are obtained by shifting the control lever on the bed. The standard bed is 48 in. in length and the distance between centers 25 in. Two face plates are furnished, one at each end of the headstock. A hand feed carriage with cross feed and rest, and an automatic feed carriage can be furnished. Other attachments for woodworking operations may be supplied, such as a band saw, planer, and buffer.

— 199 —

Surfacers, Wood, Direct Motor-Driven, Improved, Nos. 61 and 199. *Oliver Machinery Co., Grand Rapids, Mich.* [A. M. vol. 58, p. 816.]

In the improved machines the motor is mounted directly on the head, particularly for installations where a 3,600



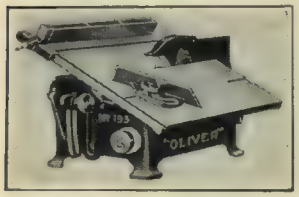
r.p.m. polyphase a.c. motor may be used. The rotor is mounted directly on the shaft of the cutter head or cylinder. The machine may be fur-

nished with belt-coupled drives for other motors. The bed is supported on square-thread screws with ball bearings. The cylinder carries thin high-speed steel knives clamped against hardened steel chip breakers. Four speeds for the work of 14, 18, 24 and 34 ft. per min. are available. There are four feed rolls, all driven by a train of heavy gears. Sectional feed rolls may be furnished. The No. 61 machine is made in two sizes, to plane material 24 or 30 in. wide and up to 8 in. thick. The smaller or No. 199 machine is also made in two sizes, for material 20 and 24 in. in width and 6 in. in thickness. Attachments can be furnished.

— 200 —

Saw Bench, Motor-Driven, 7-Inch, No. 193. *Oliver Machinery Co., Colbrook and Clancey Sts., Grand Rapids, Mich.* [A. M. vol. 58, p. 53.]

The bench is adapted to a wide variety of work. A special base can be provided, with knobs to aid in moving. The 21x24-in. table is grooved for the sliding cut-off gage, which may be used at either side of the saw and set to any angle. The table may be tilted up to 45 deg. The saw arbor runs on ball



bearings and is driven by a ¾-hp. motor. The yoke carrying the saw arbor is hinged so that the saw can be quickly raised or lowered by means of a hand lever. The driving motor, mounted on a swinging bracket, is provided with a turntable mechanism for raising and lowering to tighten the belt. Bench machine: height, 10 in.; weight crated, 200 lb. With floor base: height, 32 in.; weight crated, 300 pounds.

— 201 —

Sawing Machine, Band, Portable, 18-Inch, No. 192. *Oliver Machinery Co., Grand Rapids, Mich.* [A. M. vol. 58, p. 355.]

The wheels are 18 in. in diameter and there is an 18 in. capacity between the saw and the column. The machine is ball bearing throughout. It is portable and the belt-driven machine can be converted into a motor-driven machine at any time. The motor can be driven from an ordinary lamp socket. The table can be tipped 45 deg. The machine will rip up to 11 in. wide and will crosscut and miter up to 8 in. The moving parts are well covered



with steel guards. The ball-bearing motor is of ½ hp. and runs at 1,800 r.p.m. Attachments can be furnished.

— 202 —

Sawing Machine, Band, Motor or Belt-Driven. *Little Giant Co., Mankato, Minn.* [A. M. vol. 58, p. 608.]

The machines are made in four sizes having wheels from 12 to 48 in. in diameter. All working parts are fully enclosed. The upper wheel is spring mounted and adjustable to suit the blade length. The table can be tilted 45 deg. outward. Roller guides are provided above and below the table to guide the saw blade. The machine is equipped with S. K. F. self-aligning ball bearings throughout. Motor and belt driven machines can be changed from one type to another. A ¼-hp. motor drives the model A machine illustrated. The machine occupies a floor space of 15x20 in., has a height of 60 in. and

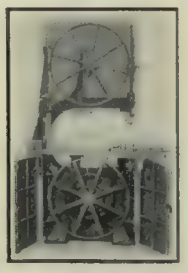


weighs 300 lb. It may be used as an attachment for, and driven from, the company's woodworking lathes and metal lathes.

— 203 —

Sawing Machine, Band, Direct Motor-Driven, No. 16. *Oliver Machinery Co., Grand Rapids, Mich.* [A. M. vol. 58, p. 639.]

The drive is by means of a motor mounted directly on the shaft of the lower wheel, which runs in two ball bearings. The motor is fully enclosed, but has an air gap running up into the column. The motor drive is particularly recommended when a 600 r.p.m., 2- or 3-phase, a.c. motor can be used. The table may be tilted 45 deg. to the right and 5 deg. to the left. There is a 36 in. space between the blade and column, while a 16 in. clearance is under the guide. The lower wheel is encased in iron doors, while the upper wheel has a heavy wire-mesh guard.



The wheels are 36 in. in diameter and rubber faced. Attachments can be furnished. Floor space, 48x60 inches.

— 204 —

Saw, Cut-Off, Woodworking, Underswing, High-Speed, No. 96. *Oliver Machinery Co., Grand Rapids, Mich.* [A. M. vol. 58, p. 968.]

The machine performs the same functions as a swinging cut-off saw suspended from either the wall or ceiling. It can cut off 2-in material up to 22 in. wide, or 4-in. material up to 16 in. wide. Either belt or motor drive can be utilized. Pressure on the treadle brings the saw forward. When the pressure is relieved, the saw immediately returns to its original position. The length of stroke is adjustable. The center section of the table is a casting 22 in. wide by 36 in. long by 33 in. high. The two extension tables are of hard maple fitted with two rollers each. For motor drive, either a 3-hp., 1,800 r.p.m. or a 5-hp., 1,200 r.p.m.



motor can be supplied. Floor space, 4x10 ft. Shipping weight, 1,000 to 1,300 lb. depending on whether belt or motor drive is supplied.

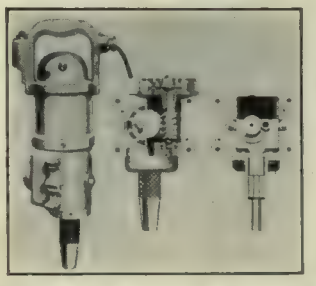
See Lathes, Special.

Small Tools

— 205 —

Hammer, Electric, Portable, Kron. *American Kron Scale Co., 430 East 53 St., New York, N. Y.* [A. M. vol. 58, p. 55.]

The motor of the device can be supplied for either 110 or 220 volts, to suit the type of current available. The hammer is intended for driving rivets up to ⅜ in. in diameter, or drilling concrete with drills up to 2 in. in diameter. The reciprocating motion of the hammer is derived from the rotation of the eccentric pin on the worm-wheel geared to the motor. When the hammer is at the bottom of its stroke, the pin is disengaged from the hammer and does not receive any of the shock. None of the

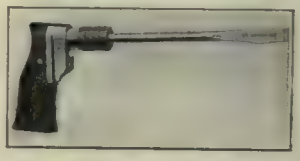


blow is transmitted through the mechanism to the motor. No matter how much pressure is placed on the hammer, the motor is not overloaded, but continues to run at the same speed. Length, 20 in. Weight, 26 pounds.

— 206 —

Screwdriver, Ratchet, Pistol-Grip, Hargrave. *Cincinnati Tool Co., Norwood, Cincinnati, Ohio.* [A. M. vol. 58, p. 129.]

The grip of the screwdriver is so shaped as to fit and not to tire the hand. It gives sufficient leverage to turn tight-fitting screws. Easy



running screws may be quickly turned by means of the knurled ferrule without taking the hand from the pistol grip. Blades of two widths and a reamer are regularly furnished with each tool. The blades can be changed without making adjustments on the tool, and may be had in 3, 4, 6, 8, 10 and 12 in. lengths.

— 207 —

Wrenches, Adjustable, Automatic, Gordon. *Automatic Wrench Co., 450 Palisade Ave., West New York, N. J.* [A. M. vol. 58, p. 238.]

In the adjustable monkey wrench shown at the right the head and the shank are made of one piece of drop-forged steel and riveted in the handle, which is a single

piece of drawn sheet metal without seams. The lower jaw is the movable one and slides on the shank of the upper. To adjust the opening of the wrench, the operator pushes the lower jaw in contact with the work with his thumb, in which position it stays. When the wrench is to be removed from the work, pressure on the releas-

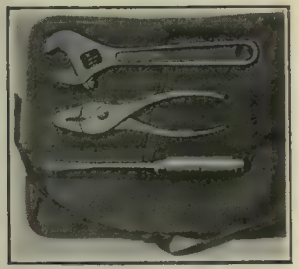


ing catch at the top of the handle causes a small spring to pull back the lower jaw. In the pipe wrench at the left the lower jaw slides on a fixed post secured in the handle. The upper jaw is pivoted on the handle. The wrenches are made in 8, 10 and 14 in. sizes. An open-end wrench is also made. It can be adjusted to size by pressure on the adjustable jaw. Tightening can be obtained by turing the knurled thumbscrew. Release is by a downward pressure to draw the knurl out of contact with the teeth on the movable jaw. The tool is made in sizes of 6, 8 and 10 inches.

— 208 —

Tool Kit. *Crescent Tool Co., Jamestown, N. Y.* [A. M. vol. 58, p. 565.]

This kit consists of a wrench, pliers and screwdriver, and is intended for general use. The wrench is made of drop-forged steel, is 8 in. in length and has an adjustable head with a max-



imum opening of $\frac{15}{16}$ in. The 6-in. pliers have a straight nose. The screwdriver is $7\frac{1}{2}$ in. in length with $\frac{5}{16}$ in. blade, and has a handle which may be swung and locked into position at right angles to the shank to give more leverage.

— 209 —

Drawing Instrument, Combination. *Golden Compa Co., Elkhart, Ind.* [A. M. vol. 58, p. 565.]

The instrument combines a protractor, T-square, rule and compass. The rule, pivot point and zero mark on the protractor are all in line, and



thereby make it possible to "short cut" many drawing operations. The protractor is graduated to $\frac{1}{2}$ deg.; the rule is 6 in. long. A compass is provided by the use of an adjustable pivot point and an adjustable slide on the rule that holds the pencil point. The pencil point is pressed down when drawing circles and angles and released for other work.

— 210 —

Hacksaw Frame, Morgan. *Albany Hardware Specialty Manufacturing Co., Albany, Wis.* [A. M. vol. 58, p. 644.]

The frame of this device is made to withstand severe strains without springing. Its features are the means



for the rapid releasing and tightening of the blade, quick adjustment to suit various lengths of blade, and a method of setting the blade to cut in any of four ways. The handle provides an easy grip for the operator.

— 211 —

Drawing Instrument, Combination, Blackboard. *Golden Compass Co., Elkhart, Ind.* [A. M. vol. 58, p. 781.]

The device combines a compass, rule, protractor and T-square, and is arranged with a vacuum cup pivot for holding the instrument on the board and allowing it to rotate freely. The rubber cup is claimed to hold the instrument in position from 10 to 15 minutes. The rule is 18 in. long and has holes for chalk at every inch. The protrac-



tor is graduated to 5 deg. divisions, and the T-square has a crossbar graduated to $\frac{1}{2}$ in. The zero point on the protractor is in line with the edge of the ruler. The instrument is adapted to school, shop and apprentice classrooms.

— 212 —

Pliers, Drop-Forged, Carlson. *Noble & Westbrook Manufacturing Co., Hartford, Conn.* [A. M. vol. 58, p. 820.]

The tool is adjustable to different sizes of pipes, bolts, nuts, caps and nipples, and is especially adapted for tightening or loosening such parts when they are in close quarters. The jaws are set at an angle to the handles. The capacity of the pliers ranges up to 1 in. on square and



$1\frac{1}{8}$ in. on round material. Either charcoal or gun-metal finish may be had. The device weighs $\frac{3}{4}$ lb. and has a length of 7 inches.

— 213 —

Dresser, Grinding Wheel. *M & S Manufacturing Co., P. O. Box 294, Hartford, Conn.* [A. M. vol. 58, p. 889.]

The tool is made in two sizes, with 1 in. and $2\frac{1}{2}$ in. abrasive wheels, respectively. The handle is made from a single piece of steel tubing, split at one end and formed in dies to the shape of the fork. The grip is knurled and the handle is nickel-plated. The bearings upon which the wheel runs are furnished by a ball-ended stud set permanently in one

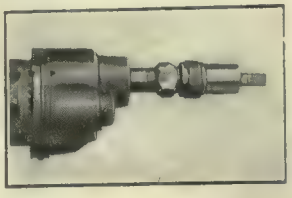


side of the fork and a ball-pointed setscrew in the other. The wheel center is a steel bushing with deep conical centers, running upon the ball points.

— 214 —

Screwdriver Attachment, Portable Electric Drill, Thor. *Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill.* [A. M. vol. 58, p. 890.]

The attachment consists of two main parts, one of which, the body, screws onto the drill spindle and revolves with it. The second part is the shank that carries the screwdriver by means of a knurled sleeve. The contacting ends of the parts are milled out to form a



clutch. When not held in engagement by the hand, the clutch is disengaged by a coil spring so that the blade is stationary. When screws are drawn up tightly, the clutch automatically releases. A bell-shaped finder can be furnished, to assist the operator in locating the slot in a screw head. The screwdriver attachment can be easily attached to or removed from the drill driving it.

— 215 —

Soldering Iron, Electric. *American Electric Heater Co., Detroit, Mich.* [A. M. vol. 58, p. 926.]

The iron is suitable for both light and heavy soldering operations where electric energy is available. By means of a non-conducting compression winding, the



heating element is kept in intimate contact with the core to prevent overheating of the element. The copper tip is of straight construction without an enlarged head. As the tip wears away, it can be withdrawn from the core. There is a polished nickel finish on all exterior metal parts and an ebonoid finish on the wooden handle. A 6-ft. cord and lamp socket attachment is supplied. Three sizes of the iron are available, with soldering tips $\frac{3}{8}$, $\frac{5}{8}$ and $\frac{7}{8}$ in. in diameter. The irons require 100, 200 and 300 watts, have an overall length of $12\frac{1}{4}$, 13 and $13\frac{3}{4}$ in., and weigh 18, 26 and 42 oz., respectively.

— 216 —

Truing Device, Crankpin, Hand-Operated. *R. G. Smith Tool and Manufacturing Co., 245 N.J.R.R. Ave., Newark, N. J.* [A. M. vol. 58, p. 92.]

The truing device is intended for turning the pins



on the crankshafts of automotive engines. The crankshaft need not be removed from the crankcase for the work. The device consists of a frame that carries the

cutter and that is turned about the pin by means of a lever. To true a pin, the lower half of the crankcase is removed and the connecting rod disconnected. The tool is applied by opening the frame, putting the frame in place on the pin and tightening the swing-bolt. A lever inserted in the holes in the periphery of the frame is used to rotate the tool.

— 217 —

Cutter, Circle, Metal, Hargrave. *Cincinnati Tool Co., Norwood, Cincinnati, Ohio.* [A. M. vol. 58, p. 129.]

The tool is intended for cutting circular holes in sheet metal, wood or fiber. The body of the tool is malleable iron, and the blades of tool

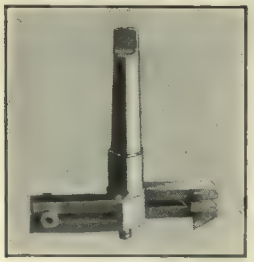


steel. Adjustment of the positions of the blades can easily be made after loosening the thumbscrews that lock them in position. Two models of the device are made, one with a center guide pin, and the other with a center drill for drilling holes. The capacity of both models is circles from 1 to 4 in. in diameter up to ⅞ in. deep.

— 218 —

Cutter, Fly-, Adjustable, Jiffy. *Paul W. Koch & Co., 19 South Wells St., Chicago, Ill.* [A. M. vol. 58, p. 167.]

The device is intended for cutting holes in fiber sheets, metal plates, or other work up to 3/16 in. thick. The body of the tool is made of malleable cast iron. It carries two



tool-steel cutters, either of which can be adjusted by loosening a nut. It is made in two sizes, the smaller one cutting diameters from 1¼ to 3 in. and the larger one diameters from 1½ to 6 in. The taper of the shank of the smaller tool is No. 2 Morse, and on the larger No. 3 Morse.

— 219 —

Reamer, Expansion, Helical. *Hanlon & Wilson, Wilkinsburg, Pa.* [A. M. vol. 58, p. 170.]

The tool is adapted to reaming holes containing oil grooves or cavities, and has a range of expansion of 1/16 in. It is made in diameters from ¾ to 1½ in., although larger diameters can be furnished. The central spindle or arbor is threaded in that portion of its length on which the blades are fitted. The arbor contains slots, the bot-

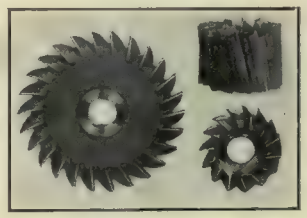


toms of which form a cone about the axis of the arbor. Keys or wedges are fitted in the slots. The segments having the helical cutting edges form a complete cylinder when assembled, with the exception of the portions removed when cutting them from the solid cylinder. The keys and the segments are interlocked. The diameter over the blades is varied by advancing the cutting sections lengthwise along the spindle by means of the adjusting nuts. Since the keys travel in the tapered slots, the diameter over the blades can be expanded or contracted.

— 220 —

Cutters, Milling, High-Speed, Standard. *Gorham Tool Co., Detroit, Mich.* [A. M. vol. 58, p. 275.]

The cutters are made from a selected grade of high-speed steel, and the heat-treatment is special. The de-

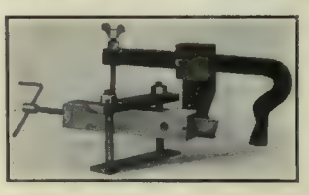


sign includes the features of the course-tooth type of cutter in a semi-coarse-tooth cutter. The number and spacing of teeth were determined by research to find the horsepower required to remove given amounts of stock under different conditions. The design provided for a large amount of chip clearance. The cutters are furnished in plain, side and end milling types in all standard sizes.

— 221 —

Toolholder, Cutting-Off, Lathe, Oddsen. *Reliable Machine Works, 42 Sixteenth St., Brooklyn, N. Y.* [A. M. vol. 58, p. 313.]

The holder is intended for use on a lathe when cutting-off round stock, especially when cutting short lengths of bar stock or pipe. The work is supported by the V's that are attached to the toolholder, and which perform the function of a steadyrest. The body of the tool consists



of a bar in which a cylindrical member is arranged to slide by the operation of the screw. The inner member carries the cutting off tool, which is of the standard ⅜ x ¾ in. size. The work-steadying member is adjustable to take diameters up to 5 in. The holder is secured to the toolpost of the lathe by a clamp. It is always fed by hand, with the cross slide of the lathe locked in position.

— 222 —

Tap, Staybolt, Spiral-Fluted. *W. L. Brubaker & Bros. Co., Millersburg, Pa.* [A. M. vol. 58, p. 675.]

The tap has spiral flutes for both the reaming and threading portions. The degree of taper is said to be just suited for the work and to increase the life of the tap about 20 per cent. The construction is such as to decrease vibration and its consequent breakage. The tap

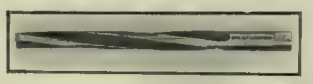


has a free cutting edge. The relief employed is a compound relief consisting of the ordinary machine relief aided by a special machining operation. A steel of a special analysis has been developed. The tap is tempered so that there will be very little shortening or gain in the lead of the thread, at the same time giving the tool the proper cutting qualities and a soft center. The tap has 12 threads per inch, and is made in stock diameters from ¾ to 1½ in. and in stock lengths from 18 to 54 inches.

— 223 —

Reamer, Taper-Pin, Cutwell. *Wells Corp., Greenfield, Mass.* [A. M. vol. 58, p. 780.]

Instead of straight or left-hand helical flutes, the



helix is right-hand. The "lands" of the reamer are relief ground in the same manner as on a twist drill. It is claimed that this treatment eliminates any tendency of the tool to draw in, while the right-hand helix assures an easy shearing cut and carries the chips out at the large end of the hole. The reamer is made in all standard taper-pin sizes.

— 224 —

Drill, Twist, "Cle-Forge." *Cleveland Twist Drill Co., Cleveland, Ohio.* [A. M. vol. 58, p. 816.]

The drill is claimed to possess the advantages of both hotforged and milled drills. A hot-forged drill, while it has toughness, has a web which in many cases is not central because of the twisting process it has undergone when the flute was being formed. On the other hand, a milled drill, while not as tough as the forged, is used in far greater quantities because it has a centrally located web and is uniform in character, thereby producing more uniform holes. This drill is first hot forged to give toughness, and then it is machined in the same man-



ner as a milled drill to give accuracy and a centrally located web. The drill is made of high-speed steel and in a variety of sizes, with both tapered and straight shanks.

— 225 —

Center Drill, Reamer and Countersink; Inserted-Blade. *Frederick A. Wagner Co., Inc., Rochester, N. Y.* [A. M. vol. 58, p. 820.]

The device does in one operation the three operations required in putting center holes in work; namely, drilling, reaming and countersinking. The tool has an inserted blade or cutting member. It has a case-hardened mild steel body or holder, slotted to receive the blade. Four sizes are available, for centering shafts from ⅝ to 10 in. in diameter.

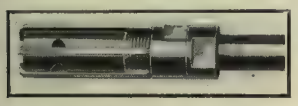


The blades are made of tungsten alloy steel and are blanked out with dies. The cutting lip and the drill point are hot-forged in a die, and then the blade is hardened, tempered and ground. Two 30-deg. beveled edges on the rear edge of the blade are used as a means of centering the latter in the holder.

— 226 —

Reamer, Chucking, Machine, Expansion. *Davis Boring Tool Co.*, 3718 *Forest Park Blvd., St. Louis, Mo.* [A. M. vol. 58, p. 969.]

This reamer was designed for use on production in shops where a tool of moderate price is desirable. The blades project and cut in advance of the body, and are firmly held in place by hardened and ground taper

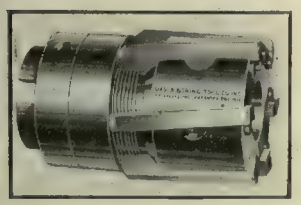


pins, so placed as to make line contact in grooves running longitudinally along the blades. The blades are moved forward for expansion by a nut near the rear of the body, and they slide on tapered seats. After the proper size has been attained, the nut is locked in position by a locknut at its rear. Reamers can be furnished with either straight or taper shanks and in sizes from ½ to 3½ in. The blades can be adjusted to cut oversize from 0.019 in. in the ½-in. size to 0.184 in. in the 3½-in. size.

— 227 —

Reamer, Expansion, Helical. *Davis Boring Tool Co.*, 3718 *Forest Park Blvd., St. Louis, Mo.* [A. M. vol. 58, p. 969.]

In adjusting the blades, they are moved either forward or back by a hardened nut at the rear, the blades sliding on tapered seats. After adjustment has been made, the nut is locked in position by a hardened locknut. The blades are held in the body by hardened and ground taper pins, so placed as to make line contact in

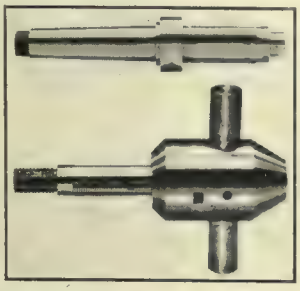


grooves running lengthwise of the blades. It is not necessary to loosen the taper pins when adjusting the blades. The reamer is of the shell type and can be furnished with blades set in right-hand, left-hand, or in a combination of right and left-hand helices, and in sizes ranging from 1⅛ to 7 in. The number of blades varies from 6 to 12.

— 228 —

Mandrels, Self-Gripping, Special "Ettco." *Eastern Tube & Tool Co., Inc., Brooklyn, N. Y.* [A. M. vol. 58, p. 126.]

The mandrel has three grooves, each containing a small hardened steel roller held in place in the gripping position by means of a flat spring. The diameter over

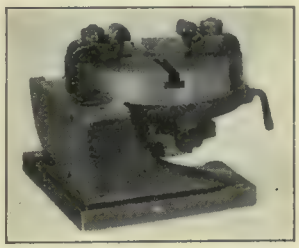


the rollers can be varied by shifting them in the slots. The work cannot be turned in one direction on the mandrel while the cut is being taken, but by twisting it in the reverse direction, it is released. The mandrel shown at the top is equipped with a taper shank and the one at the bottom with a threaded end. Special mandrels to fit Lo-Swing, Fay and other automatic lathes and engine lathes can be furnished as aids for holding work.

— 229 —

Angle Plate, Universal. *Coats Machine Tool Co.*, 108 *West 40th St., New York, N. Y.* [A. M. vol. 58, p. 639.]

The device is for use on milling and drilling machines, and is especially adaptable for holding and indexing circular work. It has a

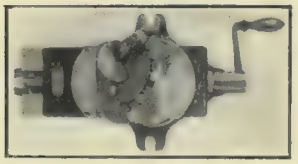


rotatable cast-iron faceplate 6 in. in diameter provided with T-slots. A ¾-in. central hole is provided and plugs are furnished for centering work. The plate is graduated and may be locked in any position of rotation. Steel indexing plates, which are mounted below the faceplate, are supplied in six sizes having from 12 to 360 divisions. A graduated swivel enables the axis of the faceplate to be set and locked at an angle about a horizontal axis. The complete unit can be fastened to the machine table by means of clamps and bolts, which are shown mounted on the angle plate itself.

— 230 —

Vise, Machine, Multiple Adjustable Jaws, Mantle. *Montrose Newman, Inc.*, 342 *Madison Ave., New York, N. Y.* [A. M. vol. 58, p. 644.]

The vise is intended for holding parts having irregular form. Both the movable and the sliding jaws carry sets of multiple jaw members that can automatically adjust themselves to the shape of the work. The adjustable members are semicircular in shape; there are four sizes and each member except those touching the work is fitted to receive two smaller ones. The mating jaws are dovetailed into each other. The body of the vise is of cast iron; the spindle and all of the jaw parts except the smallest are chrome-nickel steel. The smallest jaws, which touch



the work, are made from oil-hardened tool steel. The jaws are 4¾ in. wide and provide a maximum opening of 4½ in. The vise can be fitted with a graduated swivel base or a plain base. It has an overall length of 13 in. The use of the vise eliminates the need for special vise jaws and fixtures to suit each part, particularly for first-operation work.

— 231 —

Holding Device, Connecting Rod. *E. P. Campbell*, 238 *N. El Dorado St., Stockton, Cal.* [A. M. vol. 58, p. 644.]

The device is for holding automotive connecting rods while reaming or boring the bearings to size. It is shown mounted on a Sawyer-Weber connecting rod machine. It enables rapid setting up and location of the rod, but without deforming or twisting it. When setting up to bore the large bearing, the small bearing is centered and held on the bar at the right. Cones are put in the large



bearing to properly position it. The rod is then clamped into position and the centering cones removed. The bearing can then be bored to size. For rebabbitting work the rod is first set up by means of the centering cones then removed and babbitted. When replaced in the fixture it is properly held for reboring.

— 232 —

Chuck, Wrenchless, Improved, Foster-Barker. *Foster Machine Co., Elkhart, Ind.* [A. M. vol. 58, p. 677.]

The chuck is double acting and will grip both externally and internally. The improvement eliminates the use of springs for returning the jaws when releasing. The action is obtained by employing grooved cams instead of cams with external lobes only. The chuck can be opened and closed while in motion. The rear casing is kept stationary, although the body of the chuck is revolved by means of the lathe spindle. The position of the jaws can be adjusted by the lever mounted on the ring, the action taking place through two sets of planetary gears. Both three-jaw, and two-jaw types of chuck are available. The former type is made in seven sizes ranging from 6 to 21 in. in diameter and

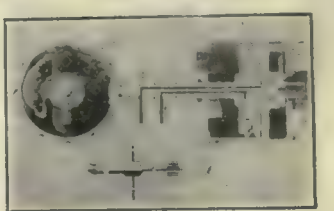


weighing from 29 to 400 lb. The latter is made in five sizes ranging from 6 to 15 in. in diameter and weighing from 27 to 160 pounds.

— 233 —

Air Cylinder, Style-H, M.E.C. *Manufacturers' Equipment Co., Waller Ave. and Fillmore St., Chicago, Ill.* [A. M. vol. 58, p. 715.]

The cylinder is for operating air chucks, such as used on drilling machines for clamping the work. The construction permits adjustments to be made without dismantling the cylinder. The features here included in the Style-H cylinder are applicable to other air cylinders manufactured by the company. An internal ring gear is threaded to screw on a shoulder on the piston. The teeth on a pinion can be meshed with the teeth of the gear after a plug has been removed from the cylinder

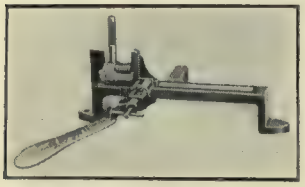


head. The pinion is then turned to compress the packing in the periphery of the piston and prevent leakage past it.

— 234 —

Compressor, Valve Spring. *American Tool Co., 10 Pleasant St., Pawtucket, R. I.* [A. M. vol. 58, p. 91.]

The device is for use in repairing automotive engines for placing the valve spring in position when re-assembling the motor. It consists of a compressor and a clip. The valve spring is placed in the compressor, and the long handle is pulled until the spring is compressed. The clip is then placed over the spring, and the cross handle of the compressor turned until the spring is relieved and can be lifted from the device. After the key has

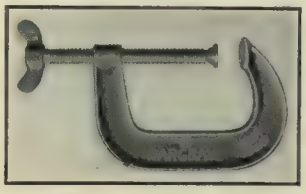


been placed in the valve stem of the motor, the valve spring in its clip is brought to bear on the key and the handle is pressed down. The clip can then be easily removed, leaving the spring in place.

— 235 —

C-Clamp, Hargrave. *Cincinnati Tool Co., Norwood, Cincinnati, Ohio.* [A. M. vol. 58, p. 125.]

The clamp is intended especially for automobile body and pattern work where a greater reach is required than that given by the ordinary C-clamp. The steel screw is cut with a deep Acme thread. It can be furnished with either an end button or a ball-and-socket oscillating tip. The frame is of I-section, strong enough to withstand any force that can be exerted when screwing the clamp by hand. The clamps are made in 3, 4, 5 and 6 in. sizes with 2 5/16, 2 1/2, 3 and 3 5/16 in. throat depths, respectively.



See Measuring, Gaging and Testing Equipment.

Miscellaneous Equipment and Supplies

— 236 —

Countershaft Multiple Friction-Disk. *Warner & Swasey Co., Cleveland, Ohio.* [A. M. vol. 58, p. 89.]

The countershaft is equipped with clutches having multiple friction disks, similar to the clutches employed in automobile construction. The clutches are adapted to high-speed manufacturing work, such as

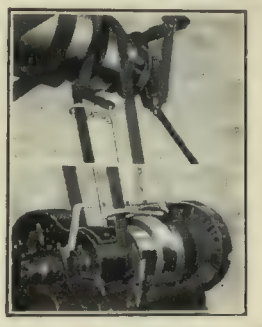


encountered in machines finishing brass and bronze parts where starting, stopping and reversal occur often. Hardened steel plates are employed in the clutch members. The countershaft is applicable to all makes of lathes and machine tools. It has pulley diameters of 10 and 12 in. and widths of face of 3 1/2 and 4 1/2 in., respectively. Shaft lengths, 4 ft. 4 in. and 5 ft. Weights, with countercone, 285 and 335 pounds.

— 237 —

Belt Shifter, Cone-pulley. *G. A. Reeve, 916 Hill St., Middletown, Ohio.* [A. M. vol. 58, p. 781.]

The shifting movement is very similar to that used by a mechanic in shifting cone-pulley belts by hand. In shifting the belt when in the position shown, the operator first swings the handle to the left, which runs the belt off the countershaft pulley and

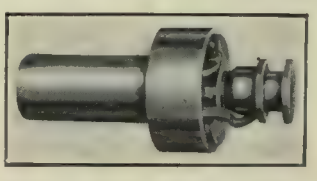


down onto the next step. He then places the vertical rod in the next notch on the bar over the lathe cone and swings the handle to the right, which puts the belt on the next larger step. The shifter is made in various sizes and styles to fit any machine using a cone-pulley drive. It weighs about 25 lb., and drilling and tapping are the only operations needed to put it in place.

— 238 —

Clutch, Friction, Expansion. *Conway Clutch Co., Cincinnati, Ohio.* [A. M. vol. 58, p. 814.]

The clutch is for geared-head lathes and other single-pulley-drive machines making speed change by means of gears. When released the

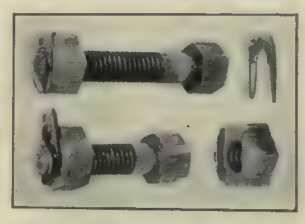


friction band springs free from the drum and is held tightly concentric to the shaft by means of a guide machined on the periphery of the carrier. This action provides a space of 0.01 in. between the friction band and the drum at all points when the chuck is released. A large lever ratio is provided in the operating mechanism, which reduces the force required for shifting. The clutch is adjusted by means of one screw.

— 239 —

Locknut, Safety, Rose-Albin. *Specialty Manufacturing and Sales Co., 171 Lexington Ave., Brooklyn, N. Y.* [A. M. vol. 58, p. 128.]

The device does not require that a hole be drilled through the bolt in order to secure it. The nut proper has a slot in the top of it, in which can be fitted a clip or pin. After the clip is



slipped in place on the nut, the two ends of the fork are pinched around the thread of the bolt. The nut cannot be taken off the bolt while the clip is in place, without actually destroying the thread. The nuts can withstand vibration as well as twisting strains without loosening. They can be furnished in all standard sizes.

— 240 —

Roller Bearing, Spherical-Type. *S.K.F. Industries, Inc., 165 Broadway, New York, N. Y.* [A. M. vol. 58, p. 276.]

The bearing contains two rows of rollers, each of which has convex sides so that its periphery is curved in two planes. The outer race is ground spherical over its inner surface so that it can be slipped over the rollers as shown. The inner race has two concave surfaces in which the rollers fit and make contact for their full length. Between these surfaces is a guiding flange. The shapes of the parts and the actions of the forces cause the inner ends of the rollers to bear against the flange, which then maintains them with their axes parallel to that of the shaft. The retainer rings serve only to separate the rollers. The bearing has a radial load capacity about twice that of a ball bearing of corre-



sponding size, and can carry considerable thrust load. It is self-contained and self-aligning.

— 241 —

Bearings, Machine, Standard, Chadwick. General *Aluminum & Brass Co., Detroit, Mich.* [A. M. vol. 58, p. 314.]

The bearing consists of a bronze back with a lining of

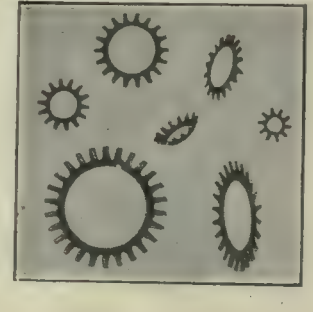


babbitt, held together with a thin bond of tin. The bronze has the strength to withstand the hammering and vibration to which the bearing is subjected, together with excellent heat - conducting qualities. The value of the babbitt lining lies in its anti-friction qualities. Also it will melt and flow when overheated, and not seize the shaft. The bearing surfaces are held within 0.00025 in. of specified dimensions to make the bearing interchangeable. The bearing surface is finely burnished and is stated to be so accurate that reaming, running-in or hand scrapping is undesirable.

— 242 —

Washers, Lock. *Shakeproof Screw & Nut Co., 400 N. Michigan Ave., Chicago, Ill.* [A. M. vol. 58, p. 565.]

The washers will lock screws and bolts of any ma-



terial from aluminum to tempered steel and are intended for use where excessive vibration takes place. They are made of clock-spring tempered steel and are rust-proofed. The flat washers range in size from ⅜ to ¾ in. nominal inside diameter and have from 10 to 32 locking struts. These struts or teeth are set at an angle of 45 deg., and under pressure they tend to flatten to about 20 deg. Countersunk washers of the type shown in the center of the illustration are also made for locking screws with countersunk heads.

— 243 —

Bushings and Liners, Jig and Die, Standard. *Kenosha Die & Stamping Works, Kenosha, Wis.* [A. M. vol. 58, p. 891.]

These standard jig liners and shoulder bushings are for use in jig and die construction. The sizes of the bushings correspond to standard drill, tap drill and reamer sizes, although special sizes can be furnished. The standard sizes of the liners range from ⅛ in. hole diameter x $\frac{15}{32}$ in. outside diameter x ⅜ in. long to 3x3⅜x4 in.; and the standard bushings range in size from ¼x½x⅜in. to 2¾x3¼x5¼ in. The bushings are made of tool steel, hardened and ground.

— 244 —

Pulley Covering, Fabric. *Monarch Belting Co., 1270 Ontario St., Cleveland, Ohio.* [A. M. vol. 58, p. 312.]

The covering is intended as a means of reducing the slippage of belts on pulleys. It consists of a duck that is treated with a preservative material, and then cemented to the face of the pulley by a special cement. The covering is laid on in a single thickness with a closely fitting butt joint at the junction of the ends. The surface of the pulley must first be properly cleaned. The cement is applied cold and hardens overnight. It is suitable for use when cementing cloth disks on metal wheels of disk grinders. No non-slip preparations are placed on the belt.

— 245 —

Bronze, "Ampco." *American Metal Products Co., 34th Ave. & Burnham St., Milwaukee, Wis.* [A. M. vol. 58, p. 674.]

The bronze is made in several grades and is intended for use in the manufacture of metallic packing, bearings, bushings, gears, worms, valves and fittings, pickling equipment, chemical apparatus and the like. The grades are said to vary in hardness from a very soft bronze to one that is harder than chrome-nickel steel, the latter grade being practically non-machinable. The metal is from 5 to 20 per cent lighter than ordinary bronze and is 3 per cent lighter than steel. It ranges in hardness according to the grade from 15 to 55 Shore scleroscope reading. The metal can be cast, forged, rolled or drawn. In the harder grades it is said to be extremely resistant to the action of most commercial acids and alkalis. Its heat-resisting qualities adapt it for uses such as automotive poppet valves. It is readily machinable in all grades except the hardest.

— 246 —

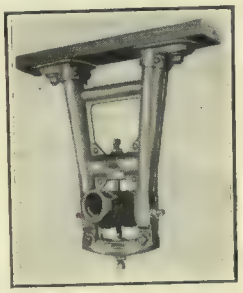
Micarta, Small Gear, No. 238. *Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.* [A. M. vol. 58, p. 678.]

This grade of Micarta is for use in the manufacture of gears and pinions of small pitch and face width, such as are used in phonographs and magnetos. It is made from a good grade of fine fabric and, because of its densely homogeneous structure, can be machined very accurately. For this reason it is adaptable to fine-pitch applications, particularly in small motor - operated machines, where the gears must run silently with a high operating efficiency.

— 247 —

Hanger, Shafting, Pressed-Steel. *American Pulley Co., Philadelphia, Pa.* [A. M. vol. 58, p. 961.]

The hanger is made in regular drop sizes from 7 to 24 in., and for all shaft sizes up to 3 in. The main frame is constructed of two stampings placed face to face, with inturned flanges extending the entire length of the leg, and the cross brace is integral with the legs. The feet are made of cold-drawn, seamless metal and are riveted to the legs. The hanger is of the parting variety, with a swing yoke that permits removing

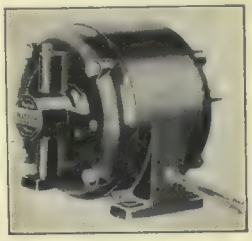


quickly the shaft or bearing. Four setscrews hold the bearing in place. A babbitted bearing box is employed. The castings of the box are heavy, and provided with large oil reservoirs.

— 248 —

Motors, Electric, Small. *Master Electric Co., Dayton, Ohio.* [A. M. vol. 58, p. 128.]

The motors are made in sizes from ⅛ to 1½ hp. The construction of the frame is the same at the commutator end as on the end from which the shaft projects. The frames are interchangeable for a.c. or d.c. use. Other

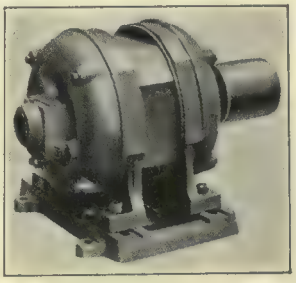


features are the compact short-circuiting device, the removable self-aligning phosphor-bronze bearings and the dual wick-oiling system. Induction motors for single-phase and polyphase a.c. circuits can be furnished, while compound-wound motors are made for d.c. use. Motors up to 2 hp. for high-speed work, and as small as ⅛ hp. can be supplied.

— 249 —

Motor, Heavy-Duty, Squirrel-Cage, A. C. *Louis Allis Co., Milwaukee, Wis.* [A. M. vol. 58, p. 205.]

The motor is for operation on polyphase alternating current. It differs from the standard design principally in the construction of the



rotor. The windings of the rotor consist of a single sheet of copper punched and formed by a special process. The winding is wrapped around the core and the copper bars are then expanded into the core slots by swaging. The single joint in the winding on the two end rings is silver-welded, and the rings contracted by a special operation. The shaft is usually mounted in bronze bearings, but ball bearings can be supplied. The motor is guaranteed to carry its full rated load continuously with a temperature rise not exceeding 40 deg. C. above the surrounding air. It is ordinarily mounted on a base by which it can be moved backward and forward. Backgears can be fitted. The motors are made in sizes from 1 to 10 hp. and in the standard speeds.

— 250 —

Light, Electric, Floor, Garage. *Manley Manufacturing Co., York, Pa.* [A. M. vol. 58, p. 238.]

The device is intended especially for use in garages to enable the mechanic to throw light on any part of the automobile on which he is working. The base is 14 in. in diameter. The main column is telescoping and can be raised to a height of 60 in. The arm can be placed in any position and clamped; for work underneath the chassis it can be swung downward. At the top of the stand there is a socket from



which a portable electric drill or a trouble light can be supplied with current. A heavy, rubber-covered cable 25 ft. long is supplied. The reflector is made of enameled steel and equipped with a guard for the lamp. The fittings are waterproof throughout. The weight of the base holds the stand rigidly in position.

— 251 —

Motor-Generator Set, Battery-Charging, Low-Voltage. *Ohio Electric & Controller Co., 5900 Maurice Ave., Cleveland, Ohio.* [A. M. vol. 58, p. 463.]

The set is intended particularly for charging storage batteries such as used on automobiles and radio sets. It is designed for 6- to 12-volt batteries and consists of a ball-bearing low-voltage d. c. generator and a motor wound for a. c. current. The motor and generator are connected by a flexible coupling.

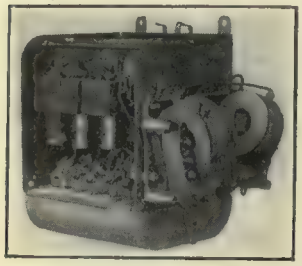


An ammeter and rheostat are provided with which to regulate the charging rate, which varies from 1 to 20 amperes. The set is simply and easily operated and runs with comparative silence.

— 252 —

Starter, Squirrel-Cage Motor, Automatic. *Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.* [A. M. vol. 58, p. 605.]

This automatic "autostarter" is for use in starting squirrel-cage induction motors such as commonly used for machine drives. The tank enclosing the contacts can be dropped to permit of inspection. Taps are pro-



vided on the coils for adjusting the starting voltage and, consequently, the starting torque. The contacts are of the rolling type. They are actuated by a dual magnetic mechanism to open and close them at the proper times. The run magnet also functions as a low-voltage relay. The control relay is given a definite time limit by means of a dash-pot so that the time of starting a motor may be adjusted for any period up to 15 sec. The starter is operated either by a master switch or by push buttons for remote control. Overload protection on all phases is provided.

— 253 —

Pump, Centrifugal, Motor-Driven, Ball Bearing. *Fulflo Specialties Co., Blanchester, Ohio.* [A. M. vol. 58, p. 388.]

This self-priming centrifugal unit is for pumping liquids such as coolant compounds, oils, brines and enamel. It is of 75 gal. capacity. It has both intake



and outlet located at the top and retains enough fluid for priming purposes without the aid of valves or other mechanical means. It begins pumping the instant the machine is started. The free-floating impellers and anti-clog features expel chips without harm to the pump. The pump will deliver from a few drops per minute to full capacity, depending on the regulation.

— 254 —

Pump, Rotary, Hydraulic, High-Pressure, Hele-Shaw. *American Fluid Motors Co.,* 2414 *Aramingo Ave., Philadelphia, Pa.* [A. M. vol. 58, p. 853.]

The pump can be used for supplying oil under pressure to presses, cranes and testing machines, and fuel oil to burners. It is claimed to maintain a constant pressure at all times, while automatically varying the supply from zero to the full capacity. The cylinder body is mounted on and rotated about a central hollow shaft, which is the valve of the pump and contains the inlet and exhaust ports. The cylinder body holds several radial cylinders, in each of which a plunger operates. The plungers are fastened to a gudgeon pin, which engages in a groove of the "floating ring." The extent to which the floating ring is shifted from the center determines

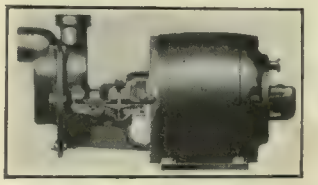


the length of stroke and, accordingly, the volume of fluid delivered. The pumps are built in capacities ranging from 3 to 110 gal. per min. maximum discharge, and with maximum pressures ranging from 3,500 to 2,200 lb. per sq.in., respectively.

— 255 —

Pump, Coolant, Centrifugal, Motor-Driven. *Arrow Pump Co., Buhl Building, Detroit, Mich.* [A. M. vol. 58, p. 856.]

The pump is primarily intended for circulating the cutting lubricant to cutting tools in machine shops, since its construction is such as to resist the injurious effects of abrasives present in coolants. The pump has only one working part, the impeller. A priming chamber enables it

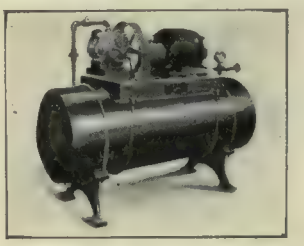


to retain its prime automatically. The construction prevents the liquid being pumped from coming in contact with the bearings, and provides a positive supply of oil to the bearings by means of the ring oilers. The unit is capable of supplying a group of machines from a central supply. It requires no base and is suitable for either floor or side wall mounting.

— 256 —

Compressors, Air, Automatic, Dunning. *George Sachsenmaier Co.,* 926 *North 3rd St., Philadelphia, Pa.* [A. M. vol. 58, p. 389.]

The cylinders, oil reservoir and base are in a one-piece casting. The ends of the cylinders are covered with removable cylinder heads and hold the valves, which are of

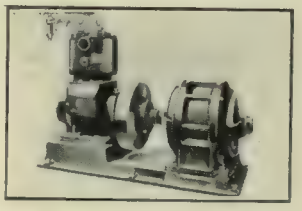


steel bearing against cast-iron seats. A long, double, one-piece piston is operated in both cylinders by means of a hollow eccentric shaft. Three piston rings at each end of the piston prevent the loss of compression. Complete electric-driven compressor units are made in various sizes. Model A size is a ¼-hp. unit and will develop 150 lb. per sq.in. pressure; Model B has a ½-hp. motor, for 200 lb. pressure; and Model C is a ¾-hp. unit for 250 lb. pressure. The automatically controlled tank units shown are made in two sizes. The tanks are tested to withstand 400 lb. unit pressure.

— 257 —

Compressor, Air, Direct-Connected, Small. *Chicago Pneumatic Tool Co.,* 6 *East 44th St., New York, N. Y.* [A. M. vol. 58, p. 462.]

The compressor can be run at high speed and directly connected to an electric motor

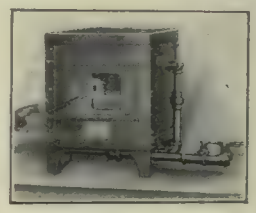


or internal combustion engine. It is of the vertical, duplex, single-acting, water-cooled type, and is fitted with Simplate flat disk inlet and discharge valves. The machine is built in three sizes, having piston displacements of 128, 160 and 210 cu.ft. per min. Each is suitable for a working pressure of 150 lb. per sq.in. and a speed of 600 r.p.m. If an intermittent supply of air is required, the motor can be furnished with an automatic starter. The water control valve is operated by air pressure. The complete unit is automatic in every way, as it controls the electric current, air delivered, circulating water and lubrication.

— 258 —

Furnace, Gas, Heat-Treating, "Midget Universal." *Fitzgerald Forging and Heat-Treating Co.,* 576 *St. James Ave., Springfield, Mass.* [A. M. vol. 58, p. 54.]

The furnace is suitable for heat-treating both high-speed and carbon tool steels. At the front of the furnace is a space 4 to 6 in. wide and 4¾ in. deep where tools may be pre-heated to approximately 1,500 deg. F. before being placed in the heated chamber. Only 275 cu.ft. of gas are required per hour to maintain a temperature of 2,400 deg. F. Complete combustion is claimed, with the absence of scaling, pitting or wasting away of the work. The furnace is fitted with four burners. The roof of the heating chamber is arched to prevent the formation of cold pockets. There is provision made at the rear of the furnace for inserting a pyrometer couple. A removable

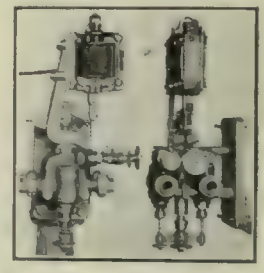


plug at the rear allows for heating long tools. Chamber: width 6½ in.; height, 7 in.; length, 9 in.; opening, 4x4⅜ inches.

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Control, Temperature, Automatic, Oil Furnace. *Combustion Control Co., Otis Bldg., Philadelphia, Pa.* [A. M. vol. 58, p. 350.]

This temperature and pressure controller is to be used in connection with heating and heat-treating furnaces where oil is employed as fuel. It is of the solenoid-operated



type with constant stroke. The dual control and adjustment mechanism is mounted on a central housing and consists of two separate bodies,

one for oil and the other for air or steam. Each of these bodies has an independent by-pass and auxiliary regulating valve. A vertical shaft operates the auxiliary valves to control the admission of the fuel oil and the air or steam for atomization. The temperature indicating and control pyrometer is first set at the desired point. The mechanism then operates to keep the temperature within close limits. The control can be operated in conjunction with any of the standard pyrometric controllers, such as are used for signalling by bells or colored lights.

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Generator, Acetylene, Welding, Portable. *Alexander Milburn Co., 1416 West Baltimore St., Baltimore, Md.* [A. M. vol. 58, p. 463.]

The generator provides a source of acetylene gas for use in oxy-acetylene welding,



without the use of cylinder containing gas at high pressure. It has a capacity for 30 lb. of carbide, which is equivalent to 150 cu.ft. of cylinder gas. It has a steel body welded throughout, weighs approximately 200 lb. and is 5 ft. 3 in. over-all. The diameters of the bottom and top are respectively, 24 and 12 in. The generator is simple to operate, has few parts, and no clocks nor motors are needed, because the operation is automatic.

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Blow Torch, Gasoline, "Master," No. 44 A. *Turner Brass Works, Sycamore, Ill.* [A. M. vol. 58, p. 532b.]

The torch has a number of special features, such as a safety valve, only one opening in the tank, two sources of air supply and the separation of the shut-off valve from the fuel-control valve. The safety valve at the end of the pump cylinder gives way automatically at 40 lb. air pressure. The pump is equipped with a leather washer on the piston. The fuel passes through a solid bronze baffle called the "hot spot hump," the heat of which vaporizes the fuel. Air is admitted from two sources. One is through a flared inlet in front of the needle valve; the other a long slot at the top of the burner tube. Separate shut-off and fuel control valves are provided. The needle valve has a thumb-and-finger

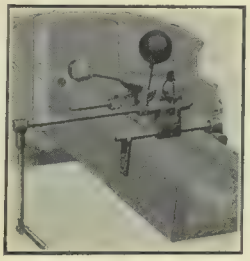


control to prevent the operator from exerting enough pressure to enlarge the orifice. The torch is built in a variety of sizes and types.

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Cupola Tapper and Stopper, Foundry, Safety. *Medart Co., Potomac and DeKalb Sts., St. Louis, Mo.* [A. M. vol. 58, p. 314.]

The device is for controlling the molten metal from a cupola in a foundry. It is attached to the spout of the cupola and carries a ball of special composition that fits in the tap hole to stop the flow of the metal. Opening and closing the tap hole is accomplished by moving the lever at the left. The safety of the operator and of the workmen around the cupola is considerably enhanced. Since the device is hinged, it



can be lifted and swung to one side so as to leave the spout absolutely clear. The breast of the cupola is filled with fire clay in the usual manner. One ball should last for four to six heats. The link mechanism is such as both to raise and to draw back the piston rod when the cupola is to be tapped.

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Sifting Machine, Sand, Electric-Driven, Portable. *Lowe Manufacturing Co., 6063 Wabash Ave., Detroit, Mich.* [A. M. vol. 58, p. 818.]

The machine is for use in the foundry operation of screening core and molding sand. A ½-hp. G.E. motor of either a.c. or d.c. type and 110 or 220-volt capacity is bolted to the steel side bars at the top of the machine. The flywheel into which the motor shaft is fitted runs on the same center as the latter. It has a double row of Hess-Bright ball bearings on its lower side which are ⅛ in. off center and hold the upper end of the main shaft. A 2-in. ball supports the lower end of the main shaft, but allows a 14-in. clearance over the riddle for shoveling. When the riddle is in operation the upper end of the main shaft moves in a circular path ⅛ in. off center,



the riddle moving similarly. The machine makes 1,725 gyrations per min. holding a 20-in. wooden-rim riddle. Weight, 125 pounds.

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Marking Machine, Floor. *Hampden Supply Co., 45 Sharon St., Springfield, Mass.* [A. M. vol. 58, p. 749.]

The machine marks floors with paint at a speed as fast as man walks. Lines can be quickly made for aisles, safety zones and spaces where material is to be piled on factory floors. It is claimed that the machine will mark close to posts and walls. The frame is made of one piece of angle iron and mounted on 5-in. malleable iron wheels having rubber tires. The paint container has a capacity of 6 quarts, and a hand lever controls the flow of paint. The marking pad can be furnished in any width desired, but is usually made for 2-in. lines. The



four wheels are lined up rigidly so that the machine will follow a straight line while being pushed. Weight, 50 pounds.

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Sandblast Operator's Outfit, Apron and Hood, "Shotpruf." *Pangborn Corporation, Hagerstown, Md.* [A. M. vol. 58, p. 95.]

The clothing is especially resistant to wear, and has been developed particularly on account of the increasing use of steel shot and grit as an abrasive for sandblasting. The front of the apron is



made of chrome leather. The garment is held to the operator's legs by means of spring clips, and can be easily and quickly put on or removed. The hood is provided with a chrome-leather front and a crown that resists the wear of the abrasive. A finely woven wire screen that can be easily replaced protects the operator's eyes. The hood is made with an adjustable head band.

How to Use the Index of Manufacturers

THE contents page preceding the review pages is useful for locating a particular type of machine or appliance, the products being grouped according to type.

If it is desired to find what developments have been made by a certain concern, the following pages will be of value, as they give an index of the manufacturers for whom new products have been described in the *American Machinist* during the past six months. The index serves to show the activities of manufacturers in bringing out new products, as it offers a résumé of the developments occurring during the six-month period.

In the index, the names of the manufacturers are placed in alphabetical order, and under the name of each can be found the product or products treated in the review pages. The number of the page on which the story appears is given to aid in finding the location of the article. The number of the item is placed after each product to make locating rapid.

The condensed descriptions and illustrations are intended to give the reader a good general idea of each product. For further details the description appearing in Vol. 58 of the *American Machinist* on the page referred to at the head of each item, should be consulted.

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Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

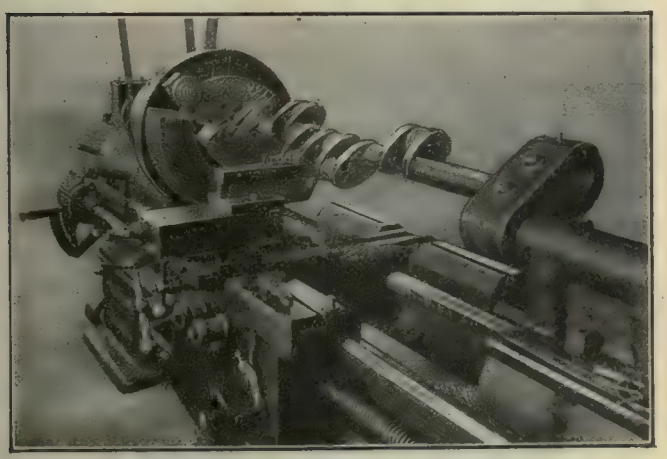
Turning Crankshafts in an Engine Lathe

By William Denton

An engine lathe arranged for turning the crankpins of a six-throw shaft for a marine motor is shown in the cut herewith. The fixture is kept permanently attached to the faceplate and the latter needs but to be swung into place and screwed on the spindle nose in order to make the lathe ready for the job.

The fixture is essentially a V-block, the centerline of which is parallel to and at the correct distance from the centerline of the lathe. Swinging clamps held down by bolts similarly fastened to the fixture complete the rig, so that there are no loose parts to get lost or to become out of adjustment. As the fixture is always used for the same size and style of shaft there is no necessity for adjustability, and the faceplate is counterbalanced for that particular job.

At the tailstock end is the block containing three



FIXTURE FOR TURNING CRANKSHAFT

hardened bushings located in one plane; the center bushing fitting the turned journal of the shaft at that end and the outer bushings a running fit on the tailspindle itself. Means are provided for clamping the shaft tightly in the center bushing. The outer bushings are at the correct throw distance from the center.

A line drawn on the turned journal of the shaft in a previous operation indicates the setting at the tailstock end by matching with a witness mark on the end of the center bushing. The shaft is then placed in the lathe with the throws in vertical plane, so as to avoid distortion or wringing of the shaft by the weight of itself and attached block, and the clamping bolts tightened. The V-block at the faceplate end will thus take care of the alignment automatically as the pressure comes on the clamps.

To turn the opposite throws the tailspindle is withdrawn from the bushing, a block of wood placed across the shears of the lathe to support the weight of the shaft, the clamping bolts loosened and the shaft rotated one-half turn in the V-block. The tailspindle will then enter the opposite bushing in the block and tightening the clamping screws at the faceplate end completes the alignment.

Regrinding, Reboring or Reaming Cylinders—Discussion

By W. J. Gardner

On page 774, Vol. 58, of the *American Machinist*, in an article under the above title, M. I. Sidler contends that reaming is the only good method for refinishing motor cylinder-bores.

My experience with a reboring machine is that it takes as skilled a mechanic to operate it as a grinding machine. The main objection to boring is the tendency of the boring bar to follow the hole in the block whether it is square or not.

With the reboring method, considerable amount of pressure will be exerted on the walls of the cylinders. Since these walls are comparitively thin and are only reinforced by water jackets in certain places, it will be found that where they are not reinforced, they will spring away from the cutting tool and then spring back after the tool passes on, leaving the cylinders smaller. Where the walls are reinforced the tool will take a slightly heavier cut. There are hard and soft spots in iron and the cutting will bite into a soft spot and spring away from a hard one.

In a rebored cylinder, the full bearing surface is not realized until from 0.002 to 0.005 in. of metal has been worn away by the piston and rings, allowing 0.003 in. clearance for the piston and from 0.004 to 0.010 in. for wear in both sides of the cylinder walls, which would allow 0.007 to 0.13 in. clearance between the cylinder and piston. This would cause piston slap and oil pumping in a short time.

When a cylinder is rebored, it is centered from one end where very little wear takes place and has to be made considerably oversize, whereas in grinding it can be centered in the middle of the length of the bore. Just enough can be taken out to true up to some standard oversize and the other cylinders in the block can be ground to that size.

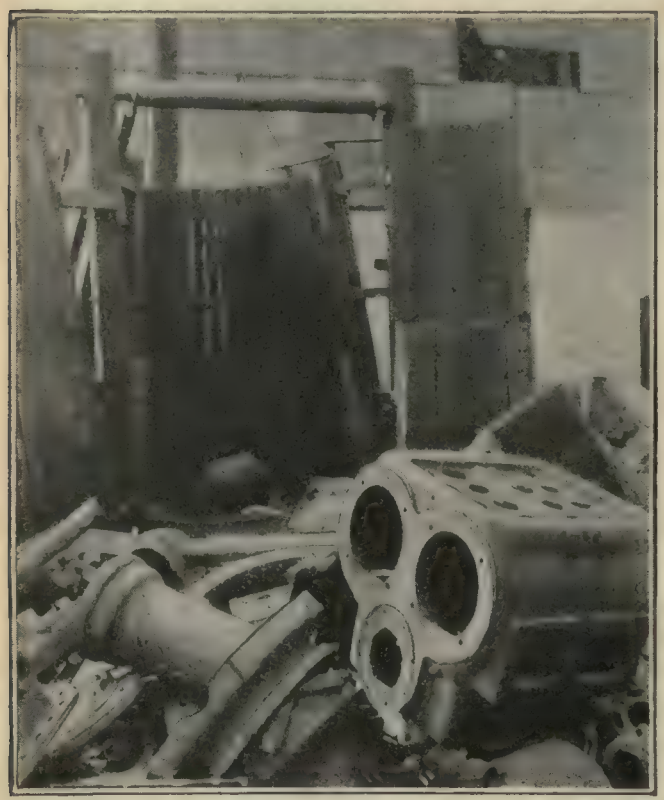
Mr. Sidler also states that ground cylinders wear faster owing to the particles of abrasive which have become embedded in the cylinder walls. Laboratory tests show that where ground cylinders are properly cleaned there is no abrasive whatever to be found. As all high-grade car manufacturers finish their cylinder bores by grinding, either they are all wrong, or else grinding is not guilty of the disadvantages claimed by those who like to use reboring machines and reamers.

I have known of cases where the cylinder grinding machine saved the repair shop the price of a cylinder block after it had been rebored or reamed.

Skull-Cracker Protection

By Chester H. Franklin

Using the old skull cracker still seems to be the only practical way of breaking up miscellaneous scrap castings before remelting, and when in use, the danger from flying pieces always nas to be guarded against. While a few large plants have built guards of heavily reinforced concrete, they are the exception, but some



PROTECTING MEN WHEN USING THE SKULL CRACKER

kind of a wooden guard is usually erected. The illustration shows one of the latter in use in the scrap yard of the Commercial Iron Works, Los Angeles, Calif. It consists of heavy vertical timbers to support the circular plank structure surrounding the base on which are the castings to be broken up. The planks at the bottom are of double thickness, both on the stationary portion at the back and on the two swinging doors at the front. The illustration shows the skull-cracker weight, and some of the castings in the foreground.

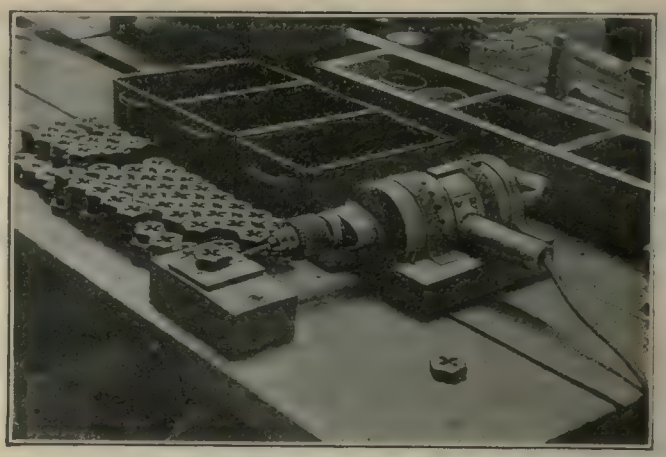
Improvised Power Screwdriver

By Milton Wright

For setting in the adjusting screws of small dies, an electric portable drill was rigged as shown in the illustration. Two beveled wooden blocks were nailed to the bench and a couple of straps of sheet metal were passed over the body of the drill and fastened by wood screws to the blocks. A screwdriver in the chuck and a block of steel of the right height, on which to lay the work, complete the outfit.

A foot-operated switch was contemplated for starting and stopping the drill but it was found in practice that the operator experienced no difficulty in entering the screwdriver in the slot with the drill running.

Having the electric drill already in the tool crib,



AN IMPROVISED SCREW SETTER

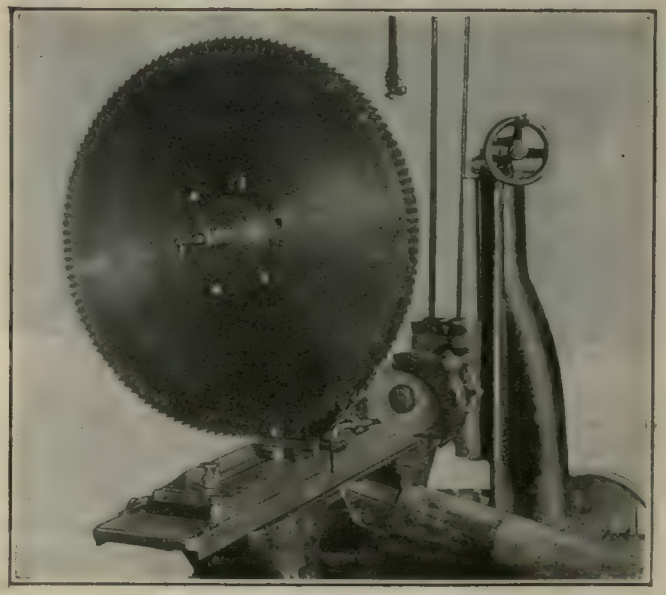
the cost of the device amounted to nothing more than the time spent in rigging it up, and this was returned many times over, even on a small lot of the dies, by the time saved over setting the screws by hand.

Sharpening a Large Saw

By William Denton

A saw sharpening job that is remarkable because of the size of the saw in comparison to that of the machine upon which the sharpening was done, is shown in the accompanying illustration.

The saw is 32 in. in diameter by $\frac{1}{16}$ in. thick and has inserted teeth. It was ground on the periphery and one corner of each tooth was beveled to an angle



SHARPENING A LARGE SAW

of 45 degrees. Two 4 in. raising blocks were used under the dividing head in which the saw was held.

The saw ran out quite badly sidewise and it was necessary to guide it true by means of a steel plug set in the face of an angle plate and brought to bear against the side of the saw at a point near the grinding wheel.

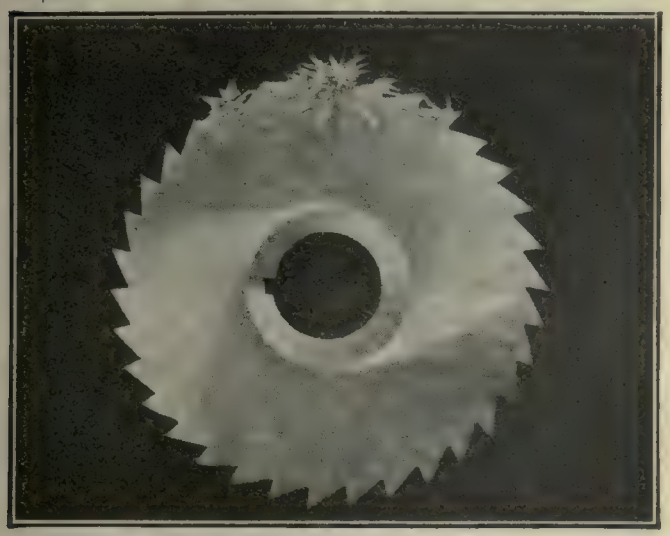
The wheel used was a 3,860 I, Norton Alundum. The work was done in the Brown & Sharpe Cutter Grinding Department and the time of grinding was 5 hr. and 18 minutes.

Magnetism in Cutters and Tools

By P. P. Phillips

A lot of trouble is caused in the milling department by residual magnetism in cutters, especially thin saws, and workmen are apt to blame the makers of these tools for leaving them too hard when the only reason for breakage is that they have not been properly demagnetized.

The accompanying illustration shows a new cutter



A MAGNETIZED CUTTER

that has never been in service, but was received from the manufacturer in the condition indicated by the clinging chips. It is easy to deduce what would happen to such a cutter if it were put to work without further demagnetizing it.

In these days of magnetic chucks and fixtures, especial care should be exercised by everybody who has to use them that all pieces of hardened steel that have, at any stage of manufacture, been in contact with such chucks or fixtures are thoroughly demagnetized before they leave the factory or department.

A Lapping Paste for Motor Bearings—Discussion

By R. R. Joseph

That kerosene and Sapolio combination, referred to in an article under the above title by I. B. Rich, and published on page 266, Vol. 55, of the *American Machinist*, is one of the best kinks I have found in a long time. I was scraping a taper bearing about 2 in. at the large end, 1¼ in. at the small and 8 in. long, and had been at it about two hours when the lapping compound referred to in the above-mentioned article came to mind. As it looked like another two hours' job I decided to try this compound on the bearing.

I put the spindle in a speed lathe and held the bearing by hand. Using kerosene and Sapolio mixed to a thin paste, I had a perfect bearing in ten minutes. The bearing was of bronze and the spindle of hardened steel.

I had another case where this compound did the trick. While fitting two mitre gears on an engraving machine, I found that the gears did not run well together, the indication being that the gear blanks were not running perfectly true when the teeth were cut. The gears made a grinding noise and showed signs of wear in some places.

A piece of Sapolio as big as a walnut and a quarter pint of kerosene made the gears run very smoothly, with that purr which is so pleasing to a mechanic's ears. The gears were made of Sanderson tool steel, and the whole job took but 15 minutes.

Taking the Machine to the Work

By Anis L. Welch

The die pocket in the base of our 1,500-lb. steam hammer was in bad condition and needed to be replaned. As the base weighed 15 tons and as the machine shop was some distance away, we decided to rig up to do the planing in place.

After removing the cylinder, ram and uprights, we took the head and knee from an old Gould & Eberhardt

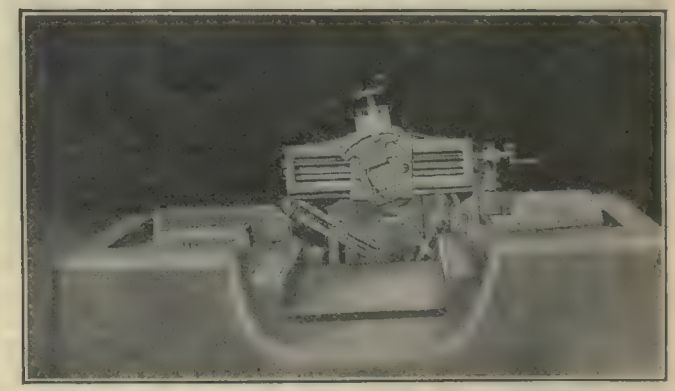


FIG. 1—FRONT VIEW OF SHAPER PLANING HAMMER BASE

shaper and brought the shaper to the hammer base, to which we fastened it by bolts and clamps as shown in the accompanying illustration.

A crossrail from a small planer was mounted on the shaper ram in place of the regular head. With the

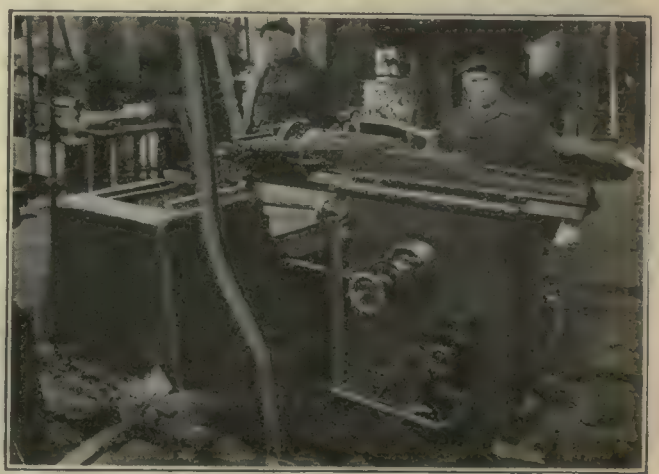


FIG. 2—SHOWING HOW SHAPER WAS ATTACHED TO HAMMER BASE

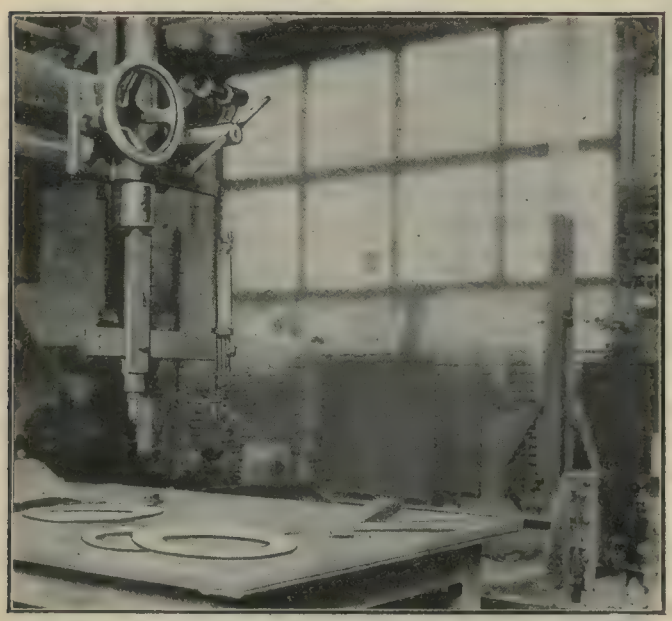
shaper properly aligned with the base, we were ready for business.

In spite of the long tool necessary to reach some parts of the work, the job was satisfactorily done and at a cost very much less than if the base had been moved to the machine shop and mounted on a planer.

Flame Cutting on a Radial Drilling Machine

By Herbert F. Crawford

The Galigher Machinery Co., Salt Lake City, Utah, is an extensive user of oxyacetylene for cutting and welding. Some time ago it became necessary to cut a number of rings from boiler plate steel, and it was



FLAME CUTTING ON A RADIAL DRILLING MACHINE

decided to enlist the services of a radial drilling machine for this purpose. A suitable table was constructed, mostly of steel angles, as shown in the accompanying illustration.

The sheets to be cut were laid on this table. The bar *A* carrying the crossarm *B* was placed in the spindle of the machine and the cutting torch clamped at the outer end of the crossarm. The center *C* was brought into position over the punch mark in the plate and the torch set at the proper radius to give the desired circles.

When properly adjusted, the spindle of the radial drill was revolved by hand at the desired speed, and the circles were quickly obtained. This method has the advantage of giving almost any radius desired, and of changing rapidly from one size to another.

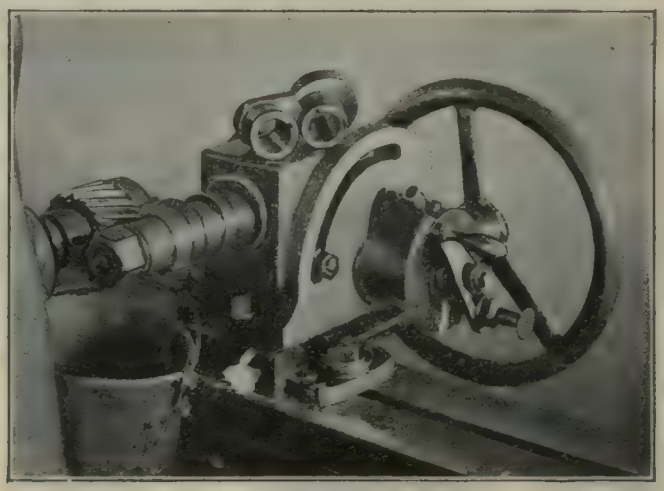
Rough Milling the Contours of Small Cams

By Milton Wright

A cheap and efficient way of rough milling the contours of small cams such as are used on stationary and marine gas engines is shown in the accompanying illustration. The requisites are: a hand milling machine, an old dividing head that one is not bound to treat with more than ordinary respect, and a chain fall. A master-cam, a cutter and a hardened steel collar are also needed.

The head is mounted crosswise on the table of the machine. A suitable work arbor is provided to take the master cam and one of the blanks to be milled, also a weight. On the cutter arbor is an ordinary standard spiral fluted cutter and, next to it, a hardened steel collar of the same outside diameter as the cutter.

The table of the machine is weighted to move to the right (left in the picture) and cause the master cam on the work arbor to bear hard against the steel collar on the cutter arbor. To change work pieces, the weight



RIG FOR MILLING CAMS

is lifted by the chain fall and the table moved by hand away from the cutter.

A finished cam and a cam blank as it comes from the screw machine are shown in the picture, lying on top of the dividing head. The blank is placed on the work arbor, where a key holds it in correct relation to the master-cam, and the weight is lowered to move the work against the revolving cutter. The latter cuts its way into the blank until the master-cam stops against the hardened collar on the cutter arbor, when there can be no further movement in that direction and consequently no further cutting.

The work arbor is then given one complete turn by means of the hand wheel and the master-cam causes the table to move to and from the cutter as the contour travels over the hardened collar. The cutter thus makes of the blank a duplicate of the master cam.

A Kink in Thread Cutting

By John D. Law

When using the compound slide of the lathe set at 30 deg. for cutting U.S.F. threads, the tool is ground with a slight backward slope, which certainly speeds up the operation. The depth to which to feed in the cut is more or less guess work, and one is tempted to leave rather more than is necessary to finish up with a properly ground thread tool; which results in the loss of the time previously gained. Knowing the length of side, the amount to be left for finishing can be determined exactly.

With a V-thread the side equals the pitch. With the U.S.F. thread, however, we have the flats to contend with in finding the length of side. Since the width of the flat is $\frac{P}{8}$ and is the same top and bottom of thread, the side of the flat equals the width, and, therefore, taking twice the length of flat from the pitch will give the length of side required. More simply expressed, this is $0.75P$.

I always use the above method when cutting threads of coarse pitch and find it far better and more reliable than guessing.

News Section

Railroads Storing Coal For Winter Use

Substantial progress is being made by the railroads in carrying out provisions of the program unanimously agreed upon by them in New York last April, in accordance with which they are to complete by Sept. 1 the storage of coal designed for railroad use, so that after that date the equipment and other transportation facilities may be used to the greatest extent for the transportation of commercial coal necessities.

Forty-four railroads representing 75 per cent of the total mileage of the Class One railroads of this country reported that during the month of June they stored 1,821,412 tons of coal. This would mean that each of the 44 roads during the month of June stored an average of more than 41,000 tons.

Including the 1,821,412 tons which was stored during June, the 44 railroads on July 1 had a total of 6,638,812 tons of coal in storage, compared on June 1 with 4,817,400 tons.

This would indicate that the railroads are co-operating with the Secretary of Commerce in his efforts to get the industries of this country to lay in their winter coal during the light consuming season—that is, from now until Sept. 1 of this year.

Record Established in Freight Movement

The heaviest freight traffic for May and within striking distance of the highest figure ever reached is reported by the Bureau of Railway Economics after study of reports just received from Class 1 carriers. Net ton miles, or the figure reached by multiplication of tons of freight by the distance carried, for May, last, amounted to 39,597,582,000, an increase of 2.7 per cent over the previous high May record reached in 1917 and an increase of 41.7 per cent compared with May of 1922 when the coal strike was on.

"Substantial progress is being made by the railroads in carrying out the program adopted by the carriers in April calling for a speeding up in the movement and the heavier loading of freight cars," according to the report. "The daily average movement per freight car in May was 28.6 miles. Except in May, 1917, when an average of 29 miles was attained, this average has never been excelled in any month before and only once equalled, that one time being in the Fall of 1920. The average of 28.6 miles was an increase of three-fifths of a mile over the average for April, and was an increase of 5.9 miles over that for May last year.

"In computing this average movement per day account is taken of all freight cars, including those loaded, those in the process of being loaded and unloaded, and also those on side tracks either awaiting repairs or for which no load is immediately available.

"Every increase of one mile in the average movement of a freight car is equivalent to the addition of 100,000 freight cars to the country's transportation facilities without any increase in capital expenditure, so that the increase in the average over April was equivalent to the addition of 60,000 freight cars.

"The average load per car in May was 28 tons. This was the highest for any May since 1917, when the compilation of these statistics began, except for May, 1920, when the average was 28.2. The average for May this year was an increase of two-fifths of a ton over that for April.

"The program adopted by the railroads calls for a daily average movement per car of thirty miles and for the loading of all freight cars to maximum capacity in an effort to bring the average loading to thirty tons per car for the entire country."

Big Contracts Received at Cramp Yards

New contracts for hydro-electrical machinery aggregating 180,000 horsepower were announced by the William Cramp & Sons Ship & Engine Building Co. This additional equipment is to be placed in service, the announcement says, throughout the United States and Canada.

The largest single contract calls for the construction by the Dominion Engineering Works, Ltd., Canadian licensees of Cramp's, of two 58,000 horsepower turbines for the Queenston, Niagara, development of the Hydro-electric Power Commission of Ontario. The same plant also received a contract from the commission for two Johnson penstock valves and two sets of I. P. Morris governors.

Other contracts reported include two 10,000 horsepower turbines for the Northern Canadian Power Co., one 14,000 horsepower impulse wheel for the Southern Sierras Co., two 7,500 horsepower turbines for the Montana Power Co. and an additional turbine for the Washington Water Power Co., all from the Pelton Water Wheel Co. of San Francisco; and a 7,500 horsepower turbine for the Amoskeag Manufacturing Co., to be built in the I. P. Morris shops in Philadelphia.

Anthracite Shipments in June Are Large

Shipments of anthracite for June totaled 6,634,787 gross tons. This compared with 6,564,285 tons for May. Shipments in June show an increase over the corresponding month of 1921 of 602,850 tons, or 10 per cent. No comparisons are made with June last year on account of the coal strike at that time.

The average monthly shipments for the first quarter of the current coal year amounted to 6,457,615 tons, an increase over the average of the first quarters of 1921-1922 of 8.9 per cent.

Europe Optimistic Says Westinghouse Man

Brudenell P. Boyle, assistant to the European manager of the Westinghouse Electric International Co., who is on a short business trip to this country from London, predicted a general but slow improvement in European business conditions.

Mr. Boyle has been in the export business for many years and is very familiar with general world affairs. He was rather reluctant to make any definite statements on the European situation, which is so unsettled that it is rash to attempt any predictions, but said that the general tone in England seemed to be toward stability.

People there are becoming tired of the unsettled conditions and are making up their minds to take things as they are and make the most of them. Except for some of the poorer classes who are living on the unemployment doles of the government and are content to remain idle, the average Englishman is anxious to get back to work and start production. Many of the war-made fortunes have also been spent by this time.

Speaking of the French-German situation, Mr. Boyle said that there could be no real stability in Europe until the Ruhr matter was settled, and that he could see no prospect of a speedy settlement. He did not see how the French could withdraw from Germany now, nor did he think that they would do so unless there were a violent upheaval in France itself caused by the industrial unrest.

Since France is mainly an agricultural country, however, the majority of the population is fairly comfortable and is behind the government. The most likely cause of a change in the situation, Mr. Boyle thinks, will come from Germany, where he expects a change of government and a more frank attempt to pay off the indemnity.

General Electric Shows Big Gains

Annual sales of the General Electric Co. increased from about $12,000,000 to $243,000,000 in the thirty years between Jan. 1, 1893, and Jan. 1, 1923, a statement issued by the corporation discloses.

The outstanding capital stock increased from $35,000,000 to $184,000,000 and the value of its manufacturing plants from $4,000,000 to $167,000,000. The number of employees grew from 4,000 to more than 74,000.

The statement was issued as a review of the corporation's accomplishments under the leadership of Charles A. Coffin, who is retiring as chairman of the board after thirty years of continuous service. Tribute is paid also to the accomplishments of E. W. Rice, Jr., former president of the corporation, and to its corps of engineers, including Professor Elihu Thomson and Dr. Charles P. Steinmetz.

Philadelphia Chamber of Commerce Proposes to Establish Industrial School

THE absence of uniform standards of apprenticeship, and the present haphazard system of teaching the skilled trades to young men, is the cause of failure to provide artisans for future needs in industry, it is reported by a committee of leading industrialists of Philadelphia, representing the Industrial Relations Committee of the Chamber of Commerce.

The present apprenticeship methods or lack of methods, would be replaced under the committee's recommendations, with a uniform program, in the operation of which the whole plan of teaching the trades would be broadened into a comprehensive scheme calling for a co-operative undertaking between the industries and the state and city school systems.

The sub-committee of the Industrial Relations Committee has just completed its report covering recommendations for a new apprenticeship program. Months of study were spent in making up the report, compiled after conferences with the city and state school officials. The study is the most extensive ever attempted in Philadelphia, and members of the committee believe none so broad has been attempted anywhere. The task of making the recommendations effective will be a part of the Chamber of Commerce's program. William F. James of the Westinghouse Co. is chairman of the sub-committee.

Two, three and four-year courses for machinists, with alternate activity by the apprentice in shops and trade schools, is one of the main features of the committee's program.

The two-year industrial course calls for practical shop work, except evenings and one day each two weeks, when the apprentice would attend school, either one of the public institutions or one of the recognized trade schools.

The Curriculum

The first year is for study of trade drawing, including instruction in the use of instruments, geometrical problems, principles of orthographic projection, standard threads, bolts and nuts, blue print reading, including principles of view and section arrangement, conventionalization, dimensioning, coordinated study of prints related to trade practice and other subjects useful in machine shop work.

The second year calls for a study of trade drawing, machine details and elementary assembly, trade mathematics, ratio and proportion, involution and evolution, elementary formulas, and the practical use of tables of trigonometric functions. These would be supplemented with talks and studies and vocational practice. The completion of the two-year course would entitle the apprentice to an Improver's Certificate to Industry.

The three and four-year courses cover virtually the same ground, except in more detail. Completion of the latter courses gives the apprentice a Machinist's Diploma to Industry.

The plan would be made effective through the Trades Education Association of Philadelphia which it is proposed to organize through the Chamber of Commerce. This would be made up of industries, a governing body would be formed and the details for the apprentice system to operate would be worked out by it. A wage system during apprenticeship is provided.

The association would take an industrial census to determine accurately the normal supply and demand of the various crafts and the apprentice and trades education requirements of each.

The series of conferences held by the committee, at which scores of industries sent their executives to testify, demonstrated that there "is a serious shortage of skilled mechanics, and that the present extent of apprentice training is entirely inadequate to the needs of the future."

Manufacturing Revival in Milwaukee

Foundry and machine shop operations in the Milwaukee district appear once more to be holding their own following the loss of some ground during May and June. This was due more to excessive labor turnover because of keen competition for skilled labor among local industries as well as outside shops, and the lack of any supply of replacement labor, than to any material dropping off in business.

Since July 1, interest among machinery users seems to be increasing. New orders placed in June were smaller than in other months in the recent past. Many salesmen for dealers said prospective buyers continued to seek quotations and delivery dates, but hesitated about closing, probably awaiting developments when effect was being felt from a wave of warnings that more caution be exercised to prevent undue inflation such as occurred three years ago.

One of the most pleasant developments of the past few weeks is the pronouncement from a number of the largest producers of passenger automobiles that their research gives substantial reason for projecting current output schedules indefinitely, which will mean a further continuance of active buying of metal and woodworking machinery. The volume may not be as large as in the past eight to twelve months, when the principal aim was to bring up the elements of production, while for at least some time to come it is believed that the main buying will be to keep equipment rounded out against replacement needs and secure greater efficiency.

For several weeks the call for woodworking machinery has been more active than purchases of metal working machinery by automobile shops. It is said the major problem is to build enough enclosed bodies to satisfy the demand. The heaviest buyer of woodworking machinery at the present is the Ford interests, which are investing between $4,000,000 and $6,000,000 in further development of a great sawmill, planing mill and body factory at Iron Mountain, Mich. This project also is taking a large quantity of hydroelectric and steam generating equipment and includes also a large machine shop unit.

Industrial construction has experienced a lull, doubtless owing to the fact that most concerns are satisfied to rest at the present limit of their facilities and not overtax themselves. Fabricators of structural shapes in this territory are well filled up with work, and several of the largest shops have not been able to accept additional business, excepting small tonnages for repair work, since the middle of May. The small jobs are taken, as a rule, only when an old customer places an order and the accomodation is a matter of policy.

Manufacturers of toolroom and floor equipment are running steadily on old and current orders, at a rate comparable to the average of the past six months.

New York Business Moves at Even Pace

Even during the warm weather when everyone expects a lull, business in the Metropolitan district in the machine tool line is better than was anticipated, in fact so good with some dealers that vacations have been deferred. This statement is not meant to convey the impression that there is a sudden boom in business, but merely to show that there are fewer complaints than are usual at this time of the year and sales charts show a less perceptible downward curve than was expected.

Politics and politicians, while noisy and distracting, do not seem to have the bad influence that was expected and business men generally have come to the conclusion that presidential campaigns are bugaboos that have been given too much serious thought in the past. Railroad buying is not up to standard and some attribute this to Mr. Harding's trip while others claim ability to prove that it is merely seasonal and wholly temporary. However, there is some railroad buying and this, combined with a little in each of the other classifications, makes a total business of fair proportions.

Business is not so brisk in the used tool line as it has been during the Spring and early Summer and dealers are at a loss to explain the let down. Purchasing proves simple, but the resales are slower than usual, it is claimed.

There is every reason to believe that there will be a general revival of buying in the Fall and that things will move at a more even pace from then on. While automotive production has somewhat abated those with inside knowledge state that this means that the Fall will see a busier season than ever in that industry.

Textile mills are looking forward to a busy autumn season, which means machine-tool business.

Machine Tool Offices in New Building

Many prominent firms have taken space in the new Pershing Square Building in East 42nd St., New York City, and from every indication other machine tool companies will have headquarters in the building. Within the past few years there has been a steady movement of the industries' offices uptown and with the completion of the new building in the heart of the city the movement has been intensified. Among the engineering and machine tool houses that have moved into the building are: Manning, Maxwell & Moore; the Cyclops Steel Co.; the Bridgeport Brass Co.; the United Alloy Steel Co.; the American Electrical Works; and the Bartlett-Haywood Co.

Pittsburgh Business at Steady Pace

While there are no great events in the machinery market there is a fair amount of buying, coming steadily and not by flashes of activity followed by dull periods. Last week was featured by the buying of 75 tools for the Westinghouse Electric & Manufacturing Co.'s transformer plant at Sharon, Pa. Among the dealers who received orders in the past ten days are Manning, Maxwell & Moore, Inc., a small punch and shear; McCoy-Brandt Machine Co., two milling machines; Somers, Fitler & Todd, Brown & Zortman Machinery Co., the Consolidated Machine Tool Corp., and others, in such items as planers, grinding machines, radial drills, milling machines, etc. The local board of education has closed bids on a list of 22 machinery items for the finishing up of a new high school in this city, and buying on these is beginning to develop.

While no large sales are reported, there are so many small sales that they make a good total in the aggregate in lathes, drilling machines and grinding machines. Inquiries are coming in every day, among them one on a grinding machine about to be closed that involves the expenditure of $8,000 to $9,000. Among the buyers of machinery lately was the Union R.R. for a 52-in. carwheel borer and a large lathe for one of the steel corporation units.

As to used machinery a fair amount of selling is reported. Some used machinery has been sold and sent out of town, a punch press and a No. 6 Becker milling machine going to Indiana. A local dealer last week disposed of a pipe machine, punch and shear and radial drill. The Carbon Steel Co. sold a 20-ton Shaw crane to the Reliance Coke & Furnace Co., and has more ready for shipment to other customers. Installation of cranes proceeds quite well, and several awards are about to be made. It is thought that the June business was not much below that of the previous month, and that July ought to exceed that of June, owing to the mills being good buyers of tools used in repair work.

Unfilled Steel Orders Decline in June

A reduction of 595,090 tons in the amount of forward business carried on its books as of the close of business June 30, 1923, was reported by the United States Steel Corp. The reduction was much larger than had generally been expected in the financial district because of the favorable statements made early in June to the effect that increased buying on the part of the railroads would offset curtailed demand in other products. The increased rail orders, however, were not sufficient to offset the slack in other products.

The reduction reported makes the total orders carried on the books 6,386,261 tons. This is the smallest total reported since the close of August last year, when forward business aggregated 5,950,105 tons. It represents a drop of more than a million tons from the peak total of 7,288,509 tons for 1923, reported at the close of March, and compares with 6,981,351 tons at the close of May this year and with 5,635,531 tons at the close of June last year.

At the rate of production reported for June it is estimated that the mills of the corporation shipped on an average of 46,000 to 48,000 tons of finished steel daily, or a total of between 1,200,000 and 1,250,000 tons for the entire month. Taking this figure and the amount of the reduction in forward orders given above, it is calculated that new business was on an average of between 25,000 and 27,000 tons daily, or between 600,000 and 650,000 tons for the month. In May shipments aggregated 1,350,000 tons, and new bookings more than one million tons. It is believed that the corporation has sufficient business on its books to keep its plants operating at 90 per cent of capacity for the balance of the year. A renewal of buying on the part of consumers is expected soon, according to opinions expressed in steel trade circles.

Business in the South Reaches Record

Production in the Alabama district, and in all of the metal trade industries throughout the South, continues at a high level with no signs of abatement. The peak, however, has been reached, and there is not likely to be an upward turn in production for the rest of the year. Holding around the present level for the rest of 1923, the metal trade industries of the district will experience their largest production year in history, according to the Metal Trades Association headquarters.

There has been a further improvement in export shipments out of Southeastern ports during the past month, and this business is now believed to have reached the highest level in the history of the industry. Large quantities of Southern made machinery, supplies and general iron and steel products are being shipped to Latin-American countries, with Cuba probably the best buyer at this time.

St. Louis Shops Still Well Occupied

Perhaps it is the warm weather that is holding back the receipt of new orders, but in any event there has been little improvement in the machine tool situation in St. Louis during the past two weeks. Shops are running on practically full schedule because of orders not yet filled but inquiries have been very limited.

Railroads are buying little and are very conservative in what they do buy; the oil fields of the Southwest are likewise very quiet and are virtually out of the market. One firm has had a representative in that section of the country for more than a month and he reports no activities. There are no new projects under way that are further advanced than the conversation stage, and no expansions or improvements worthy of note in this section.

The automotive industry has been active, though this field is limited in the Southwest.

Some machine tool men look for things to open up toward the Fall. Few look for a slump this Winter because of the proximity of the presidential election, though they think this may have an adverse effect on the railroads' buying through their fear of contrary legislation.

Chicago Business Better Than Last Year

Although business is rather slow in the machine tool industry in Chicago, it continues to be better than last year. Last week the Denver & Rio Grand R.R. spent approximately $200,000 in purchasing machine tools in the Chicago district. The Chicago, Burlington & Quincy Ry. has not purchased machine tools for which it made inquiry several weeks ago and reports are to the effect that it is not expected to close for a month or so. The Santa Fe R.R. has issued another list. Industrials are doing very little buying. Used machine tools continue in demand.

A few Chicago dealers who sold rather heavily to the railroads were able to report June business as being better than any month this year and sales made last week will make it possible for them to report good business during July. The indications for the general situation here point to a dull month which is partly attributed to the seasonal slump. Manufacturers and merchants in the Chicago district report that business is fair. But they are generally conducting their enterprises on a hand to mouth basis. They are not producing or stocking up for future trade. A falling off in business and a continued decline in commodity prices are clearly evident.

Producers of iron in the Chicago district are in a fairly good position for the next thirty days or more, but new buying of importance will have to develop in order that the present rate of furnace output may be maintained.

June proved to be a much better month in the pig iron market than May.

Record Automotive Pace Slowing Down

Automobile production in the United States this month is expected to show a decided falling off from the output of June, according to statements made in the trade. The curtailment will in part be due to seasonal falling off in demand for open models and in part to the closing down of factories for the semi-annual inventory.

While the demand for cars is not so active as it has been, it is said to be sufficient to warrant many plants operating on fairly active schedules. Dealers in some sections of the country have sufficient open models on hand to satisfy the demand during the Summer or at least sufficient to meet the call during July.

Westinghouse and Western Both Prosperous

The Westinghouse Electric & Manufacturing Co. and the Western Electric Co. both report favorable bookings during the first half of the current year.

Figures of the Western Electric Co. show that this organization's billed goods were valued at $114,890,000 in the first half of 1923, an increase of $15,237,000, compared with the same period last year. Orders booked in the first half of this year approximated $142,805,000, which is $57,363,000 more than in the same period last year.

The Westinghouse Electric & Manufacturing Co. reports new orders valued at $47,500,000 in the second quarter of 1923, against $32,119,000 in the same period last year.

News of Washington Activities

By Paul Wooton

THE anthracite report, made public recently, is destined, many believe, to exert a powerful influence on the entire coal industry. Its 21 recommendations indicate that the industry's ills have been diagnosed skillfully. There will be differences of opinion as to the benefits which would follow the application of these recommendations, but it must be admitted that the report places main responsibility on the persons in the industry to conduct it so that imperative public interests will be reasonably served.

It stands out all through the report that the Commission conceives the anthracite business as being affected by the public interest and impressed with the public use—phrases used several times in the report. One of the most significant statements in the whole report is this one: "Coal is quite as much a public necessity as gas, street railway service or any other service or commodity that has been brought under public regulation. The Commission admits that there is not sufficient basis in knowledge or experience as to just how far control or regulation should be exercised in insuring maximum service to the public by the coal industry, but the industry itself is asked to modernize its wage agreements and the machinery for interpreting them; to set up an adequate inspection service of its own; to take hold of the problem of resizing; and to improve its practices generally, but it also calls upon the public to take a healthy interest in looking out for its own welfare. The Commission does recognize that any failure on the part of the industry to discharge properly its own responsibilities, thereby stopping the flow of coal long enough to imperil the public interest, would justify the government in taking over "the operation of the mines and the transportation and distribution and marketing of the product with full power to determine the wages to be paid the mine workers, the prices at which the coal shall be sold and, subject to court review, the compensation to be paid to land and mine owners." Not more than a month ago, the Supreme Court of the United States, in the Kansas Industrial Court case, said that since the adoption of our Constitution the vocations of the coal miner and the coal operator have not been regarded as public callings. The utterance of the Court is an historical fact, but this jury of six representative Americans has decreed something different for the future. That jury holds "that a limited natural monopoly like anthracite, held by a relatively small number of individuals, estates and companies, and supplying a necessity of life for millions of our people can not continue to be treated as if it were not affected by a public interest."

Of the 21 recommendations, 15 constitute disinterested counsel to men in the coal business. Two of them deal with regulation, two with emergency powers, one with the uniform ton and one is a recommendation to the Interstate Commerce Commission.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb....	$0.034	$0.034	$0.0252
Cold finished shafting.....	per lb....	0.042	0.042	0.0335
Brass rods.....	per lb....	0.1825	0.1850	0.1566
Solder (½ and ½)	per lb....	0.2862	0.2862	0.21
Cotton waste...	per lb....	0.1231	0.1231	0.101
Washers, cast iron (½ in.)...	per 100 lb.	4.66	4.66	3.83
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100...	3.08	3.08	3.11
Lard cutting oil	per gal...	0.575	0.608	0.575
Machine oil....	per gal...	0.349	0.349	0.36
Belting, leather, medium.....	off list....	37%	42½%	46¾%
Machine bolts up to 1x30 in.	off list....	44½%	44½%	56¾%

Coal at Lake Erie Ports Nears Record

From Jan. 1 this year to July 2, a total of 10,217,830 tons of bituminous coal had been dumped at Lake Erie ports for shipment up the lakes, according to reports just received by the Car Service Division of the American Railway Association.

This is the largest amount of coal that has ever been transported to Lake Erie points and dumped during the corresponding period in the last six years, except for that period in 1921 when the total to July 2 exceeded the total this year by 38,059 tons.

Reports also showed that during the week which ended on July 2 this year, 21,245 cars containing 1,120,990 tons of bituminous coal were dumped at Lake Erie ports. This was the largest number of cars dumped at Lake Erie ports during any corresponding week in the last six years, except in 1921 when that total was exceeded by 141 cars. Reports show that 17,576 cars of coal, or approximately 900,000 tons, were on hand at Lake Erie ports on July 2 awaiting to be dumped.

Code of Ethics for Gas Products Makers

The Eighth Annual Convention of the Gas Products Association, held at Excelsior Springs, Mo., recently adopted a code of ethics. Since the code, which contains the best points of codes previously adopted by various trade organizations, covers the relation of employer and employe, relations with those from whom purchases are made, relations between members of the industry, their customers, the public and the government, members of the Association plan to have copies printed and sent to their customers and employees.

Foundrymen Prepare for European Tour

Members of the Foundrymen's Association are making preparations for the tour through Europe which will take place during August and September of this year. According to the tentative program that has been issued, members will leave New York on the Leviathan on Aug. 18 and arrive in Southampton on the twenty-fourth. Entertainment has been arranged in England where various plants will be visited and inspected, notably those at Sheffield, Manchester, Birmingham and London.

Crossing the channel accompanied by members of the Institution of British Foundrymen, the party will arrive at Calais and proceed to Paris arriving there on Sept. 11. At Paris they will attend the International Foundrymen's Congress where papers prepared by prominent American, British and French authorities will be discussed.

On Sept. 18 the party will leave Paris for Nancy and from that point they will visit battlefields around the St. Mihiel and the Verdun sectors. At Liege the party will inspect the Cockerill Works, the Conduit d'Eau plant and the Fabrique Nationale. After Liege, Brussels and Lille will be visited and on Sept. 26 the American contingent will sail on the Homeric from Cherbourg arriving in New York on Oct. 2. It is not at the present time known the number of members that will make the trip. The arrangement for the tour are in charge of Thomas Cook & Sons, Philadelphia office and are under the direction of Stanley G. Flagg, Jr., vice-chairman of the committee on international relations of the A.F.A.

Slight Seasonal Decrease in Labor Demand

There was a slight decrease in employment in the country last month, according to a survey by the Labor Department. Thirty-one cities reported increased employment while in thirty-three cities there was a slight falling off in industrial activities.

Among the cities reporting enlarged activities are Toledo, Philadelphia, Chattanooga, Boston, Chicago, Bayonne, Johnstown, Louisville and Jersey City. Decreases are reported in Seattle, Denver, Cleveland, Perth Amboy, Buffalo, Trenton, Paterson, Detroit, Passaic, Niagara Falls, Bridgeport, New York, Newark and Baltimore.

The shading down in employment appeared in the paper and printing manufactures, in the textiles and their products. This is regarded as merely seasonal and may disappear in due time. The demand for farm labor continues, and in some sections the shortage of this class of help is acute. Progress in State and Federal road building is being hampered, the survey says, because of insufficient labor. Shortage of carpenters, bricklayers and plasterers exists in many cities according to the report of the survey.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THE markets kept step with the news from Europe last week. Until the British Premier had spoken on Thursday they were quiet and thereafter they improved. He gave the impression of being conciliatory, but firm, and those who are schooled in the ways of European diplomacy insist that he has made it practicable for France to abandon her untenable position with dignity.

If the greatest war in history was not so recent it would be thinkable, as some assert, that the questions at issue would lead Europe to take up arms again. But even the fiery Frenchmen are not likely to fight until the struggle whose hostilities were ended in November 1918 has become a fainter memory than it is today.

The alarming tone of some of the European cables may therefore be discounted. The correspondents who send them must be sensational to get the attention of the jaded public for whom they write, but American business men will wisely proceed upon the theory that there will not be another war for at least ten years.

Even if this theory should be a mistaken one action upon it will not be costly to the United States in an economic sense. If Europe goes to fighting again whatever wealth it has left will be thrown into America's lap and as a nation we will be like the Fuggers, the Medici and the Rothschilds of the past who prospered so mightily in financing the internecine quarrels in which the monarchs of their time were perpetually engaged.

This allusion is not, however, intended to belittle the horror of the next war about which so many are glibly talking. Its very horror is one of the reasons why it will not occur and another reason is that out of self interest America's power must sooner or later be organized to put Europe on its feet. In the wheat market we are getting a taste of what the continuance of chaos overseas will mean to us. Wheat is below a dollar in Chicago, principally because there is little or no export demand for our surplus production.

The Agricultural Department estimates that our prospective crops, not including tobacco, are worth over seven billion dollars at present prices. The wheat crop is put at 821,000,000 bushels and the yield of corn at 2,877,000,000 bushels.

But such crops, usually considered as the surest basis of prosperity, will mean loss and poverty to the farmers unless a consumptive demand for them at fair prices can be developed. This is why the really forward looking man will be optimistic as he faces the present situation.

Through the credits she has extended and can extend, this country has the power to control the economic policy of Europe and it is as certain as anything political can be that our Government will soon be compelled to use this power in the interest of our agricultural classes. Meantime we may be sure that the banks will help the farmer to hold his grain and that he will find salvation in the very magnitude of the disaster that seems to threaten.

In nearly every other aspect the outlook is highly satisfactory. Railroad car loadings continue to break previous records and railroad earnings are correspondingly good. For May they were at the equivalent of 6.33 per cent per annum on the officially estimated value of the roads, and for June they will be equally large, if not larger. The steel industry is a little less busy, but busy enough, and the domestic demand for copper is on a scale which partially offsets the reduced exports. Cotton is firmer as the weather grows hotter down South. The mills who are buying very sparingly in the hope of lower prices will do well to remember that procrastination is frequently the thief of profits as well as of time.

"Railroad car loadings continue to break previous records and railroad earnings are correspondingly good. For May they were at the equivalent of 6.33 per cent per annum on the officially estimated value of the roads, and for June they will be equally large, if not larger. The steel industry is a little less busy, but busy enough, and the domestic demand for copper is on a scale which partially offsets the reduced exports."

Sugar is in *status quo*. For the balance of this season the big Cuban sugar companies will be able to name the price at which the remnant of this year's crop will be sold and they are not likely to let it go much lower. Coffee for delivery in May 1924 has sold as low as 6.75, at which price it seems cheap. The Brazilian government is not buying, but as its unsold holdings are comfortably financed they are not likely to come on the market inopportunely.

The wool market is quiet. The best judges say that higher prices are unlikely, but they do not expect any decline at present. Building materials are easier and coal is obtainable at prices which seem relatively moderate and at which large users will probably do well to secure their winter's supply. The market for hides and leather is still unexplicably poor. There are some who attribute it to the disuse of harness and the growing use of "leatherized" cotton cloth in upholstery.

The output of automobiles is at last slackened, but the manufacturers say that the dullness is seasonal. At 25 cents rubber seems reasonable for those who can merchandise its products. Dry goods jobbers complain that trade is dull, but as the department stores and the mail order houses all report increased sales it is to be inferred that stocks are small.

The stock market has stopped declining. The bond market is better and the indications are that some recent prophets of disaster will soon have to double on their tracks again. The railroad stocks should certainly be worth more soon unless earnings are no longer an index of value. The increased production of petroleum is still urged as a reason for selling the oil stocks, but the logic of the argument is not appealing. The use of oil for fuel is meantime increasing amazingly.

The Governor General of Canada has signed the bill giving him discretionary authority to embargo the export of pulp wood from Canada. The embargo is not therefore mandatory as had been supposed, and in Washington the bill is construed as to notice that Canada is preparing for retaliation against our tariff if retaliation be necessary. To this end she is putting herself in a position to raise the cost of newsprint to the American newspapers who constitute the most vocal as well as the most sensitive element of the community. That it is a shrewdly planned move is not to be denied.

The weekly statement of the Federal Reserve System shows a gain of $13,000,000 in gold and a rise of 1 per cent in the reserve ratio, which now stands at 75.4 per cent. These figures assure a continued abundance of credit and a financial condition from which great prosperity can be easily evolved provided confidence in the future of Europe is soon re-established.

The imports for June are valued at $328,000,000 as against exports worth $329,000,000. The result is a favorable balance of $1,000,000. This compared with an excess of $74,000.000 in exports in June, 1922, and an adverse balance of $56,000,000 in May 1923.

May Shipments of Iron and Steel Large

Exports of iron and steel products from the United States during May exceeded foreign shipments for any one month since June, 1922, according to figures of the Iron and Steel Division of the Department of Commerce. Most noticeable advances over the April, 1923, are gains in steel rails and accessories, plain wire, boiler tubes, and welded pipe, and cast iron pipe and fittings.

Good Order Locomotives Increase in Number

The railroads of the United States on July 1 had the largest number of locomotives ready for service and the smallest number in need of repair for any time since compilation of such reports by the car service division of the American Railway Association on Aug. 1, 1920. Serviceable locomotives on July 1 totaled 52,456, an increase of 1,237 over the number on June 15, according to the report.

Motive power in need of repair on July 1, the report said, totaled 11,450, or 18 per cent of all the engines on line. On June 15 the total was 12,659, or 19.9 per cent.

On July 1 only 16.2 per cent was in need of heavy repair, or a total of 10,326, this being 1,147 engines below the June 15 total.

On July 1 the railroads had 2,181 serviceable locomotives stored in readiness for increased traffic demands.

Business Items

The Athol Manufacturing Co., which was incorporated recently with a capital stock of $600,000 to manufacture machinery, succeeds the company of the same name which was incorporated in 1915 by L. S. Starrett to manufacture artificial leather and rubberized fabrics and which had a capitalization of $2,000,000. Mr. Starrett was president of the company at the time of his death some months ago, since which time it has undergone a reorganization with the new corporation as a result. Officials of the L. S. Starrett Co. are among those interested in the new company including Willard G. Nims, Frank A. Ball and Arthur H. Starrett.

The largest coal mining hoist in the world will be installed at Orient No. 2 mine of the Chicago, Wilkington & Franklin Coal Co., at West Frankfort, Ill., and the contract has been awarded to the Westinghouse Electric & Manufacturing Co. and the Nordberg Manufacturing Co. The Westinghouse company will furnish the complete electrical equipment for the hoist, which will be twice as large as any in North America at the present time. The largest similar machine now known is equipped with a motor having a capacity of 1,400 hp. The capacity of the hoist motors of the Orient No. 2 hoist will be 4,400 hp., divided into two motors, one mounted at each end of the drum shaft.

The Colonial Supply Co., Pittsburgh, has been appointed exclusive distributor in the Western Pennsylvania territory for the Latrobe Tool Co., Latrobe, Pa., manufacturers of high-speed drilling machines and reamers.

The new factory of N. A. Strand & Co., Chicago, was opened with a reception on July 14. The factory is located at Lincoln and Argyle Sts.

The entire personal property and real estate of the bankrupt Aspinwall-Drew Co., Waterloo, Wis., was offered for sale at public auction jointly by Michael Tauber & Co. and Samuel L. Winternitz & Co., Chicago, on July 12. The inventory value is in excess of $100,000. The Waterloo concern manufactured barn equipment. The inventory included shears, hack-saws, punch presses, pipe bending machines, drilling machines, engine lathes, milling machines, tap-tumbling barrels, post boring machines, riveting and punch presses, and ten motors and generators.

The Oshkosh Motor Truck Co., Oshkosh, Wis., manufacturer of motor trucks with quadruple drive, is resuming production on more nearly a capacity scale through the completion of additional financing. An issue of $100,000 of first mortgage bonds has been made.

The local committee appointed by the Milwaukee Association of Commerce for the American Mining Congress, to be held Sept. 24-29 in the Municipal Auditorium, consists of the following: Max W. Babb, vice-president, the Allis-Chalmers Mfg. Co., chairman; Bruno V. Nordberg, sales manager, the Nordberg Mfg. Co.; E. K. Swigert, vice-president, the Bucyrus Co.; N. C. Lamont, general manager, the Worthington Pump & Machinery Corp.; W. J. Fairbairn, secretary-manager, the Milwaukee Metal Trades and Founders Bureau; Frank Cleveland, convention secretary, the Association of Commerce. This will be the twenty-sixth annual convention and will be accompanied by the customary exposition of mining machinery and equipment.

Loss estimated at about $10,000 was caused by a fire which recently destroyed the foundry and shops of the Orangeburg Foundry Co., at Orangeburg, S. C.

The machine shops and warehouse of the Connors Steel Co., of Birmingham, Ala., comprising what is known as Plant No. 1, were destroyed by fire recently at a loss estimated at about $200,000.

The Southern Iron & Equipment Co., of Atlanta, general manufacturers of iron and steel products, announces the opening of new offices at Pittsburgh, Pa., and at Seattle, Wash., for handling the company's trade in these territories.

The American Nickel Corp. has discontinued its Pittsburgh sales office and has moved the sales organization to the main office and plant at Clearfield, Pa.

The Bridgeport Worm & Gear Manufacturing Co., Bridgeport, Conn., has purchased part of the plant of the American & British Manufacturing Co., corner of Crescent Ave. and Helen Court, and have moved to that location. The company was formerly located at Stratford, Conn.

A motion picture showing the employer-employee relationship idea as it is worked out in the Riverside & Dan River Cotton Mills, Danville, Virginia, has been made and is being distributed in the various industrial plants by the Rothacker Film Manufacturing Co., Chicago.

Fire damaged the offices and stockrooms of the New York Central R.R. shops at Depew, N. Y., recently, destroying about $50,000 worth of electrical and other equipment. The executive offices of the shop were also ruined.

The Chicago office of the Latrobe Tool Co., Latrobe, Pa., has been moved to 1,440 West Lake Street.

Obituary

ROBERT WOOLSON HUNT, founder of the Robert W. Hunt Co., Chicago, died at the age of 84 years at his home on July 11. Mr. Hunt was prominent in engineering circles and a complete obituary will be printed in the *American Machinist* next week.

WALTER MONTIETH AIKMAN, long identified with the stamping, enameling and galvanizing industries, died recently in his ninety-sixth year at his home in Greenwich, Conn. Mr. Aikman at the time of his death was chairman of the board of directors of the Central Stamping Co., Newark, N. J.

L. J. MAESCHER, president of the Pioneer Boiler & Machine Works of Los Angeles, Cal., died in that city on July 1, aged 57 years.

HENRY C. ROBERTS, for 36 years connected with the Avery Co., makers of agricultural implements, at Peoria, Ill., and formerly vice-president of the company, died in Los Angeles, Cal. June 22, aged 66 years.

GILES A. GRAVES, for the past eight years foreman and superintendent of the tool room at the plant of the L. C. Smith & Brothers Typewriter Co., Syracuse, N. Y., died recently at his home in that city, aged 50 years.

Personals

J. G. FOGERTY, JR. will have charge of the new offices of the Lawrence M. Stein Co., Chicago, that will be opened in Atlanta, Ga. The company makes power sewing machines and factory equipment and the new territory will include all of the Southeastern states.

M. H. BLANK has been appointed works manager of the Engine Motors, Inc., Indianapolis, Ind. Mr. Blank was formerly connected with the Cole Motor Car Co., the Cadillac Motor Car Co., Continental Motors, Inc., and the General Electric Co.

H. T. MARTIN, assistant to the president of the Lanston Monotype Machine Co., Philadelphia, has resigned and will open an office in New York City, at 32 Union Square. He will conduct a consulting engineering service, covering production, designing, organizing in the metal and printing arts.

C. L. DICKERT has been appointed superintendent of motive power for the Central of Georgia Railway with headquarters in Savannah, Ga. Mr. Dickert succeeds W. H. Fetner who has resigned.

E. L. COX has been appointed assistant master mechanic at Macon, Ga., for the Central of Georgia Railway, succeeding W. A. McCafferty.

W. A. MCCAFFERTY has been appointed master mechanic at Columbus, Ga., for the Central of Georgia Railway, succeeding A. J. Flowers.

A. J. FLOWERS has been appointed master mechanic at Macon, Ga., for the Central of Georgia Railway, succeeding C. L. Dickert.

A. B. BREEZE, vice-president and general manager of the Cincinnati Ball Crank Co. has resigned. Prior to his connection with this concern he was the district sales manager and assistant general superintendent of the National Acme Manufacturing Co., Cleveland, Ohio.

GEORGE GORDON CRAWFORD, president of the Tennessee Coal, Iron & Railroad Co., of Birmingham, Ala., has gone to Europe to make an extensive tour for the purpose of studying new industrial advancements which have been made since the war.

FRANK NEWMAN SPELLER, metallurgical engineer of the National Tube Co. at Pittsburgh, has been given an honorary degree of doctor of science by the University of Toronto. He has been identified with research work on the corrosion of steel for a long time.

CALVIN L. JONES, welding engineer of the Westinghouse Electric & Manufacturing Co., stationed at Atlanta, Ga., has been elected vice-president of the American Welding Society, and will be in charge of the society's interests in the South.

JOSEPH L. SCHOLL, formerly with the Pittsburgh office of Niles-Bement-Pond Co., in the sale of machine tools, but more recently identified with the McCoy-Brandt Machinery Co., has become affiliated with the Reliance Machinery Sales Co., Pittsburgh.

R. B. HUBBELL has been placed in charge of machine tool sales with the Greenfield Tap & Die Corp., Greenfield, Mass. Mr. Hubbell formerly was connected with the Norton Co. and the Heald Machine Co. and is well known to the trade.

FRANK J. WESCHLER, who for years has borne an important part in the affairs of the Hendee Manufacturing Co., Springfield, Mass., producers of the Indian motorcycle, was elected president of the organization at a meeting of the directors July 10. He succeeds to the place made vacant by the death of Henry H. Skinner, early in the year. He will continue to act as general manager, a post he has held for the past year, during which time the plant system has been reorganized.

L. W. SCHEN has been appointed in charge of the laboratory of the Price Electric Co., Cleveland. He was formerly with the Hickok Electric Instrument Co., Cleveland.

W. A. THOMPSON, comptroller of the Allis-Chalmers Mfg. Co., Milwaukee, Wis., has been appointed secretary to fill the vacancy caused by the recent death of Henry Woodland, secretary and treasurer. Raymond Dill, assistant treasurer, has been appointed treasurer. D. A. Stuart, auditor, is made assistant treasurer, and J. A. Keogh, assistant secretary.

E. J. WILKIE has been appointed Northern sales manager of the Bucyrus Co., South Milwaukee, Wis., the territory embracing Wisconsin, Minnesota, the Dakotas, upper Michigan and eastern Montana. He succeeds E. R. Weber, resigned. Mr. Wilkie has been connected with the sales department 14 years and continues to make his headquarters at the general offices in South Milwaukee.

WALTER ROGERS has joined the Vonnegut Machinery Co., Indianapolis, Ind., and will have charge of the accessory department for that company. He was formerly with the Taft-Pierce Manufacturing Co., Woonsocket, R. I

C. F. ROGERS, formerly representing C. E. Johansson, Inc., has been appointed factory representative for the W B. Knight Machinery Co., St. Louis.

ERNEST W. DUSTON has been appointed chief engineer with the American Bolt Corp., New York City.

CLINTON R. FRENCH will succeed his father, H. S. French, deceased, as president of the Machinery Forging Co., Cincinnati, Ohio.

H. A. DEITERS has been appointed manager of the Price Electric Co., Cleveland. Mr. Deiters was formerly master mechanic with the Ferro Machine & Foundry Co., Cleveland.

WILLIAM R. HILL, formerly sales manager for the Yale & Towne Manufacturing Co., Stamford, Conn., has been elected president of the Sargent & Greenleaf Co., Inc., Rochester, N. Y.

THOMAS H. ENDICOTT has been appointed as vice-president and general manager of the Green Equipment Corp., Chicago. Mr. Endicott was formerly sales manager for the metal cutting department of the E. C. Atkins Co. and previous to this connection was sales engineer with the Crocker-Wheeler Co.

GEORGE D. MARTIN was elected secretary and treasurer of the William Cramp & Sons Ship & Engine Building Co., Philadelphia, at a recent meeting of the directors.

Trade Catalogs

Pumps. The Gould Manufacturing Co., Seneca Falls, N. Y. A four-page folder in the form of a letter has been issued by this company in which the double suction centrifugal pumps manufactured by it are illustrated and described. The folder is complete and exceptionally well arranged.

Stokers. The Combustion Engineering Corp., New York City. The Type K stoker manufactured by this company is illustrated and described in a broadside that has been issued recently. The application of the product to various types of boilers is also shown.

Drilling Machines. The Kingsbury Manufacturing Co., Keene, N. H. Two folders have been issued by this company, one showing the semi-automatic sensitive ball bearing two-spindle drilling machine and the other the multiple spindle gang type. Specifications are given in both cases and illustrations show the advantages of both machines.

Airplane Tools. Wright Aeronautical Corp., Paterson, N. J. Field service tools for airplane repairs are listed in a catalog issued by this company. A special service kit is featured.

Washing Machines. The Crescent Washing Machine Co., New Rochelle, N. Y. "Washing Metals by Machinery" is the title of a new booklet that has been issued by this company in which the advantages of using washing machines in factories are put forth. The principles of the machines and a list of the metal working factories using the machines are also given.

Leather Belting. The Chicago Belting Co., Chicago, Ill. A new lot of circulars has been issued by this company in which the uses of belting in factories are shown by illustrations and text and the many economies of good belting are put forth.

Twist Drills and Reamers. The Latrobe Tool Co., Latrobe, Pa. The 1923 catalog of high speed twist drills and reamers made by this company has been issued. The catalog contains 111 pages in which are shown prices, specifications and uses of the tools.

Ground-Form Cutters. The Brown & Sharpe Manufacturing Co., Providence, R. I. Sectional drawings, half-tone illustrations and excellent descriptive text regarding the product of this company are to be found in a pamphlet that has been issued. Ground-form gear cutters, spline shaft cutters, and sprocket cutters are discussed.

Milling Machines. The Ingersoll Milling Machine Co Rockford, Ill. Pictures showing the interior of the factory at Rockford are printed on a broadside that has been issued by this company. A descriptive article tells of the immensity of the factory and the methods of assembling the milling machines.

Grinding Wheels. Vitrified Wheel Co., Westfield, Mass. The efficiency of the grinding wheel that is made by this company is told in a folder that has recently been issued. Sizes and descriptions of various wheels are also given.

Pyrometers. The Brown Instrument Co. Philadelphia, Pa. "The Automatic Control of Temperature in the Heat Treating of Steel" is the title of a booklet that has been issued by the Brown Instrument Co. Factories where the instrument is in use, testimonials from users and interesting halftones of the machine itself are to be found in the booklet together with descriptive matter.

Chucks. The Skinner Chuck Co., New Britain, Conn. A condensed catalog showing the various chucks made by this company has been issued. Lathe, drill and planer chucks with dimensions and prices are shown in the unique booklet.

Riveters. Hanna Engineering Works, Chicago, Ill. A folder showing fifteen types of riveters has been recently issued. Short descriptions accompany silhouetted cuts, making the folder most attractive.

Grinders. The Wisconsin Electric Co., Racine, Wis. The Dumore high-speed grinder as it appears in use in factories and sectional views of the various parts have been combined in a broadside that has been issued. Speed and accuracy are featured in the folder.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Canning machinery. Turin, Italy. Agency. Reference No. 7117.

Cement-making machinery, capacity 500 barrels daily. San Jose, Costa Rica. Purchase. Reference No. 7076.

Galvanized iron bending machinery. Chihuahua, Mexico. Purchase. Reference No. 7124.

Oil-well drilling machinery. Bilbao, Spain. Purchase. Reference No. 7074.

Presses, automatic, for production of small metal articles. Sofia, Bulgaria. Purchase. Reference No. 7086.

Forthcoming Meetings

New Haven Branch of the American Society of Mechanical Engineers. Third annual machine tool exhibit Sept. 18, 19, 20 and 21. Mason Laboratory, New Haven, Conn. A. C. Jewett, chairman.

Association of Iron and Steel Electrical Engineers. Iron and steel exposition, Buffalo, Sept. 24 to 28. John F. Kelly, secretary, Association of Iron & Steel Electrical Engineers, 708 Empire Building, Pittsburgh, Pa.

American Management Association. October 29, 30, and 31 Hotel Astor, New York City.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Iron and Steel—Pig-iron prices gradually declining, owing to unsettled market conditions and slowness of buying. A fair-sized volume of new steel plate inquiries, for tank and car construction, marks the beginning of the third quarter. No deviation from the $2.50 base on plates and shapes. Bars still $2.40 per 100 lb. f.o.b. mill. Fair volume of new demand for structurals. Production at mills dropping off slightly owing to labor shortage and weather conditions.

Advances—Copper prices climbing slowly; advance of ⅛c. per lb. quoted during week. Tin also showing steady price improvement owing to slow arrivals of foreign metal; market advanced 1⅛c. since last week. Zinc, $1 per ton higher; sheet mills taking fairly heavy tonnages.

Declines—Lead market quiet; dropped 35c. per 100 lb. in week. Copper wire down ⅛c. per lb. in New York. Linseed oil, raw, in 5-bbl. lots, $1.10 per gal., f.o.b. New York, against $1.13, last week.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$29.05
Northern Basic	29.27
Southern Ohio No. 2	29.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.25
BIRMINGHAM	
No. 2 Foundry	25.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	28.76
Virginia No. 2	32.17
Basic	27.76
Grey Forge	27.26
CHICAGO	
No. 2 Foundry local	29.11
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.51
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	27.77
Basic	26.77
Bessemer	28.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	6.75
New York	5.50@7.00
Chicago	4.00@5.00

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.95	4.45	4.85
Nos. 22 and 24.	3.75	5.00	4.50	4.85
Nos. 25 and 26.	3.80	5.05	4.55	4.90
No. 28	3.85	5.15	4.65	5.00

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00	5.15	4.70	5.10
Nos. 12 and 14.	4.10	5.25	4.80	5.20
Nos. 17 and 21.	4.40	5.55	5.10	....
Nos. 22 and 24.	4.55	5.70	5.25	5.65
No. 26	4.70	5.85	5.50	5.80
No. 28	5.00	6.15	5.80	6.10

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
BUTT WELD					
1 to 3	62	50½	¼ to 1¼	30	13
LAP WELD					
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	26	11
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1¼	60	49½	¾ to 1¼	30	14
2 and 3	61	50½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ⅛-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	5.00	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	7.50	8.00	7.35
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.40	3.90	4.30
Cold finished flats, squares	4.90	4.40	4.80
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.32½
Soft steel bar shapes (base)	3.54	3.36	3.32½
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.71	3.40
Bar iron (3.25 at mill)	3.54	3.36	3.32½
Carbon tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 3/32, 8½c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.37½
Tin, 5-ton lots, New York			39.50
Lead (up to carlots), St. Louis	5.80	New York	6.37½
Zinc (up to carlots), St. Louis	6.25	New York	6.70

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.20	27.00	27.50
Antimony (Chinese), ton spot	8.00	10.00	8.25
Copper sheets, base	24.50	23.75@24.00	23.00
Copper wire (l.c.l.)	17.25	21.00	16.25
Copper bars (l.c.l.)	22.00	24.25	19.50
Copper tubing (l.c.l.)	27.00	29.25	23.00
Brass sheets (l.c.l.)	19.75	24.25	18.75
Brass tubing (l.c.l.)	25.50	29.75	20.50
Brass rods (l. c. l.)	18.00	21.00	15.75
Brass wire (l. c. l.)	20.25	22.00	.....
Zinc sheets (casks)	10.25	10.10	.....
Solder (½ and ½), (caselots)	28.50	29.50@31.50	20.00
Babbitt metal (83% tin)	56.00	49.00	40.00
Babbitt metal (35% tin)	30.00	17.00	16.00
Nickel (ingot and shot)	29.00	.....	35 00
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	13.50@14.00	12.00	12.00
Copper, heavy, and wire	13.25@13.75	11.50	11.00
Copper, light, and bottoms	11.25@11.75	9.50	10.00
Lead, heavy	5.00@ 5.50	5.00	5.75
Lead, tea	4.50@ 4.75	4.00	4.75
Brass, heavy, yellow	7.50@ 7.75	....	7.50
Brass, heavy, red	11.00@11.50	9.50	9.50
Brass, light	6.00@ 6.50	5.00	6.50
No. 1 yellow brass turnings	7.50@ 7.75	6.00	7.00
Zinc	3.75@ 4.25	3.00	3.50

TIN PLATES—American Charcoal—Bright—Per box.

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 20x28, 112 sheets	$23.50	$19.50	$18.50
"A" Grade:			
IC, 20x28, 112 sheets	21.00	17.00	17.00
Coke Plates—Primes, 20x28 in.			
100-lb., 112 sheets	14.00	12.60	14.50
Terne Plates—Small lots, 8-lb. Coating			
IC, 14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13¼x13¼, per lb.	10.75@11.00	36.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	1.10	1.22	1.28
White lead, dry or in oil	100 lb. kegs.	New York,	14.00
Red lead, dry	100 lb. kegs.	New York,	14.00
Red lead, in oil	100 lb. kegs.	New York,	15.50
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.50@5.00	
Coke, prompt foundry, Connellsville	per net ton	5.50@6.00	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	30%	50-10%	45-5%
1½ and 1¼x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	15%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	20%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	30%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	25%	45%	40-5%
Bolt ends, with hot pressed nuts	30%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 5/16 and smaller	60%	.....	...
Semi-finished nuts, ⅜ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅜ in., per 100 lb. (net)	5.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	List net	2.75	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	40%	50–10%	60%
Rivets, tinned	40%	50–10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1⅛ to 1⅜-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30–10%	30–10%	30–10%
Heavy grade	20–5–2½	30%	20–5–2½%
Rubber and duck:			
First grade	50–10–5%	50–10%	40-10%
Second grade	60–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20

New and Enlarged Shops

Machine Tools Wanted

D. C., Wash.—Peerless Motor Co., 1501 14th St.—cylinder grinders and lathes for metal work.

Ill., Chicago—Chicago Signal Co., 312-318 South Green St., W. P. Goodalt, Mgr. —1¼ Universal milling machine and pulley base drill.

Kan., Anthony—Anthony Auto Salvage & Supply Co. (machine shop), J. M. Hall, Purch. Agt.—power drill press, lathe, emery wheel with stand, belting, hangers, pulleys and shafting.

Kan., Anthony—V. A. Fallier (welding) —welding outfit, power metal lathe, drill press, hangers and belting.

Kan., Anthony—V. Fowler (tin shop and radio factory)—tinners brake.

Kan., Anthony—E. Holmucker, c/o A. Miller (machine shop)—power lathe, drill press, emery wheel, stand, belting, hangers, pulleys, shafting, bearings, also blast furnace for blacksmith shop.

Kan., Anthony — Justice Battery Co. (exide battery repair shop)—power lathe.

Kan., Anthony—T. & H. Radio Co.— power metal lathe.

Kan., Anthony—J. E. Sneath, 201 South Blue St. (garage)— belting, shafting, drill press, lathe, burning in machine, hangers, pulleys, emery stand and bearings.

Kan., Garden Plain—Wulf Bros. Auto Co. —power drill press.

Kan., Goddard—Emerick Garage, G. F. Emerick, Purch. Agt.—power lathe and drill press.

Kan., Harper—H. Ammann—power metal lathe for garage.

Kan., Harper—E. Wheilschlagle — power metal lathe for garage.

Kan., Kingman — N. Hobson & Son (garage) — power automobile cylinder grinder.

Kan., Kingman—E. R. King—power drill press for garage.

Kan., Kingman—Kingman Motor Service, L. E. Kiser, Purch. Agt.—power drill press, lathe and motor equipment.

Kan., Kingman—A. D. Rayl Motor Co., R. Markle, Purch. Agt.—cylinder grinder.

Kan., Kingman — Stead Bros. (machine shop)—metal lathe, drill press, cylinder press, burning in machine, belting and hangers.

Kan., Murdock—Wolfe Motor Co.—belting and power metal lathe.

Me., Portland—Portland-Nash Co.—machinery for proposed garage and machine shop.

Mass., Wakefield—C. Locash, Stark Ave. (machine shop)—machine table saw with about 3 hp. single phase motor.

Mo., St. Louis—Pennsylvania R R., Syndicate Trust Bldg., C. R. Peddle, Purch. Agt.—two planers, boring mill, radial drill and tire trimming lathe for Columbus shops.

N. J., Newark—Eagle Tool & Machine Co., 37 Freeman St.—hydraulic press, about 500 ton pressure, for die forcing (used).

N. M., Albuquerque—Quickel Automobile & Supply Co.—garage, machine and repair shop equipment for $75,000 service station, to replace that which was destroyed by fire.

N. Y., Albany—F. La Du, State Engr., 158 State St.—two lathes, drill, planer, etc., for proposed machine shop; also complete dust cleaning system, including pneumatic cleaners, low pressure conveyors, capacity 20,000 bu. per hour, etc., for proposed $1,-000,000 grain elevator at Oswego.

N. Y., Brooklyn — M. Kamenstein, 135 Pearl St. (tinware)—No. 295 or 300 Bliss automatic wire ring machine.

N. Y., Buffalo—V. Budziak, 793 Northampton St.—equipment for automobile service station, also two 1,000 gal. gasoline tanks and pumps.

N. Y., Buffalo—Hugh Co., Inc., 190 Elk St.—110 volt, 25 cycle, a.c. ⅜ in. drill.

N. Y., Buffalo—S. Landt, 494 Elmwood Ave.—machinery, tools and equipment for proposed $40,000 garage and service station.

N. Y., Corning — Elmira, Corning & Waverly R.R. Co.—repair shop machinery and equipment, including lathe, drill, grinder, welder, etc.

N. Y., Jamestown—Palmeter Tool Co., 308 Falconer St.—tool working machinery and equipment for factory at Celeron.

N. Y., Orwell—Orwell Garage & Machine Shop—bench miller and portable electric drill, 220 volt.

N. Y., Pulaski—Pulaski Motor Sales Co., Main St.—20 in. vertical drill press for garage and machine shop.

N. Y., Pulaski—A. E. Olmstead & Son Co. (machine shop)—2 x 2 in. power metal saw and one 1½ ton triple chain hoist.

N. Y., Sacket Harbor—Markham & Lepper Co., Broad St. (machine shop), H. Markham, Purch. Agt.—slotter.

N. Y., Watertown — G. Forrester Co., Court St. (brazing and welding)—oil operated annealing oven and power operated metal shear.

N. Y., Watertown—W. S. Stafford, 512 West Main St., W. D. Ogsbury, Flower Bldg., Purch. Agt.—machine tools for motor repair for proposed $10,000 garage.

O., Defiance—Kruder-Weirck Mfg. Co.— machinery and equipment, including presses, shears, etc., for the manufacture of metal containers.

O., Springfield—Peet & Schuster, Centre & Jefferson Sts., O. F. Mitchell, Pres.— metal working machinery, including shearing machine and slotter.

Okla., Oklahoma City—Amer. Electrical Co., 708 North Bway.—power metal lathe, 16 in. swing, 6 ft. base.

Pa., Franklin—Bd. Educ.—machine shop equipment, including lathe, drill, grinder, etc. (new).

Pa., Johnstown—Robinson Motor Car Co., 212-218 Main St.—machine shop equipment, including lathe, press, drill, etc.; small bench tools; air compressor and service station equipment.

Pa., Lancaster—Schmid Bros. (machine shop)—straight side punch press, arched punch press, also die bore, 4¼ in. bore, 6 in. hub.

Pa., Phila. — Associated Engineers Co., 1001 Diamond St.—punch press.

Pa., Scranton—A. Anderson, 409 Adams Ave.—lathe, press, drill, grinder, etc., for proposed $40,000 garage and service station.

Va., Richmond—E. M. Gourlay, 6-8 South Madison St.—drill press and cylinder grinder.

Va., Richmond—Gregory Bros., 611 West Main St. (plumbing and steam fitting)— drill press, gap shears and power punch for metal.

Va., Richmond—H. E. Lang, 10-12 South Madison St.—medium size lathe for automobile repair work.

Va., Richmond—Lloyd Motor Co., 315 West Main St.—cylinder grinder.

Va., Richmond—Premier Service Co., 310 West Broad St.—drill press, 1 ton portable hoist, air compressor and gas tank.

Va., Winchester—Shade Motor Co.— drill press.

Va., Winchester—Winchester Automotive Machine Wks.—drill press and milling machine.

Wis., Fond du Lac — H. W. Voell, 59 North Main St.—automobile repair machinery, gasoline tanks and pumps for proposed $40,000 garage.

Wis., Green Bay—Green Bay Motor Car Co., 316 North Jefferson St.—repair shop machinery and equipment, also air compressor for proposed $50,000 garage.

Wis., Milwaukee—Jensen Furnace Co., 525 3rd St. (sheet metal and furnace works), C. Jensen, Purch. Agt.—bending rolls, 8 to 10 ft. brake and beader.

Wis., Prairie du Sac—J. U. Schmidt— automobile repair machinery, drill press, small tools and gasoline storage tanks for proposed $40,000 garage and repair shop.

Wis., Racine—G. Nelson, 3009 Washington Ave.—automobile repair machinery and gasoline storage tanks for proposed garage.

Wis., Rice Lake—C. O. Ronning—automobile repair machinery, drill press, gasoline tanks and pumps for proposed 50 x 160 ft. garage.

Que., Acton—M. Lefebvre—equipment for automobile repair and blacksmith shop.

Que., Beauharnois—A. Langlois—automobile repair shop equipment.

Que., Bedford — E. J. Ferland, Lower Main St.—garage and automobile repair shop equipment.

Que., Montreal—Burnside Garage, Ltd., 29 Mount Royal St., W., F. S. Brown, Purch. Agt.—complete equipment for repair shop.

Que., Montreal—Duplessis, Benrier & Valquet, 27 Alexander St., A. Duplessis, Purch. Agt.—cylinder grinding and gear cutting machinery.

Que., Pont Chateau—L. Carriere—equipment for blacksmith shop and small machine repairs.

Que., St. Jude—L. Roy—garage and automobile repair shop equipment.

Que., Scotstown—Scotstown Garage Co., E. A. McIver, Purch. Agt.—garage equipment.

Que., Shawenegan Falls — Garage Lambert, 16 4th Ave., A. Lambert, Purch. Agt. —automobile repair shop equipment.

Que., Sherbrooke—East End Shop & Garage Co., Ltd., 43 Bowen St., E. Z. Blais, Purch. Agt.—equipment for automobile repair shop.

Que., Sherbrooke—J. A. Houde, 6 King St., E.—additional machine and blacksmith shop equipment.

Que., Sherbrooke — Sangster Fireproof Garage, 31 Wellington St., J. R. Sangster, Purch. Agt.—automobile repair shop and garage equipment.

Que., Vercheres—M. Desmarais—complete equipment for garage and automobile repair shop.

Machinery Wanted

Ala., Townly—Corona Coal Co.—electrical coal mining machinery and equipment.

Calif., Torrance—Western Sheet Glass Co., A. Sieroty, Pres.—machinery and equipment for the manufacture of wire glass.

Conn., Bridgeport—S. Lowndes, 40 Union Ave.—looms and equipment for new elastic fabric plant.

Fla., Miami—Drake Lumber Co.—machinery and equipment for several proposed sawmills near Kelsey City.

Ga., Columbus—J. Slaughter, Genl. Mgr. —saw and lumber mill machinery and equipment, including saws, planers, transmission and conveying machinery, etc.

Ill., Chicago—Fort Sheridan Printing Co., 1418 South Kolinan St.—12 x 18 in. or 10 x 15 in. Miller Gordon job press.

Ill., East Alton—Western Cartridge Co. —machinery and equipment for plant for the manufacture of cartridges, to replace that which was destroyed by explosion.

Ind., Bluffton—B. K. Settergren Co.— woodworking machinery and equipment for the manufacture of pianos.

Ind., Columbus—Evening Republican— duplex press for seven column newspaper.

Ind., Indianapolis—Mchy. Clearing House, 424 Bd. of Trade—lathes for turning wood.

Ind., Rushville—O. L. Carr, Perkins and 5th Sts. (lumber)—Tower edger and trimmer.

Ia., Clinton—Climax Eng. Co., foot of 4th St.—equipment for large addition to foundry.

Kan., Anthony — Anthony Planing Mill. E. A. Kennedy, Purch. Agt.—power wood lathe, metal lathe and mortiser.

Kan., Anthony — Republican Publishing Co., H. M. Sidney, Purch. Agt.—power job printing press and Miller feeder (used).

Kan., Barnard—G. F. Wilson—newspaper press and paper cutter (used preferred).

Kan., Cheney—Robinson Cabinet Shop, J. Robinson, Purch. Agt.—Universal woodworker and power belt sander (used).

Kan., Conway Springs — Conway Springs Star, R. H. Cline, Purch. Agt.—power paper cutter.

Kan., Conway Springs — J. Sedgwick (planing mill)—power belt sander (used preferred).

Kan., Fort Scott—L. Keplinger (building contractor)—mill working machinery, electric power.

Kan., Goddard—R. M. Oldfather—air compressor for oil station.

Kan., Harper — J. M. Frazee — power leather stitcher and finisher for shoe shop.

Kan., Harper—Harper Advocate, R. A. Reazin, Purch. Agt.—power metal saw and trimmer.

Kan., Harper—Living Message (job printer), T. Corey, Purch. Agt.—power newspaper folder and stereotype machine.

Kan., Kingman—Kingman Journal, R. S. Whitelow, Purch. Agt.—power metal cutter and trimmer.

Kan., Kingman—Leader-Courier, P. C. Palmer, Purch. Agt.—power job printing press.

Kan., Kingman—Wallace Garage, R. R. Wallace, Purch. Agt.—emery wheel with stand, burning in machine, belting, pulleys and hangers.

Kan., Ottawa—R. A. Harris—newspaper press, power paper cutter and linotype (used preferred).

Ky., Ashland—Ironton Stove & Mfg. Co. —foundry and enameling machinery and equipment.

Ky., Louisville—Office of United States Engineer, E. F. Kanzler, Purch. Agt.—2,000 ¾ in. round steel rods, 22 ft. 4 in. long; 7,800 washers and drift bolts, ¾ x 20 in. Estimated cost $5,000.

Ky., Sturgis—Bell Coal & Navigation Co. —loading and conveying machinery for coal mines.

La., Monroe—Brown Paper Mills, Inc.— machinery and equipment for $2,000,000 pulp and paper mill.

La., Roseland—Roseland Veneer & Mfg. Co.—sawmill machinery and equipment.

Md., Baltimore — Baltimore News & American, Fayette and Calvert Sts.—forty linotype machines, conveyor equipment, etc., for proposed $750,000 newspaper plant.

Md., Frostburg—C. J. Rowe—electrical coal mining, hoisting and screening machinery.

Mass., Boston—Boston Elevated Ry. Co., 108 Massachusetts Ave., E. Dana, Genl. Mgr.—receiving bids until July 20 for furnishing, delivering and erecting complete coal handling system in power house of shops at Everett.

Mass., Boston — W. H. Field Co., 39 Washington St.—woodworking machinery.

Mass., Boston—Magee Furnace Co., 38 Union St., address manager—foundry machinery and equipment, including furnaces, forges, blowing and ventilating equipment, for new plant at Taunton.

Mass., Boston—Merrimac Clay Products Co., 53 State St., H. Raeder, Mgr.—conveying, drying and miscellaneous equipment for new plant at Plaistow, N. H.

Mass., Cambridge — House of Byer, 26 Lansdowne St.—equipment for the manufacture of hosiery and knitted goods.

Mass., Dorchester (Boston P. O.)—Hallett & Davis Piano Co., 180 Hallett St., address manager—conveying machinery for new dry kiln, also woodworking machinery.

Mass., Gardner—Gardner Muslin Underwear Co., Parker St.—equipment for proposed $40,000 factory.

Mass., Lowell—Ingham Worsted Co., E. Hoyle, Mgr.—additional woolen mill machinery.

Mass., North Andover (Lawrence P. O.) —School Com.—machinery, including lathe, planer, saws, tables, benches and small tools for manual training department of new high school.

Mass., Wellesley (Boston P. O.)—N. B. Knease Brooks—machinery and equipment for yarn mill at Tunkhannock, Pa.

Mass., Worcester—Amer. Steel & Wire Co., Grove St.—machinery, including overhead crane, for proposed annealing plant.

Mass., Worcester—Worcester Spinning Co., Beacon St., E. Eisner, Mgr.—machinery for woolen mill.

Minn., International Falls — Backus-Brooks Co.—paper machines, presses, etc., for proposed paper mill at Kenora, Ont.

Miss., Strengthford (Waynesboro P. O.) —J. O'Keefe, Genl. Mgr.—lumber mill machinery and equipment.

Mo., Joplin—Rochschild Iron & Metal Co., 7th and Missouri Sts.—scales, 12 ton or larger.

Mo., St. Louis — Hannibal-Brown Shoe Co., 12th and Washington Sts.—equipment for proposed $150,000 factory.

N. J., Jersey City—Hudson County Knitting Mills, Wayne St., A. Siew, Purch. Agt. —machinery for mill.

N. J., Paterson—H. M. Bornstein, 21 Mill St.—50 tub silk looms.

N. Y., Binghamton—Truefield Shoe Co., Inc., Gaines and Front Sts.—shoe manufacturing machinery and equipment.

N. Y., Bowmansville — Bowmansville Creamery Co.—equipment for the manufacture of ice cream.

N. Y., Brownville—L. M. Kilborn (woodworking)—one light bandsaw with frame and table (new or used).

N. Y., Buffalo—Cuff Packing & Provision Co., 967 William St.—equipment for proposed sausage factory.

N. Y., Buffalo—Danahy Packing Co., 22 Metcalfe St.—equipment for proposed addition to meat packing plant.

N. Y., Buffalo—Home Family Laundry, 280 Guilford St.—equipment for proposed small addition to laundry.

N. Y., Buffalo—Huntington & Fink, Virgil Ave. along tracks of Erie R.R.—planing mill equipment, to replace that which was destroyed by fire.

N. Y., Buffalo—F. Jekel, 41 Granger Pl. —equipment for proposed small furniture factory at North Tonawanda.

N. Y., Buffalo—H. W. Wolcott, 1461 Main St.—equipment for charging and repairing electric storage batteries for proposed addition to plant.

N. Y., Carthage—Carthage Sulphite Pulp & Paper Co.—machinery and equipment for proposed $200,000 factory, to replace that which was recently destroyed by fire.

N. Y., Carthage—W. G. Hamilton Co., 259 State St. (manufacturer of novelties)— 2 in. capacity, power operated hack saw.

N. Y., Colonie (Watervliet P. O.)—Embossing Co.—machinery and equipment for 1 story addition to plant for the manufacture of mechanical toys.

N. Y., Dexter—Dexter Sulphite Pulp & Paper Co., C. Campbell, Purch. Agt.—one electrically operated bench jointer.

N. Y., Gouverneur — Dawley Bakery, Inc., G. Dawley, Purch. Agt.—power operated dough mixer.

N. Y., Jamestown—Jamestown Malleable Products Co., Tiffany Ave.—hoisting machines for proposed $50,000 foundry.

N. Y., Jamestown—C. A. Nelson, Route 75—one large stage and size air compressor with electric motor; pumps and machinery for gasoline distributing station.

N. Y., Jamestown — Premier Cabinet Corp., 61 Water St.—additional woodworking machinery and equipment.

N. Y., Massena—W. L. Pratt Lumber Co. (lumber and planing mill)—3 saw edger.

N. Y., New York—Railway Steel Spring Co., 30 Church St.—two 15 ton cranes, 80 ft. 6 in. span for Latrobe, Pa.

N. Y., North Tonawanda — F. Jaeckle, Fredericka St. — woodworking machinery and equipment, including transmission and conveying machinery, lathe, planers, stickers, molders, tenoner, saws, etc.

N. Y., North Tonawanda—Lenox Furniture Co., Miller St.—equipment for furniture factory.

N. Y., North Tonawanda — Van Raalte Silk Mills, Inc.—seventeen silk weaving looms.

N. Y., Oneida—Chapman Guild, Inc.— Banner hosiery machines, 108 needles, 3½ cylinders (used).

N. Y., Rochester—Addison Lithographing Co., Griffith St.—eight Hoe Stone presses and other lithographing machinery for proposed $85,500 plant.

N. Y., Rochester—Don-O-Lac Co., 770 Exchange St.—machinery and equipment for proposed $50,000 paint and varnish plant, to replace that which was destroyed by fire.

N. Y., Rochester—Rochester Industries, Inc., St. Paul St., M. H. Anderson, Mgr.— machinery and equipment for the manufacture of portable typewriters.

N. Y., Savannah—F. D. Wells—guy or stiff leg derrick, also 3 drum hoist with swinger to handle 1.5 yd. clam shell bucket.

N. Y., Schenectady—Bd. Educ.—vocational machinery, tools and equipment for new $200,000 school.

N. Y., Watertown—Northern Oil & Fuel Corp., Coffeen St., G. W. Lane, Purch. Agt. —two electrically operated gas pumps, air compressor and tank for proposed service station at Cape Vincent.

N. C., Elizabeth City—Standard Mfg. Co. —additional knitting mill machinery.

N. C., High Point—High Point Enterprise—24 to 32 page power newspaper press, also dry matrix stereotype equipment.

N. C., Marshville—Union Lumber Co.— lumber mill machinery, including transmission and conveying machinery, planers, saws, etc.

N. C., Reidsville—Cartex Underwear Co. (cotton mill), W. Pannill, Mgr.—machinery for new bleaching and dyeing plant.

N. C., Shelby—T. J. Babington—foundry equipment, including molds, hoists, etc.

O., Barberton—Vutex Rubber Co.—rubber working and tire building machinery.

O., Columbus — Gas Products Co., 100 North Skidmore St., S. D. Winger, Genl. Mgr.—one oxygen compressor.

O., Columbus—E. J. and W. E. Jones, 420 West Spring St. (millworking)—two moulding machines.

O., Columbus—Porter Co., 829 South Ohio Ave. (manufacturer of moth bags), D. Bull, Purch. Agt.—one special pressing machine for bags, also one eyelet machine.

Okla., Atoka—Atoka Press—10 x 15 in. power job press and paper cutter.

Pa., Apollo—Bd. Educ.—vocational equipment for $100,000 school.

Pa., Centralia—Lewis Bros. Shirt Co.— cutting, transmission and conveying machinery, etc., for proposed $50,000 factory.

Pa., Erie—Fox Textile Co., 510 East 10th St.—textile machinery for new shop.

Pa., Middletown—Wincroft Stove Wks.— hoists, trip hammers and foundry equipment for new stove works at Florin.

Pa., Rankin (Braddock P. O.)—Acheson Mfg. Co., F. C. Robertshaw, Genl. Mgr.— rolling mill and wire drawing equipment.

Pa., Susquehanna—Susquehanna Tri Bore Throwing Co.—$40,000 worth of silk mill and throwing plant machinery and equipment.

S. C., Newberry—Oakland Cotton Co.— additional cotton mill machinery.

Tenn., Chattanooga—Milne Chair Co.— No. 214 Mattison cabriole lathe.

Tex., Corsicana—Humble Oil Co.—electrically operated pumping machinery and equipment.

Tex., Luling—United North & South Oil Co.—machinery and equipment, including transmission and conveying machinery, for proposed $100,000 refinery.

Tex., McAllen—S. W. McClure—complete newspaper equipment.

Tex., Megargel—Business Men's Club— cotton gin.

Va., City Point—Wilson Hock Co. (machinery dealers)—high speed planer and band resaw.

Va., Marion—Amalgamated Mining & Development Co., A. T. Short, Pres.—electric mining machinery and equipment, including cutting, grinding, screening and transconveying machinery.

Va., Richmond—Acme Printing Co., 19 East Main St.—10 x 15 in. job press, Chandler & Price preferred.

Va., Richmond—H. I. Bernard, 703 West Main St. (automobile repairs)—welding outfit.

Va., Richmond—Trade Engraving & Printing Co., P. O. Box 1354—power stitcher and medium size job press.

Va., Roanoke — Cement Products Mfg. Co.—complete machinery and equipment for the manufacture of tile products at Wasena.

W. Va., Bluefield—Premier Red Ash Coal Co.—electrical coal tipple machinery and equipment.

W. Va., Clarksburg — The Exponent (newspaper)—Washington press.

Wis., Appleton—E. A. Kottke, 450 Walnut St. (structural steel fabricator)—5 ton electric crane.

Wis., Colby — Clark-Marathon County Cheese Co., c/o A. Brehm—refrigeration machinery.

Wis., Eau Claire—Dells Pulp & Paper Co., Dell's Dam—pulp grinders for proposed $500,000 addition to mill.

Wis., Hortonville — J. W. Haughton — newspaper press and power paper cutter.

Wis., Madison—Newell Bros. Co., 2306 University Ave. (general contractor), A. Newell, Mgr.—36 in. sander with 3 drums, motor driven; 12 in. turning lathe (new or used).

Wis., Manitowoc — Manitowoc Products Co., c/o O. H. Senglaub—churns, ice cream making and refrigeration machinery, etc., for proposed $50,000 dairy.

Wis., Milwaukee—Buckley Wet Wash Laundry, 531 31st St.—power washer, mangles, dryers, belting, shafting and hangers.

Wis., Milwaukee—J. Eckert, 701 56th St. (carpentry and millwork)—30 to 32 in. bandsaw (used preferred).

Wis., Milwaukee—M. R. Hunter, 16th St. and Viaduct—gas driven belt conveyor, 25 to 30 ft. long.

Wis., Milwaukee—H. R. Mayer, 1279 36th St. (carpentry and millwork)—one 3 in. sticker, motor driven.

Wis., Milwaukee—Patek Bros., 232 East Water St. (manufacturer of paint), G. Patek, Purch. Agt.—monorail crane.

Wis., Milwaukee—Sinclair Refining Co., 425 East Water St.—15,000 gal. oil storage tank and pumps for proposed $40,000 service and filling station.

Wis., Neenah—H. and W. Niles, c/o Neenah Boat Wks.—wood and metal working machinery, etc., for proposed $50,000 addition to boat factory.

Wis., Racine—Lockwood Oil Co., 1,421 Racine St.—oil storage tanks and pumps for proposed $40,000 filling station.

Wis., Weyauwega — School Bd., F. H. Russell, Pres.—manual training machinery and equipment for proposed $150,000 high and grade school.

N. S., Middleton—A. W. Allen & Sons—sawmill and woodworking machinery and equipment, including lathe, planer, sticker, etc.

Ont., Bolton—Walshaw & Son Woolen Mills—machinery and equipment for plant, to replace that which was destroyed by fire.

Ont., Fort William—Great Lakes Pulp & Paper Co., Ltd.—machinery for the manufacture of pulp and paper for plant on Kaministiquia River.

Ont., Gorrie—R. Hueston—equipment for flour mills, to replace that which was destroyed by fire.

Ont., Guelph — Guelph Stove Wks. — foundry equipment for addition to works.

Ont., Iroquois—H. H. Caldwell—equipment for proposed $40,000 linen mill.

Ont., Merritton—Garden City Paper Co., L. H. Gardiner, Pres.—paper making machines, rolls, etc., for proposed $400,000 paper mill.

Ont., Ottawa—Dept. of Marine, Hunter Bldg.—equipment for proposed $200,000 grain elevator at Halifax, N. S.

Ont., Paisley — Carlaw & Lindsey — equipment for flour mills, to replace that which was destroyed by fire.

Ont., Sarnia—Imperial Oil Co., C. Stillman, Mgr.—oil tanks and pumping equipment, to replace that which was destroyed by fire and explosion. Estimated loss $60,000.

Ont., Tamworth—A. B. Carscallen & Co. (feed mill and electric light plant)—one "Atrician" grinder, shafts, etc.

Que., Hull—Mica Co. of Canada, Ltd., Lois St., E. G. Rykert, Purch. Agt.—special machinery and equipment for the manufacture of mica insulating units for plant at Massena, N. Y.

Que., Iberville Junction—Brodies, Ltd. (granite works)—quarrying and other equipment.

Que., Montreal—City Advertising Service Regd., Albee Bldg., Mayor St., H. Birtnell, Mgr.—15 x 18 in. printing press, Chandler & Price preferred; paper cutter, type, cases and other printing equipment.

Que., Montreal — French's Complet Ore Reduction Co. of Canada, c/o E. Leboeuf, 28 St. Clement St.—mining, quarrying, dredging and refining machinery.

Que., Montreal—Natl. Rubber Co., Ltd., 207 St. Catherine St., W.—cloth cutting machine, also Eastman or Bollard long knife cutting machine.

Que., Outremont—Eastern Canada Collieries, Ltd., c/o F. G. Bush, 856 Maplewood Ave.—complete equipment.

Que., St. Nazaire—E. Giguere—equipment for blacksmith shop.

Que., St. Ours—P. Allaire—additional equipment for sawmill, including dragsaw.

Que., Thetford Mines—B. Charest, Notre Dame St.—automobile tire and vulcanizing equipment.

Que., Westmount—Duntile Co., Ltd., c/o H. E. Walker, 59 Trafalgar Ave.—equipment for the manufacture of tiles, bricks, drain and sewer pipes, etc.

Metal Working Shops

Calif., Los Angeles — I. Beveridge, c/o Milwaukee Bldg. Co., Wright & Callendar Bldg., awarded the contract for the construction of a 1 and 2 story garage on Sunset Blvd. near Wilcox Ave. Cost will exceed $40,000.

Calif., Los Angeles—The Southern Pacific Co., Southern Pacific Bldg., is having plans prepared for the construction of a 1 story, 34 x 498 ft. locomotive erecting shop and twenty four engine pits, served by a 250 ton and two 15 ton traveling cranes. Estimated cost $600,000, including equipment. Private plans.

Calif., Oakland—The J. W. Murray Mfg. Co., 5-140 Genl. Motors Bldg., Detroit, Mich., plans to build a factory for the manufacture of automobile parts, here. Estimated cost $250,000.

Calif., Sacramento—The Ochsner Estate, Ochsner Bldg., is having plans prepared for the construction of a 1 story, 40 x 160 ft. garage on K and 14th Sts. Estimated cost $40,000. E. C. Hemmings, Ochsner Bldg., Archt. Reo Motor Car Co., 1309 K St., Sacramento, lessee.

Calif., San Francisco—J. D. Phelan, c/o A. G. Scholz, Archt., Phelan Bldg., is having plans prepared for the construction of a 1 story, 222 x 312 ft. garage on 17th and Valencia Sts. Estimated cost $200,000.

Calif., San Francisco—The Williams Bros. Aircraft Corp., 1211 Van Ness Ave., is receiving bids for the construction of a 1 and 2 story factory on 25th St. between Potrero Ave. and Utah St. Estimated cost $40,000. R. R. Irvine, 736 Call Bldg., San Francisco, Archt. Noted July 12.

Conn., East Hartford—The P. B. Herlth Mfg. Co., 22 Union St., Hartford, manufacturer of machinery and tools, plans to build a 2 story, 50 x 70 ft. factory on Folland St., here. Estimated cost $50,000. Engineer or architect not selected.

Conn., Hartford—S. S. Nelson, 20 Magnolia St., is having plans prepared for the construction of a 1 story garage, etc., on Church St. Estimated cost $65,000. F. C. Walz, Trumbull St., Hartford, Archt.

Conn., Hartford—The Parker Shirt Co., Walnut St., New Britain, awarded the contract for the construction of a 2 story, 40 x 80 ft. garage and storage building on Walnut St., here. Estimated cost $40,000.

D. C., Wash.—M. M. Crawford, 230 Bates St. N. W., awarded the contract for the construction of a garage. Estimated cost $50,000.

Ill., Chicago — M. Binz, c/o Harders Fireproof Storage & Van Co., Calumet and 40th Sts., is receiving bids for the construction of a 1 story, 130 x 175 ft. garage. Estimated cost $40,000. L. E. Russell, 25 North Dearborn St., Archt.

Ill., Chicago — The Rienzi Garage, 554 Diversey Parkway, representing owner, awarded the contract for the construction of a 2 story, 150 x 250 ft. garage on Lehman St. near Dale St. Estimated cost $250,000.

Ill., Chicago—P. C. Winn, c/o J. Burns, Archt., 64 West Randolph St., is receiving bids for the construction of a 2 story addition to garage on Sheridan and Morse Sts. Estimated cost $150,000.

Ill., Harvey — The S. W. Hamilton Co., 152nd St., manufacturer of hardware specialties, is receiving bids for the construction of a 1 story, 90 x 170 ft. addition to its factory. Estimated cost $60,000. H. Raeder, 20 West Jackson St., Chicago, Archt.

Ind., Laporte—The Bastian Morley Co. plans to build a 2 story addition to its plant for the manufacture of boilers. Estimated cost $42,500.

Mass., Fall River—The Center Garage Co., 101 2nd St., awarded the contract for the construction of a 2 story, 100 x 200 ft. garage on 4th and 5th Sts. Estimated cost $100,000.

Mo., Carthage — The Liggett & Platt Spring Bed & Mfg. Co. plans to build a 2 story factory for the manufacture of spring beds. Estimated cost $50,000. Engineer or architect not announced.

Mo., St. Louis—The Police Dept. is having plans prepared for the construction of a 2 story garage, armorer's department, repair and carpenter shop on Laclede St. Estimated cost $75,000. Private plans.

N. Y., Brooklyn—J. Cervansky, c/o T. Goldstone, Engr. and Archt., 50 Graham Ave., will build a 1 story garage on Stockholm St. Estimated cost $55,000.

N. Y., Brooklyn—C. Katz, c/o T. Goldstone, Engr. and Archt., 50 Graham Ave., will build a 1 story, 120 x 200 ft. garage on Grand St. Estimated cost $50,000.

N. Y., Jamestown—The Jamestown Malleable Products Co., Tiffany Ave., awarded the contract for the construction of a 1 story, 50 x 200 ft. foundry. Estimated cost $50,000.

N. Y., New York — The Wilfred Realty Corp., c/o C. Kreymborg, Engr. and Archt., 2534 Marion Ave., will build a 1 story, 100 x 140 ft. garage on Kingsbridge Rd. Estimated cost $60,000.

N. Y., Syracuse—S. K. Bresee awarded the contract for the construction of a garage, machine and repair shop at 406 West Willow St. Estimated cost $25,000.

N. Y., Watertown—W. S. Stafford, c/o W. D. Ogsbury, Agt., Flower Bldg., plans to build a machine shop, repair and service station at 512 West Main St. Estimated cost $10,000.

Pa., Millvale (Pittsburgh P. O.)—A. Gerzowski, Searcy Rd., awarded the contract for the construction of a 2 story, 41 x 100 ft. garage on Grant Ave. Estimated cost $40,000.

Ont., Toronto—The Mahaffy Iron Wks., 4 Trafalgar Ave., plans to build a factory on Kendall Ave. Estimated cost $50,000.

Watch The Latest Opportunities

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In The Searchlight Section Of This Paper

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Standardizing Parts for Fixture Track Systems

By W. F. SANDMANN

The problem of standardizing track fixtures—Usefulness in progressive multiple drilling, boring, tapping and reaming —The predominating type of fixture —Methods of indexing

IN THEIR efforts to avoid the use of special machinery manufacturing executives are adopting, where possible, the fixture track system. The system enables them to secure high production with the use of only standard machine tools. The first cost of special machinery is not only high, but if a slight change is made in the design of the part manufactured it may necessitate the reconstruction of the whole machine or even cause it to be discarded entirely. With the fixture track system a change in the design of the manufactured product can scarcely cause any more expense than the construction of new indexing boxes or cradles for the fixtures.

The problem of standardizing the track fixtures and also making them partly interchangeable has caused much close study to be given the subject. Of course there is no such thing as standardizing the cradle or indexing box, for each of them must necessarily be designed for the individual part it is to hold. But such parts as end trunnions and indexing devices can be so constructed that they can be used in connection with any cradle or box.

A number of prominent plants are using track systems that are very similar in general design and which can, with slight alterations, be made to accommodate a large variety of work. As the track system is at its height of usefulness in progressive multiple drilling, boring, tapping and reaming operations the most careful attention has been given it in plants having quantity production of parts requiring these operations.

Advantages of Track Systems

The flexibility of the system can be readily seen, for production can be increased by merely adding more fixtures to the lineup of machines and it can be decreased by removing fixtures. The maximum number of fixtures that can be used is one for each machine tool in the lineup and one extra for loading and unloading purposes. When a lineup of machines is using its full complement of fixtures the rate of production of the part being machined is governed by the slowest operation in the line, one fixture being ready to unload its completed part every time the machines in the lineup have completed one operation.

The predominating type of fixture is that shown in Fig. 1. The dotted portions at *N* represent the cradle or indexing box which is specially designed to hold the part that is to be machined while in the fixture. The indexing of the cradle for the various operations that are to be performed is by means of the pilot wheel *B*. If the cradle *N* is accurately designed as to balance, no trouble will be experienced in turning it to the various positions. The two end trunnions *A* form the bearings for indexing the cradle, which is held in the trunnions by the bearing caps *O*. The index pin *D* locates the cradle in the various positions in which it is turned by entering the bushings *U* and is operated by the lever *C* which is fulcrumed at *E*. The index pin at *M* is used when extreme rigidity is required at any indexing point and enters a set of bushings similar to those at *U*. The tie rods *L* hold the two end trunnions together and are secured by nuts at each end. These tie rods are shouldered where they enter the trunnions so that the trunnions are spaced correctly.

Construction of Track Fixtures

When the cradle of the fixture is to be replaced by another one of different design it is only necessary to remove the caps *O* and lift the cradle from its bearings. If the new cradle is of different length, new tie rods *L* will be required.

The fixture is moved along the track *P* on four wheels. The two wheels on the one side of the fixture are of the V-type as shown in section at *G*, and the two on the other side are flat as shown at *H*. The V-wheels guide the fixture, and the flat wheels serve to keep their side at the correct level and at the same time make it possible for the gage of the track *P* to vary without affecting the movement of the fixture or cause its derailment. All wheels are generally equipped with a good grade of roller bearings for considerable thrust must be absorbed while the various operations are being performed.

The brushes *J* at each wheel are for the purpose of

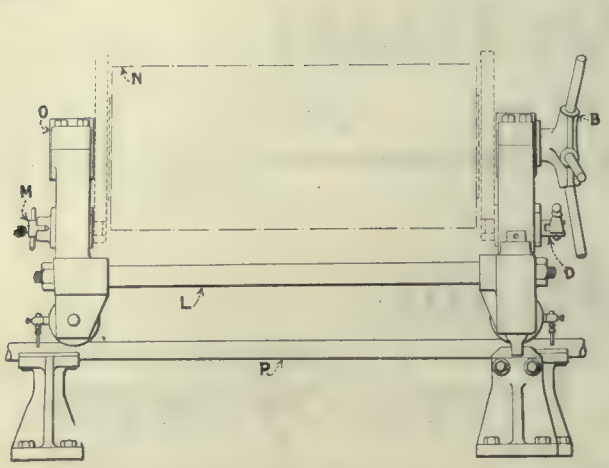


FIG 1

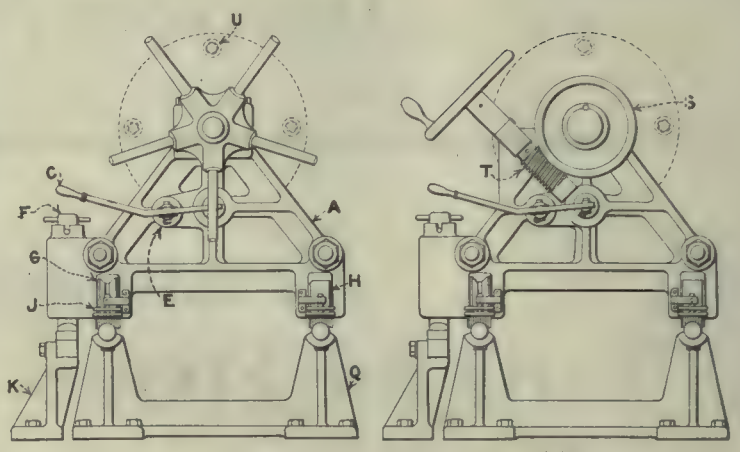


FIG.2

FIG. 1—TRUNNION JIG WITH PILOT HUB INDEX. FIG. 2—END VIEW OF TRUNNION JIG WITH WORM INDEX

keeping the track clear of shavings and dirt so that the fixture will move smoothly and be level. *F* is the locating pin which locates in the block *K* to line the fixture up in the proper position under each machine where an operation is to be performed. The cross-ties *Q* are placed at suitable intervals to support the track and elevate it over the bases of the various machines.

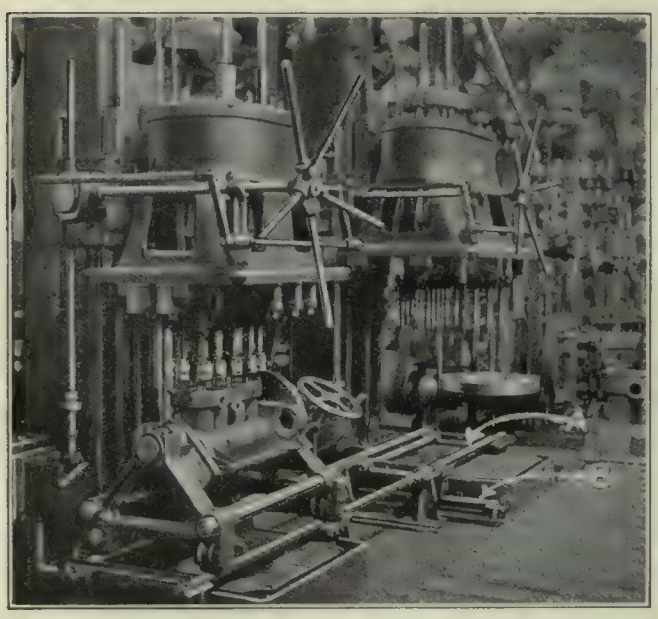


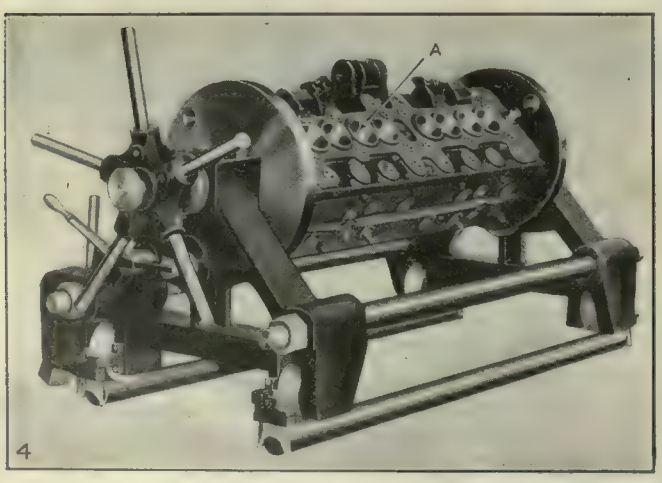
FIG. 3—SHORT TRACK SYSTEM UNDER TWO MULTIPLE DRILLING MACHINES

Fig. 2 shows another end for the same type of fixture as illustrated in Fig. 1, the only difference being that the indexing is done by means of a worm *T* and wormwheel *S*, preferably double lead so as to secure quick indexing. The construction is used when the cradle for some reason is designed out of balance or when the cradle and work are too heavy and unwieldy to be safely turned by the plain pilot wheel.

An Example of Short Track System

In Fig. 3 is illustrated a short track system that extends under the heads of two multiple drilling machines. The fixture in use is such as previously described with the worm and wormwheel for indexing purposes. This track system is used for tapping a cylinder block. The top or stud holes are tapped by the first machine and then the fixture is moved to the second machine, indexed 180 deg. and the holes in the pan flange and for the screws for the bearing caps tapped. The last operation is divided into two parts. The section of the track shown at *A* is a rolling section that moves on the sub-track *B*. By the arrangement the pan flange holes are tapped under the rear of the head of the machine, and then the fixture and rolling section are moved forward and the bearing cap holes tapped. The cradle is then indexed back to its original position and the cylinder block unclamped and removed.

A fixture with an indexing box for a valve-in-head



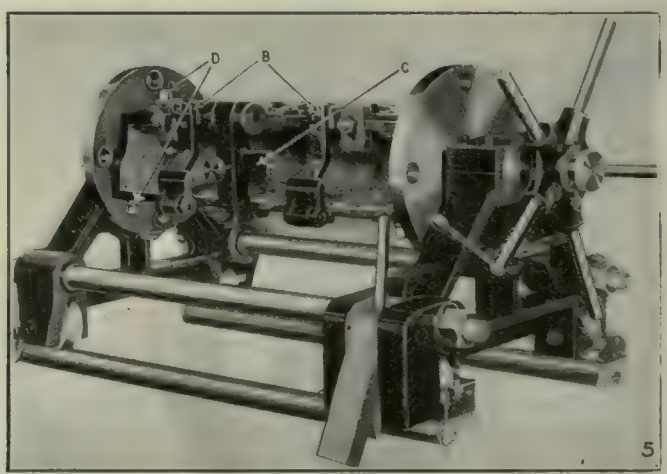


FIG. 4—FIXTURE FOR A VALVE-IN-HEAD TYPE OF CYLINDER HEAD. FIG. 5—LOADING SIDE OF FIXTURE FOR CYLINDER HEAD

type of cylinder head is shown in Fig. 4. The end trunnions and indexing device are the same as shown in Fig. 1. A cylinder head of this type contains an extraordinarily large number of holes to be drilled, reamed and counterbored and a great many of the drill and reamer bushings can be seen. The large bushings at *A* are to guide the pilots of the tools that face the valve seats in the head.

Another view of the same fixture illustrated in Fig. 5 shows the side from which the cylinder head is loaded into the box. It will be noted that five clamps are used to hold the head in place and support the sides of the box, the two at *B* each containing two drill bushings for holes that are to be drilled at an angle. The clamp *C* contains the equalizer that locates the cylinder head lengthwise. The track locater on the fixture is a little different than the one shown in Fig. 1 being simply a bar that falls in a slot that is located in a casting fastened to the floor beside the track at the correct point. The pins *D* are locaters for plates that carry additional drill bushings and which are suspended from the heads of the multiple drilling machines.

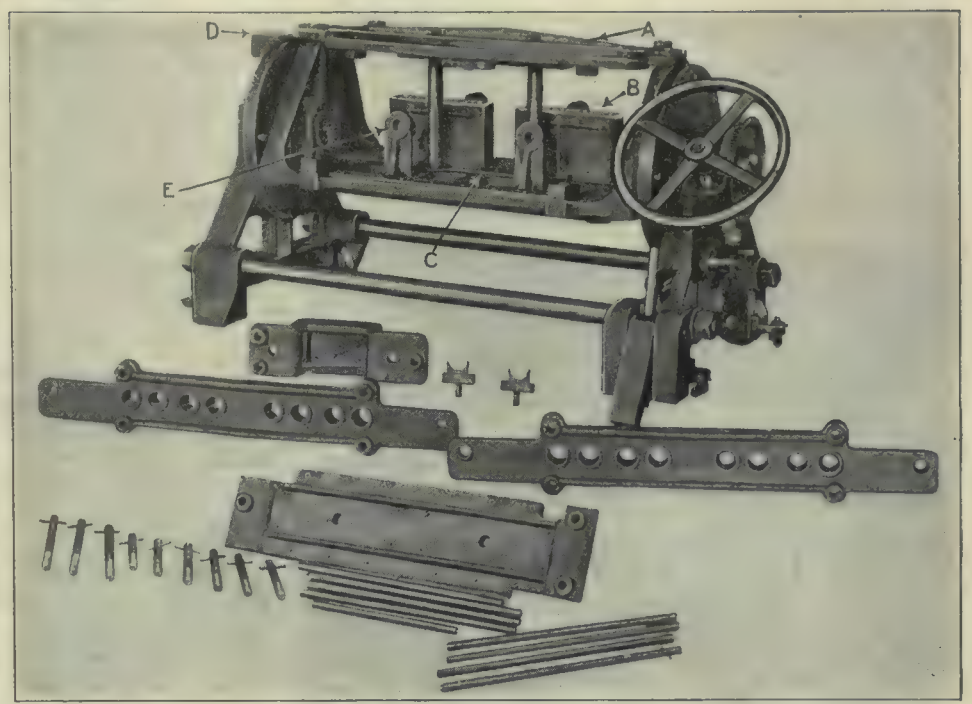


FIG. 6—FIXTURE EQUIPPED WITH THE WORM TYPE OF INDEXING DEVICE

A fixture that is equipped with the worm type of indexing device is shown in Fig. 6. The cradle of the fixture is designed to hold a very heavy crankcase. In this particular crankcase it is necessary to line ream the valve lifter guide holes, and in order to maintain the desired accuracy the line reamers must be piloted at both top and bottom. The plate *A* is suspended from the head of the straightline driller that does the line reaming and the reamers are guided by bushings in the plate, come on through the work and are piloted at the bottom in revolving pilot bushings *B*. The bushings revolve on ball thrust bearings that run in oil. The oil is supplied through the piping *C* from the tank at the end of the case at *D*.

The lugs containing bushings at *E* are for receiving plates containing drill bushings that are suspended from the heads of the multiple drilling machines. The plates are equipped with dowels that locate the plates by entering the bushings *E*. Below the fixture are

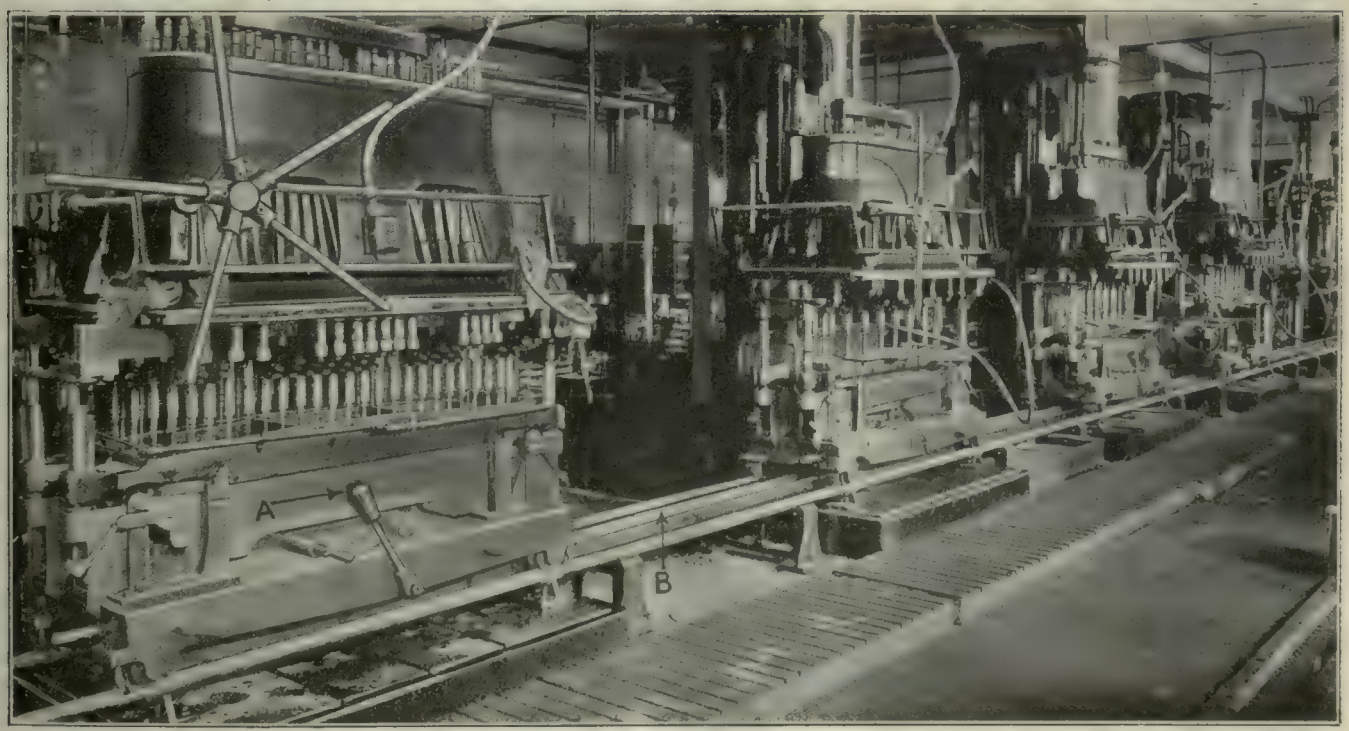


FIG. 7—LINE-UP OF MACHINES USING A FIXTURE TRACK SYSTEM

shown several of the plates that are suspended from the heads of the machines. The rods shown beside them are the supports for the plates.

An idea of the way machines are lined up for a fixture track system is illustrated in Fig. 7, which also shows plates carrying the drill and reamer bushings suspended from the heads of the machines and locating

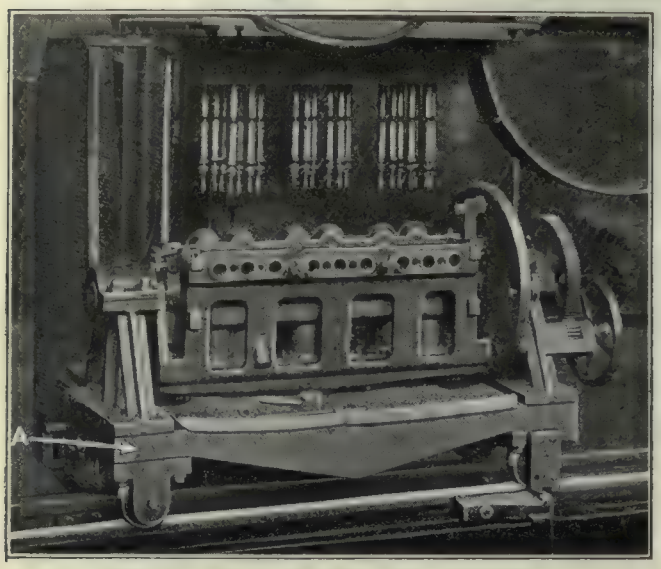


FIG. 8—SOLID BASE TRACK FIXTURE

in turn over pins in the various fixtures. This particular fixture track system contains several more machines than those shown in the photograph. Instead of the operators pushing the fixtures from one machine to another, as is usually the case, they merely throw over the lever *A* and a hook catches in a continuous moving chain that lays in the channel *B* and which pulls the fixture to the next machine and then trips the hook loose again. When the fixtures reach the end of the line they are unloaded and shunted around on a track behind the machines to the other end of the system where they are reloaded and ready to start another trip down the line.

Solid-Base Track Fixtures

A type of fixture which is still in use in many factories but which is rapidly becoming obsolete is shown in Fig. 8. This is what is known as the solid base track fixture. The portion *A* is a ribbed casting. As the length of the casting is constant the cradles cannot be changed like they can in a fixture of the tie rod construction. Also, the fixture is very hard to move because of the heavy base casting, and the spur gear indexing device is difficult to operate if the cradle is much out of balance. The worm and worm wheel are to be preferred because then it is impossible for a cradle to swing back on its own volition as it can easily do with the spur gear indexing.

There is still much room for improvement in the design of track fixtures but the present trend seems to be in the right direction. The things to be sought are lightness with strength and interchangeability and the present type of tie rod construction combines both of the requisites with the added recommendation that the fixture is comparatively inexpensive.

Don't Run to Hobbies in the Shop

By John R. Godfrey

Old man Johnson had another good object lesson for his son Tom the other day. One of his competitors, the Black Motor Co., has been getting into difficulties because it could not compete with the lowered prices on account of shop costs being too high, and most of the old management has been transferred, or fired, "for the good of the service." Just what is to be gained by the change remains to be seen, for it sometimes happens that the cure is worse than the disease.

"Tom, my boy," he was saying just as I dropped in, "it's simply another case of being one-sided, of letting your mind run along in one groove instead of considering all sides. Ed. Hughes was a mighty fine fellow and a great manager, when it came to handling men. He got more out of his men during the war than any manager I know of, and at a fair wage. I'll guarantee that no other man could have handled that shop as well as he did under the war conditions. He knows human nature from the ground up and every man in the plant loved him like a brother.

Only One Phase of Work Considered

"But he was so interested in the human relations side that he plumb overlooked the machine end of the shop, and he wasn't strong on modern methods of production. Some of his jigs and fixtures came over in the ark and his machinery was far from modern. If his men hadn't been strong for him, and worked their level best, he'd have fallen by the wayside long ago. Of course the time came when some one tipped off the higher-ups that the machinery was out of date and then the bankers sent an efficiency engineer to look the place over, and you know the answer. Ed. Hughes is transferred to another job and his men aren't any too happy over it. The new man will have a heck of a time because he doesn't know human nature as well as Ed did, and altogether, things don't look any too bright for the Black Company.

Management Mus Not Be One-Sided

"If Ed. Hughes had only paid half as much attention to new machinery and new methods as he did to the handling of men, none of us could have touched him on production costs. For the best machinery in the world depends on the real co-operation of the men who run it if you want to get the very utmost out of it. And Ed's men did that very thing. I'll gamble that none of us could have equalled his production with his out-of-date equipment. You see, Tom, his mistake was in thinking that personnel was the whole thing. I believe its the biggest thing, but there are a lot of other things to look after too.

"Don't get one-sided, Tom. Don't let any notion, no matter how good it is, get such a hold on you that it blots out all the rest of the works. That's where the trouble comes with a lot of us. The ideal way is to have a first class man for each of the different phases of the job while you sit back and try to get a real perspective on the whole thing. Then you can balance one up against the other and see that they all have proper attention. If you can do that, you'll make the Johnson Motor Co. so much bigger and better than I've done, that I'll be getting peeved about it."

The Elements of Production Grinding

By ELLSWORTH SHELDON
New England Editor, *American Machinist*

The second article — Manufacture of wheels — Modified abrasives — Vitrified, silicate and elastic wheels — Grains and grades—Various combinations of grains

THERE IS comparatively little difference in actual hardness between the two kinds of artificial abrasives. Silicon carbide is slightly harder than aluminous oxide but it is also somewhat more brittle, the difference in this respect making it more adaptable to the grinding of certain classes of work and less so to others. Aluminous oxide is susceptible to certain modifications sometimes called temper, which do not change its actual hardness but appear rather as a difference in the structure of the crystal.

The hardness of a wheel is, therefore, not a matter of the abrasive but of the bond. Even in this respect it is not "hardness" as we apply the term to other materials, but is rather a combination of density and tenacity; a property of resistance to the tearing out or breaking away of the particles of which the wheel is composed. It is determined not only by the nature of the bonding material but by the density of the mixture and to some extent by the size of the abrasive grains used in it.

TO BECOME proficient in the art of grinding, the operator should know of what his wheels are made, how they are made, and how the characteristics of each affect the work in hand. He must know their limitations as well as their possibilities. He should be able to determine the nature of the abrasive as well as the approximate grain and grade of a wheel upon which there are no identification marks. In order to do this a comprehensive knowledge of the fundamental principles of wheel making is essential.

There are three main methods or processes of making grinding wheels, designated in accordance with the nature of the material that cements the particles of abrasive together as vitrified, silicate and elastic wheels. Of the latter class there are two kinds, known as "shellac" and "rubber" wheels. Either abrasive is used with any bond.

The elastic is the oldest form of solid wheel. Various sticky substances have been used as bonding materials but shellac and rubber are practically the only ones surviving. With either material it is practical to make very thin wheels that could not be run with safety if made by any other process. Rubber bonded wheels are very strong, and will retain their size and contour under conditions that would soon break down any other kind of wheel.

Shellac wheels are made by putting a measured quantity of abrasive and shellac in a steam heated mixing machine where they are thoroughly mixed at a temperature that causes the shellac to flow. Each grain of abrasive thus becomes coated with shellac, and when the material is ready it is rolled out into sheets of a thickness corresponding to that of the desired wheel, from which the wheels are cut with a die. Shellac wheels are also made in metal molds into which the material is forced under a hydraulic or other form of press. The wheels are then packed in sand and baked in a gas-fired oven at a temperature not exceeding 300 degrees.

Rubber wheels are made by taking a sheet of pure rubber, to which sulphur has been added as a vulcanizing agent, spreading the abrasive upon it, folding the sheet upon itself and passing it through a pair of rolls. More abrasive is then added, the sheet again folded and rolled. This process is continued until the desired quantity of abrasive has been thoroughly kneaded into the rubber, when the wheels are cut out of the sheet with a suitable die and vulcanized under heat and pressure.

Elastic wheels cannot be classed as "production" wheels. The amount of material that can be removed by them in a given time is small and they cannot be forced, as the heat generated by friction would soon destroy them. Their principal field is in forming intricate shapes on tool steel parts, such as forming tools. Though they are not rapid producers they hold their place by reason of being able to do what no other kind of wheel will accomplish.

The bonding material of a silicate wheel is silicate of soda, commonly called water-glass, to which oxide of zinc is added as a waterproofing agent. The abrasive grains are thoroughly mixed with the silicate and the mass is then tamped into metal molds and baked in a gas or coal fired oven for a period of time ranging from two to four days, depending upon the size of the wheel.

The silicate wheel has some advantages over its vitrified contemporary, one being that special wheels can be made to order in a much shorter time than is required to "burn" the vitrified wheel. Another advantage is that they can be molded in or on iron backs or centers designed to go into certain kinds of machines. As the maximum baking temperature does not exceed 500 deg. F., the iron is not affected by it, whereas the high temperatures of the vitrifying kiln would melt it away.

The silicate wheel seems to be more free cutting

than a vitrified wheel of the same grade. Though it is not actually softer it will *appear* to be softer in action, and this fact must be taken into consideration when changing from vitrified to silicate wheels and vice versa. A disadvantage of the silicate wheel is that it is susceptible to damage from causes that will not affect the vitrified wheel. It will absorb moisture to some extent and, though it may be run indefinitely under a flood of water or grinding compound, it should not be allowed to stand in water or even in damp places, otherwise it may become hopelessly out of balance.

Approximately 80 per cent of the wheels used in production grinding are made by the vitrified process, which, as its name implies, consists of fusing pottery clays with the abrasive grains. Feldspar and various kinds of fusible and refractor clays are used, each

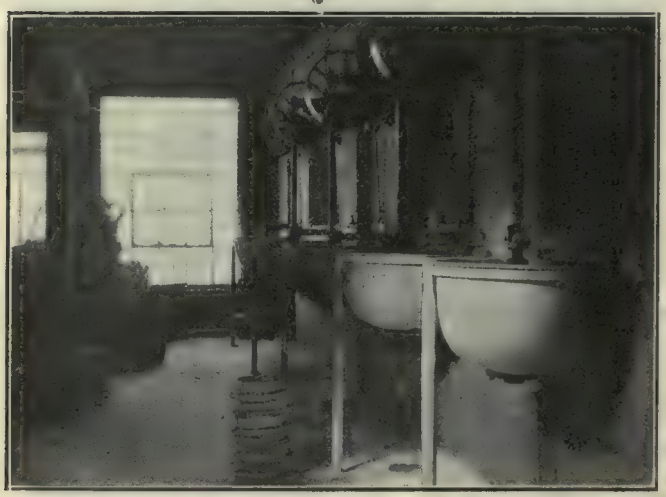


FIG. 10—MIXING BOWLS IN WHICH THE ABRASIVE AND BOND ARE MIXED

maker of wheels having his own formula of materials and proportions. Endless combinations are possible but the processes are in the main alike.

In Fig. 10 may be seen a row of mixing kettles in which the bond and abrasive are thoroughly mixed with water. When the proper consistency is reached, the mixture is drawn off at the bottom into a mold which consists of only a circular tile slab with a hoop of sheet metal laid upon it to confine the mass to a roughly circular form.

In this shape the wheels resemble nothing so much as a row of "mud pies." They are taken immediately to a steam-heated drying room, where they are placed upon racks to remain until the water has dried out sufficiently to allow them to be handled. When this stage is reached, the hoops are removed and the wheels taken to the shaving machine, Fig. 11, where they are dressed off on both sides and the periphery turned, leaving sufficient stock to permit them to be again faced and turned after burning.



FIG. 11—MACHINE FOR SHAVING THE WHEELS

As the wheel at this stage is of the consistency of dried mud, the turning and dressing are accomplished without difficulty. The machine is a "potter's wheel," over which is mounted a tool slide capable of movement in both horizontal and vertical planes. The roughly circular slab of mud is held upon the revolving table by its own weight and requires no fastening.

Large vitrified wheels are made without center holes for the reason that they are thus less liable to crack in firing. After they come from the kiln the center is cut out to the desired size by means of a core-drill, or trepanning tool, made from a piece of tubing.

Burning the Wheels

Though a great deal of care is needed—and exercised—in the preparation of the wheels up to the time of firing, it is in the kilns that the critical point in the process is reached. A kiln like the one shown in Fig. 12 may contain several thousand dollars worth of wheels that a few moments of carelessness or inattention on the part of the operator could easily reduce to scrap value—which is practically nothing.

Each wheel is laid on a circular tile and surrounded



FIG. 12—A KILN IN PROCESS OF FIRING

by the segments shown in Fig. 13, so that though a stack of wheels may be as high as the kiln will admit, no weight comes upon any individual wheel. When a kiln is filled the doors are sealed and the fires started in the furnaces.

The time required to fire a kiln depends to some extent upon the size of the wheels, and it is desirable to have the entire charge as nearly as possible of one size. The average time of firing is approximately 120 hr. After the fires are started they are allowed to burn very slowly for several hours until the water has been thoroughly dried out of the wheels, for if the firing was hurried at this point the steam generated within them would cause them to disintegrate. Another critical time is when the chemically combined water is expelled, at about 1,000 deg. Fahrenheit.

In the preliminary stages of the firing the temperature is observed by means of electric pyrometers and it is kept slowly rising until the final temperature is reached, when the kiln is sealed up tightly with fire clay and remains in this condition until it has cooled sufficiently to allow the workmen to enter; a matter of several days.

Though the temperature of a kiln is always under observation through the medium of the electric pyrometers, the final temperature is determined by means of Seger pyrometric cones, several sets of which are placed in the kiln at points where peep holes are provided through which to observe them.

The cones are made of fusible clays, the mixture of each being so calculated as to melt at a definite temperature. As the process of firing nears completion



FIG. 13—TILES BY WHICH WHEELS ARE PROTECTED IN FIRING

and the heat, which has been kept rising slowly and steadily, reaches the melting temperature of the first cone, the latter collapses.

From this point onward extreme care is demanded, as there is a range of but 30 deg. between the melting temperature of the successive cones and the heat of the kiln must be so controlled that four of them in each set, located at widely separated points in the kiln, will melt and leave the fifth one upright. The sets of cones shown in Fig. 14 indicate a satisfactory run.

Wheels used upon cylindrical and surface grinding machines for the purpose of producing work to accurate dimensions are made up of grains ranging in size from No. 24 to No. 120. Coarser grains are used to make wheels for free-hand grinding, snagging castings, etc., and finer grains may be called for in specific cases, but rarely will the operator of a production grinding machine find it necessary to select wheels with grains outside the above range of sizes.

The grain size of a wheel is designated by a number and this number will always mean the same thing regardless of the name given to the abrasive or the maker of the wheel. Not all wheels, however, consist entirely of one size of grain. All wheel manufacturers make "combination" wheels, containing definite quantities of different sized grains. Thus a wheel designated as No. 24, will be made up entirely of grains of this size while a designation such as No. 24-40, or 24-46-100 indicates that these sizes are mixed together in proportions known to the maker.

Another designation which will puzzle the beginner

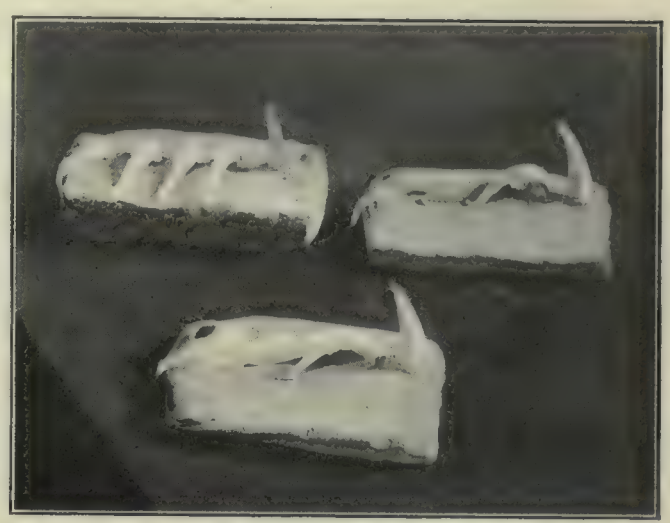


FIG. 14—PYROMETRIC CONES AFTER FIRING

is that indicating the presence of a modified abrasive. This condition is also indicated (in most cases) by a number prefixed to that indicating the grain size. The grain sizes within the range we are considering are: 24, 30, 36, 40, 46, 60, 80, 90, 100 and 120. Modified abrasives are indicated by various makers as 13, 17, 22, 38, 77, 99, etc., used as prefixes. It will be noted that in each case the prefixes are numbers that cannot possibly represent grain sizes.

Thus a number 36 wheel would be one that contained only No. 36 size of the regular abrasive while 1,736, 3,836, 7,736, etc., would indicate that the wheel, though of the same grain size, was made of the modified abrasive. Other makers would designate such wheels as AA36, W36, Special 36 and so forth.

Though some wheel makers designate a combination grain wheel by the numbers indicating the actual grain size, others indicate the combination only by a number that refers to a formula in their possession. Thus a No. 401 or 403 wheel is a combination wheel in which the predominating size of grain is 40 and the mixture in accordance with the maker's formula No. 1 or No. 3 as the case may be.

Designation of Hardness

The relative hardness, or "grade," of a wheel is usually (though not always) indicated by a letter, but in this matter, as in the numerical designation of combination wheels and wheels of modified abrasives, there is deplorable lack of uniformity. While the grade scale of one maker may run along the alphabet from A to Z as the wheels increase in hardness, that of another may run in the reverse direction and the letter A indicate the hardest possible wheel. Some wheel makers grade by numbers only, and others by a combined letter and figure. Elastic wheels are usually graded by number.

This is a condition that helps to becloud the art of grinding in a fog of mystery, and efforts should be made by wheel makers and users to establish a standard system of grading by which a given letter and figure would indicate with certainty just what might be expected of a given wheel, regardless of who made it. Thus relieve the harassed operator of grinding machines of the necessity for memorizing a mass of unrelated symbols or of compelling him to search frantically for a reference table every time he desires to change a wheel on his machine.

World Trade in Metal Working Machinery—Exports

Prepared by Industrial Machinery Division, Bureau of Foreign and Domestic Commerce

United States, 1922

Supplement to table published on pages 730-731, Vol. 57.

Countries	$
Germany	77,120
England	1,767,177
France	1,034,532
Canada	1,640,905
Russia in Europe	930
Belgium	163,105
Austria-Hungary	.....
Italy	82,157
Australia & Tasmania	415,830
Brazil	240,666
Sweden	31,039
Netherlands	52,562
Argentina	158,556
Japan	1,480,777
Mexico	449,469
Scotland	136,321
Cuba	238,199
Spain	229,745
Norway	23,973
Denmark	23,593
New Zealand	70,360
Chile	206,324
British India	2,404,884
Panama	10,820
Br. South Africa	62,186
Philippine Islands	57,771
Peru	74,664
Finland	3,515
Switzerland	8,996
Dutch E. Indies	14,471
Straits Settlements	12,532
China	319,237
Uruguay	6,622
Portuguese Africa	2,973
Japanese Leased Ter. (China)	14,712
Venezuela	72,089
Colombia	77,676
Turkey in Europe	1,764
Ecuador	9,688
Newfoundland & Labrador	4,091
German Africa	.....
Ireland	243,056
Portugal	2,201
Chosen	1,737
Costa Rica	6,211
Turkey in Africa & Egypt	.....
Santo Domingo	8,789
Other Br. E. Indies	21,13
Hongkong	22,951
Br. W. Indies—Barbados, Jamaica, Trinidad, Tobago and Other Br.	27,464
Bolivia	16,102
Turkey in Asia	.....
Salvador	4,070
Russia in Asia	.....
British Guina	329
Roumania	5,688
Guatemala	10,310
British West Africa	191
British Honduras	703
Greece	755
Nicaragua	3,280
Siam	5,649
Haiti	2,941
French Oceania	607
Honduras	24,284
French Guiana	.....
German Leased Ter. (China)	.....
Bermuda	1,044
Dutch Guiana	9,526
Bulgaria	2,762
Persia	968
French Africa	.....
Other British Oceania	.....
Canary Islands	200
French Leased Ter. (China)	.....
German Oceania	.....
Danish West Indies	.....
French West Indies	222
Dutch West Indies	7,788
Azores & Madeira Islands	.....
Gibraltar	.....
Iceland & Faroe Islands	.....
Malta, Gozo, etc	.....
Paraguay	1,559
Aden	147
Belgian Kongo	656
British East Africa	2,927
Egypt	3,984
Liberia	15
Madagascar	.....
Morocco	2,830
Spanish Africa	12,854
Fr. East. Indies	.....
Miquelon, Langley	.....
Poland & Dantzig	54,962
French Indo-China	2,378
Czecho-Slovakia	8,770
Hungary	20
Yugo-slavia, Albania, etc	.....
Hedjas & Arabia	250
Palestine & Syria	3,813
Armenia & Kurdistan	63
Greece in Asia	2,717
British Oceania	57
Algeria & Tunis	9,839
Latvia	2,881
Far Eastern Republic	487
Virgin Islands of U. S.	145
Other Oceania	259
Ceylon	4,624
ANNUAL TOTALS	$12,209,138

United Kingdom, 1921

Supplement to table published on page 804, Vol. 57.

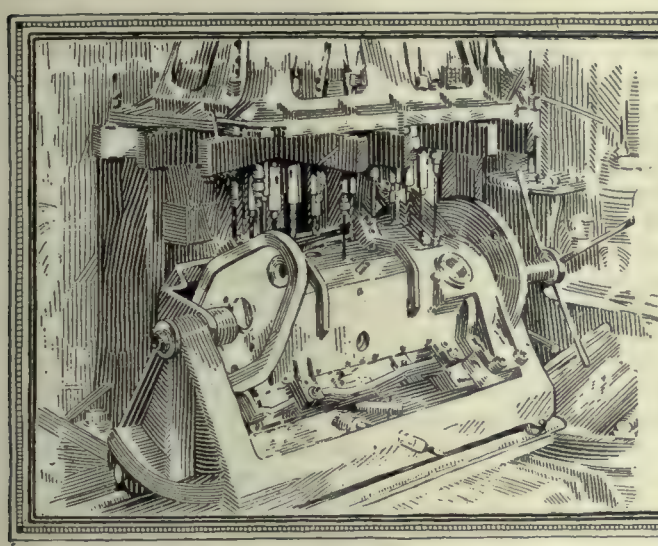
Countries	£
Austria-Hungary	.....
Argentine Republic	66,157
Belgium	185,412
Brazil	24,518
Chile	35,524
China (Exclusive of leased territory)	97,252
Denmark	380
France	215,446
Germany	70
Greece	3,470
Italy	15,863
Japan, Inc. Formosa	301,676
Netherlands	10,110
Norway	.....
Portugal	56,066
Russia	136
Siam	14,945
Spain	60,417
Turkey	235
United States of America	5,759
Other Foreign Countries	234,546
Total Foreign Countries	1,327,982
Australia	355,883
British East Indies (British India only since 1920)	780,566
British West Indies	3,716
Canada	1,341
Ceylon	2,994
Egypt	8,945
Federated Malay States	4,070
Hongkong	62,109
New Zealand	29,900
Straits Settlements	34,657
Union of South Africa	141,052
Other British Possessions	134,000
Total British Possessions	£1,559,433
TOTAL	£2,887,415

Value of £ at parity is $4.8665

Denmark, 1921

Supplement to table published on page 924, Vol. 57.

Country	Quantity 100 kg.
Germany	.....
Great Britain	453
Norway	154
Sweden	144
Finland	61
Russia	164
Netherlands	77
Belgium	492
France	284
Italy	.....
Austria-Hungary	.....
Switzerland	.....
Bulgaria	.....
Portugal	49
Spain	70
Hamburg	.....
Iceland & Faroe Islands	.....
Morocco	.....
Algiers & Tunis	49
British So. Africa	149
China	218
Siam	160
Dutch East Indies	583
British India	1,201
Straits Settlements	87
Australia	33
New Zeland	.....
United States	.....
British North America	.....
Argentina	901
Brazil	230
Other So. American	39
Other or Unknown Countries	118
Egypt	43
Japan	102
Roumania	39
TOTAL	5,900



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Design of inspection gages—Importance of indicating devices—Gages for testing relations between surfaces—Gaging of cross-hole location

WHEN a piece of work is being machined, the various operations may be tested and gaged separately; but after the work has been completed, it is often found advisable to make an inspection fixture in order to determine whether the part will function properly and whether the relation of one part to another is correct. There are several methods of testing finished work. One of these methods is by means of fixtures having indicators so arranged that they will show whether the work is machined correctly or not, and at the same time will indicate any variations from the exact sizes which may be found. Another type is in the nature of a receiver gage which the work must fit accurately in certain portions if it is to be considered fit to pass inspection.

The receiver type of inspection gage has many advantages, although it does not show how much variation there is in the work. It simply determines whether the piece has been machined within the required limits of accuracy, or not. If the work is correct it will enter the fixture readily, while if it is not correct it cannot be placed in position. In some classes of work it is possible to gage several portions of the work progressively as the work is placed on the fixture, by allowing certain portions to pass by given points. In other cases the piece must be tested as a unit, and all surfaces gaged at practically the same time. The decision as to which type of inspection fixture should be used for a given piece of work should be determined by the nature of the work, and by the requirements of the piece in the complete mechanism.

An example which illustrates a simple type of inspection fixture for a somewhat difficult piece of work is shown in Fig. 547. The various operations on the work *A* and some of the fixtures used for this part have been described in one of our articles on jigs and fixtures. Very great accuracy is required in the machining of this part, and the holes *C* and *G* and the teeth in the sector *B* must be cut in a certain relation to each other. The inspection fixture consists of a plate *E* in which the stud *H* is fixed in a bushing *K*, and has two diameters to correspond with the two holes in the hub of the work as shown.

The stud *F* has an inserted plug at *L* which is elongated as shown in the plan view in order to compensate for slight inaccuracies in the center distance between the two holes. This method of locating a stud has also been previously described. Attention is called to the construction of the plug *F* and the locating piece *L*, the latter being so made that it can be driven out and replaced when worn. The position of the sector tooth is determined by the block *D*, which is pointed to the shape of the space between the teeth so that it will

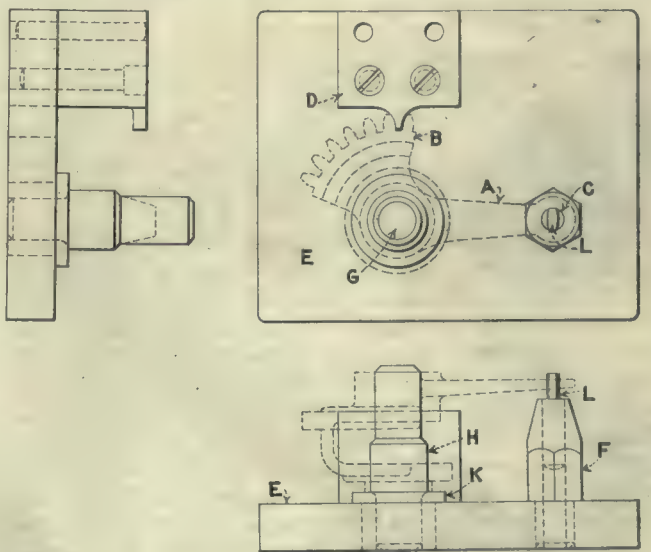


FIG. 547—TESTING FIXTURE FOR SECTOR LEVER

enter if the cutting has been properly done. Otherwise the work cannot be forced into position and it must be discarded. Gages of this general type are frequently used on small parts such as those which are utilized in adding machines, cash registers and other mechanisms of a similar kind.

When there are several machined surfaces which must bear a certain relation to each other, the method of testing used should be preferably so arranged that variations from the correct sizes can be readily determined. In other words, it should be possible to find out in which direction the variation takes place and

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approximately how much it is. The testing can be accomplished in several ways, *viz.*, by means of pointers working on a graduated scale, by using fixed indicators and set-blocks, and by using "feelers" of different thicknesses.

The example shown in Fig. 548 requires the use of "feelers" to determine the variations. The work *A* must be so machined that the surfaces *B*, *C* and *D* will bear a certain relation to each other. The work *A* lies flat on a table, or in some other position where there will be plenty of clearance so that the plug *E* can pass

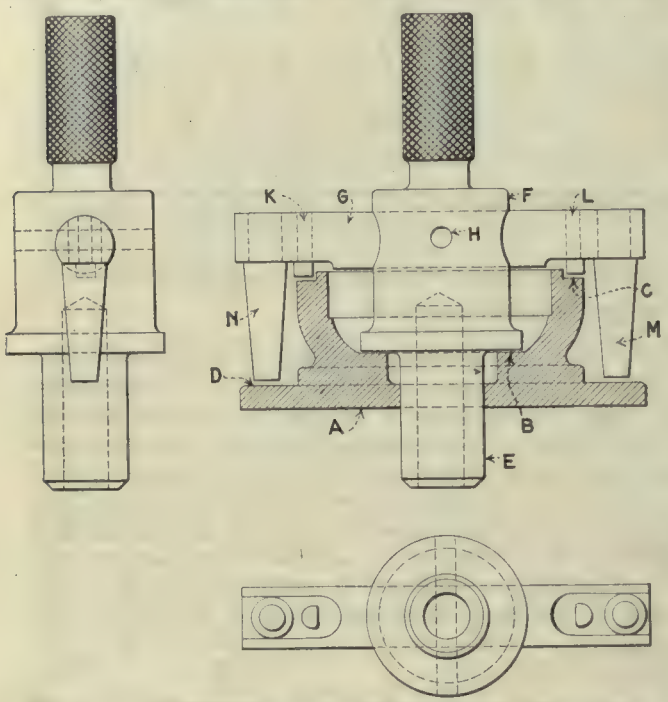


FIG. 548—INSPECTION GAGE FOR TESTING RELATION OF SEVERAL SURFACES

down without interference. This plug is made to fit the center hole, and it has a shouldered portion which strikes against the surface *B*, which may be called the registering surface.

The plug has a knurled handle, and the enlarged portion of the body *F* has a bar *G* passing through it and held in position by a pin at *H*. In this bar there are two pins, *K* and *L*, which are ground off on the ends so that they will allow a clearance of 0.010 in. between their ends and the surface *C*. There are two other plugs *M* and *N* which are inserted in the bar *G*. These plugs are ground off to provide a clearance of 0.020 in. between their ends and the surface *D*. In gaging the work "feelers" of the proper thicknesses are inserted between the ends of the various plugs and the surfaces mentioned, and by using different thicknesses of feelers the accuracy of the work can readily be determined.

There is very little to be said about the general construction of this gage, as it is simple and comparatively inexpensive. A surface plate with a hole in it for the center plug *E* can be used if it seems desirable, but it is unnecessary as the work can be set up on a couple of parallels or on a wooden block with a hole in it. There are occasional opportunities for using this type of gage, and the only objection to it is the fact that the workman may possibly make an error in using the proper size of feeler. The principles of the gage are excellent, and the same type can be adapted to many other kinds of work.

We have previously taken up the matter of gaging the relation of a cross hole to a given surface, but this problem is continually encountered in gaging work, so that a description of several methods which have been found successful will materially aid the designer of gages. In automobile work there are many cases when the position of a cross hole in relation to a surface is very important and if the hole is out of alignment it is likely to cause a great deal of trouble in the finished car. Any sort of a bearing in which a shaft or pin operates must be correctly aligned if proper operation is expected.

In Fig. 549 is shown an inspection gage designed for the cross holes in the casing *A*, which unit is composed of two parts that are bolted together before the test is made. The relation of the holes *C* with respect to the surfaces *B* and *D* is very important, and it can be seen that the inner surface *D* is not readily accessible. As a consequence, some method must be used which will permit gaging to determine the distance between the hole *C* and surface *D*. The method as applied in this case consists of the use of a plug *E*, which is passed through the cross holes and at the same time entered in the unit *F*, which is held in proper position while the plug is being used. After the unit *F* is placed in position, the socket wrench *G* is used to tighten the capscrew *H*, thus making a single unit of the plug *E* and collar *F*. The latter is provided with two gage points *K* and *L*, and a movement of the plug *E* backward and forward allows the operator to judge whether or not the surface *D* is in the proper relation to the hole *C*.

Accuracy in Gaging Cross Holes

The sense of touch is employed in this case, and the judgment of the inspector must be used in order to determine whether the work is within the required limits. It might be possible to make the two points *K* and *L* on the "go" and "no go" principle, so that a real limit gage would be produced. After gaging the surface *D*, a "go" and "no go" feeler gage *M* is used between the surface *B* and the plug *E*. The operation determines the relation of these two portions of the work. This example shows a somewhat extraordinary

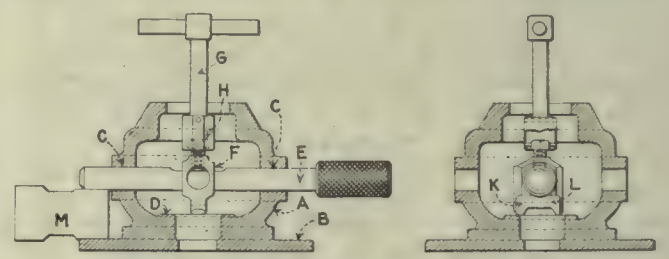


FIG. 549—INSPECTION GAGE FOR CROSS HOLES IN CASING

condition which, however, may be met with in certain lines of manufacturing.

The automobile piston is another shining example of a cross-hole gaging proposition. It is of the greatest importance that the wrist-pin hole should be perfectly square with the outside of the piston, in order that there will be no trouble due to a lack of alignment when the motor is assembled. Fig. 550 shows a piston *A* in which it is assumed that the end *B* is perfectly square with the outside of the piston. This assumption is reasonable, as the work is usually located for finishing the outside of the piston from the end surface *B*. With

this hypothesis it would appear safe to use this surface to rest the piston on while gaging the relation of the wrist-pin hole and determining whether it is in alignment or not.

In order that the principles of this gaging proposition may be clearly understood, let us refer to the diagram and note that a pin *C* has been forced through both wrist-pin holes and projects a considerable distance on each side of the piston. Then, if we should set the piston end *B* on the surface plate and pass a surface gage or indicator over the pin at the points *D* and *E*, any errors in alignment would at once become apparent. However, the inspector must place his hand on the piston and hold it down firmly on the plate when making the test. If he is a careful man there should be no great difficulty in determining the relation of the hole to the surface. In the hands of a careless inspector, however, there are chances for error with this method.

Gaging Wrist Pin Holes

In the other diagram the piston *F* rests on a plate *G*, and the pin *H* is forced through the wrist-pin hole in the same manner as previously shown. By using a

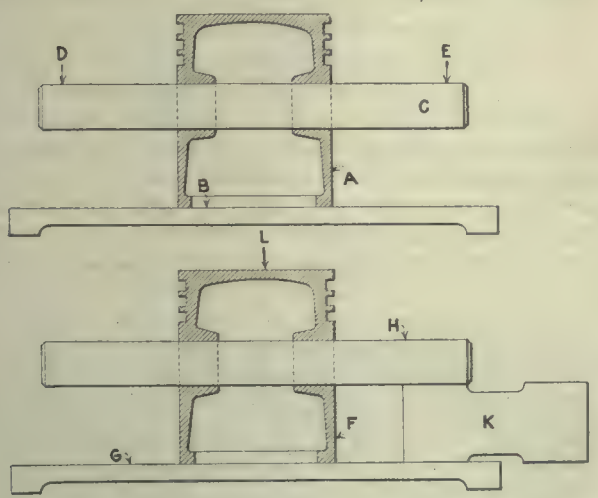


FIG. 550—PRINCIPLES OF GAGING WRIST-PIN HOLE ALIGNMENT

"go" and "no go" gage *K* the operator can tell by feeling whether the two ends of the pin *H* are the same distance from the plate *G*. There is considerable danger, however, in using this method, as the workman must keep pressure on the piston at *L* in order to hold it down on the surface plate. Unless his sense of touch is fairly well developed, he may lift the piston slightly and not obtain good results.

If a method like this is to be employed, it is much better to use instead of a limit gage a size block and feelers of different thicknesses. The longer the pin *H* is, the greater the accuracy which will be obtained. Some manufacturers gage the alignment of the wrist pin from the outside diameter of the piston by laying it in a V-block and using a dial indicator to test the relation of the pin to the outside surfaces. The writers believe, however, that the use of an indicator and the surface plate like that suggested in the diagram at *A*, is perfectly satisfactory in the majority of cases. If it is desired to make absolutely sure that there is no possibility of shift to the piston while inspecting it, a simple clamp can be used to hold the piston down on the plate.

What Should a Boy Study Outside of the Shop?

By A. W. Forbes

AT THE present time it seems as though practically everyone under 21 years of age was doing some kind of systematic study. At least it has been a long time since I have employed anyone who was not. But there seems to be no agreement as to what should be studied. The state of Massachusetts makes certain requirements for boys between 14 and 16 years of age, but there is considerable fault found with the selection by both educators and men in the industries. It would probably be impossible to lay out a schedule for a single boy that would meet with general approval, much less to lay out a rigid system to fit a whole state and convince everyone of its merits.

We shall probably agree that boys should spend some time studying the work they are doing. If they are working in a machine shop, they should read, at least occasionally, some paper like the *American Machinist*, as well as look up specific things in books. I do not see how the principal part of this study can be done in any way except by personal initiative. If at a later day they wish to review their knowledge by attending a course of lectures on the subject, such a course may be advisable, but it should not be confused with real study of the subject.

I should, therefore, recommend that school study be spent in the more general subjects, subjects that will prove of value in giving a better perspective in dealing with men or in considering public questions, rather than in their immediate application. The following list gives my recommendations for boys between the ages of 14 and 21 working in a machine shop. It is not suggested that anyone take the whole list, but only that part of it which fits with his inclinations. Those subjects in capitals are the ones that I consider of greatest value. Those marked with an asterisk are considered suitable for continuation schools for boys between the ages of 14 and 16. I hope that we may be favored with other lists from those who have looked at this subject from other points of view.

LITERATURE
- *ENGLISH
- *ANCIENT AND MEDIEVAL (In translation)
- Foreign in their respective languages

*ENGLISH COMPOSITION (Grammar and Rhetoric)

LANGUAGES
- LATIN
- Greek
- Spanish
- French
- German
- Native Language

HISTORY
- *ANCIENT
- MEDIEVAL
- ARCHAEOLOGY
- *American
- Modern European

ART
- MUSIC
- Architecture
- Painting

MATHEMATICS
- *ALGEBRA
- GEOMETRY
- Trigonometry
- Calculus

PHYSICAL SCIENCE
- CHEMISTRY
- GEOLOGY
- Astronomy
- *Physics

BIOLOGY
- *PRINCIPLES, GROWTH, INHERITANCE
- ETHNOLOGY
- *Physiology and Hygiene
- Botany
- Zo-ology

After preparing this list, I inquired of my employees as to what they were actually studying in the various kinds of schools, day, night, correspondence, etc., as well as under private instructors. The time was spent in the following proportions:

Mechanical Drawing	19	per cent
American History	12	"
Geometry	12	"
English Literature	10	"
Chemistry	10	"
Office Practice	10	"
Music	6	"
Algebra	4	"
Shop Mathematics	3	"
Typewriting	3	"
Penmanship	2½	"
Stenography	2½	"
Trigonometry	2	"
Arithmetic	1	"
English Grammar	1	"
Hygiene	1	"
Civics	1	"
Total	100	per cent

In comparing this list with mine, it is easy to see that I was not often consulted in the selection of studies. But 42 per cent of the time is spent in my preferred list, and another 42 per cent is on subjects which I did not consider of sufficient value to include. Mechanical drawing, which tops the list of what is actually studied is good without any question, but for boys in the machine shop it hardly seems of enough value to include. They are using drawings all the time, and will in this way pick up enough of the subject. Possibly if they worked in a machine shop where all the work was laid out so that drawings were unnecessary, it might be well to have mechanical drawing as a school study. Certainly we cannot find any fault with the subject. It is only a case of taking up the limited time that might be spent on more valuable studies.

A word about my reason for selecting each subject follows:

It is hardly necessary to give a reason for including English Literature, a speaking acquaintance with the best of the English language being so evidently important. But the subject is often spoiled in the schools by spending so much time over books or poems which are so far above the understanding of the pupils that it gives a dislike for good literature rather than an appreciation. I have not yet reached the point where I can appreciate Milton or Burke's "Speech on Conciliation."

Ancient and Medieval Literature is best taken with the respective histories. I do not see how anyone can appreciate Greek History without Homer. Aristophanes' works and a little (a very little) of Plato will also help. In the same way the "Song of Roland" is really essential to an understanding of medieval culture, and the Autobiography of Benvenuto Cellini to the Renaissance. All of these works are simple enough to be appreciated by the ordinary boy, and good enough for the library of the university professor.

English Composition and Rhetoric need no comment.

The reason for studying Languages is not so apparent, and sentiment is quite generally against the ancient languages. We must recognize that very few of the boys will ever make practical use of any of them. I should not recommend them to everyone, but am inclined to stress Latin as one of the sources of our language as well as of all other prominent languages. At the same time, I know those who have studied Greek, which I have not done, who claim this subject to be superior to Latin. Modern languages are recommended for those only who intend to use them, and the study of them had probably be better postponed until their application can be seen. Aside from recommending languages for American boys, sociologists generally consider it a mistake for a person to give up entirely the language and traditions of the country from which his ancestors have come.

It is assumed that every boy will have the foundations of American History before starting work. If he is a recent immigrant, American History should be placed before other history. But in general I would suggest that most of the time be spent in Ancient and Medieval History. Ancient History has the advantage of showing complete civilizations from their rise to their fall. Medieval shows the first thousand years of ours. American and Modern European History includes merely a few hundred years of the prime of a civilization, but so near to us that it is difficult to see the real situation. Modern History too often gives the impression that everything is progress. It takes Ancient History to prove that civilizations can make mistakes and destroy themselves, as every one so far has done.

Need for the Exact Sciences

Mathematics is a much disputed point, and I am not sure that I would recommend anything beyond Arithmetic for the average person. However, those who cannot appreciate mathematics at least to the extent of Algebra should not be in a machine shop. There are other kinds of work, and just as good jobs, where mathematical ability is of no value whatever. Everything in a machine shop is of a mathematical nature, even if it is not expressed in a mathematical language. Of course, Calculus should be reserved for those only who are specially inclined in that direction.

In Physical Science, Chemistry of the materials used is of general shop value, especially when it comes to talking over various heat-treating processes. The laws of Physics are more apparent, and the principles should be observed without a course by anyone inclined in that direction, although often a course is of value in consolidating observations. Geology and Astronomy are for purposes of general culture rather than for any direct application.

In deciding questions of public policy, Biology probably stands next to History in giving a solid basis on which to make decisions. It is interesting to see men in prominent positions in education and social work, making statements that are proved false by Biology; but not enough of the public are familiar with the proved facts to know that the speaker is merely displaying his ignorance. The two main facts of life, growth and inheritance, with the effects of environment on them, are naturally given first place. Ethnology, the study of the races and types of man, is also of evident value. The study of the various forms of plant and animal life, Botany and Zo-ology, is of recognized value though subordinate to the main principles.

In all these subjects the personal element is not to be neglected. I knew one bright boy who had studied fractions in school, but had failed to get the point that there were 100 hundredths of an inch in one inch. When it came up in connection with using a micrometer he seemed glad to get the information. It merely shows the impossibility of trying to force study beyond what the pupil is prepared to receive.

Development of Machine Tools in New England

BY GUY HUBBARD

The second article—Beginning of the iron industry—Bog ore carted eight miles to the furnace—Early high-pressure, double-acting steam engine

THE FIRST saw mill in New England was erected on the Salmon River near Portsmouth, N. H., about 1630, and here and there the old "up and down saws" are still in use in primitive mills. The writer discovered one very recently in operation by an aged sawyer in the mountains back of Windsor. See Figures 4, 5, 6 and 7. It is a fine example of the early millwright's craft, both the machinery and the building being without a doubt almost identical with the original Israel Curtis Mill of 1768.

After the Revolution, Windsor rapidly grew to a town of considerable size—one of the most important in the state. From a social and political standpoint it plodded on in the even tenor of its ways, while the saw mill and the grist mill grew to accommodate the increasing population, serving as a nucleus about which grew up other small shops, such as a blacksmith's shop,



FIG. 4—OLD SAWMILL NEAR WINDSOR

wheelwright's shop, a carding mill and possibly a cooper's shop—for Windsor in those unregenerate days was not only supporting an oil mill but also a distillery. These shops served the needs of the town and the hill farmers thereabout, but none of them fulfilled our modern conception of an industry, as no particular product was manufactured upon a quantity basis.

The first representative millwright of the Windsor district was Benjamin Tyler of Claremont, N. H. While Tyler styled himself a millwright, he was in fact a self-taught but highly competent mechanical engineer. In the year 1767, Tyler, then a young man probably just released from apprenticeship, came on foot from Farmington, Conn., to Claremont, which is a few miles below Windsor on the river. The following year he erected a sawmill, and shortly afterward a forge, bloomery and slitting mill, at a fall in Sugar River not far from where it empties into the Connecticut. Thus Benjamin Tyler not only became the mechanical engineer, but also the iron master of the locality, for his forge, bloomery and slitting mill were the Colonial equivalents of the modern smelter, foundry and rolling mill, in which the bog iron-ore from the neighboring town of Charlestown, N. H., was converted into pig and wrought iron.

Bog ore, which was the usual source of native iron

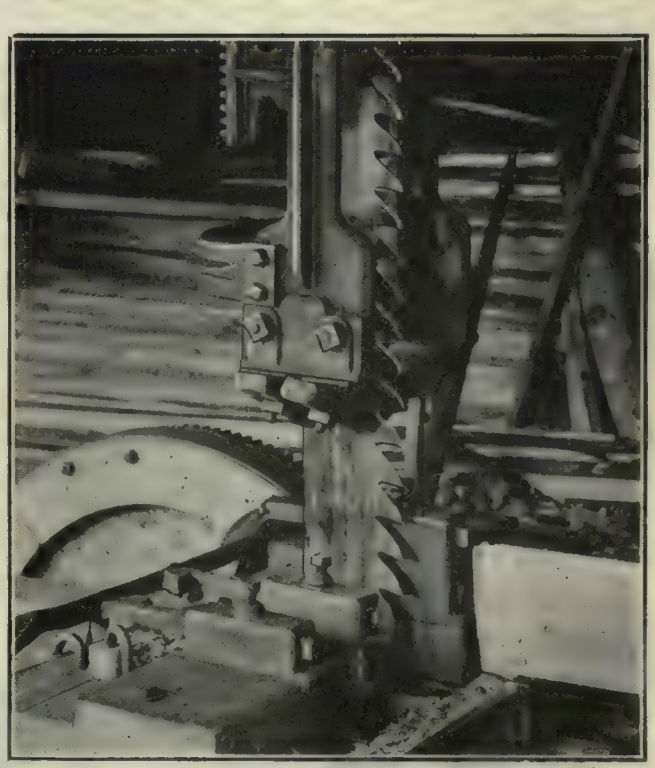


FIG. 5—OLD FASHIONED "UP AND DOWN" SAW

in the Colonies, is limonite, a hydrous-oxide of iron which collected as a sort of mud in swampy places and in the bottoms of ponds. It was anciently believed to be somehow generated by pine and cedar trees, for the reason that they usually grew near where it was found, but actually it was brought in by water. The bog ore of Charlestown was dug out much as is peat and was carried to higher ground where it was washed and dried. It was then carted about eight miles to Tyler's forge where it was smelted in a crude furnace, see Fig. 8, fired by charcoal and blown by a huge

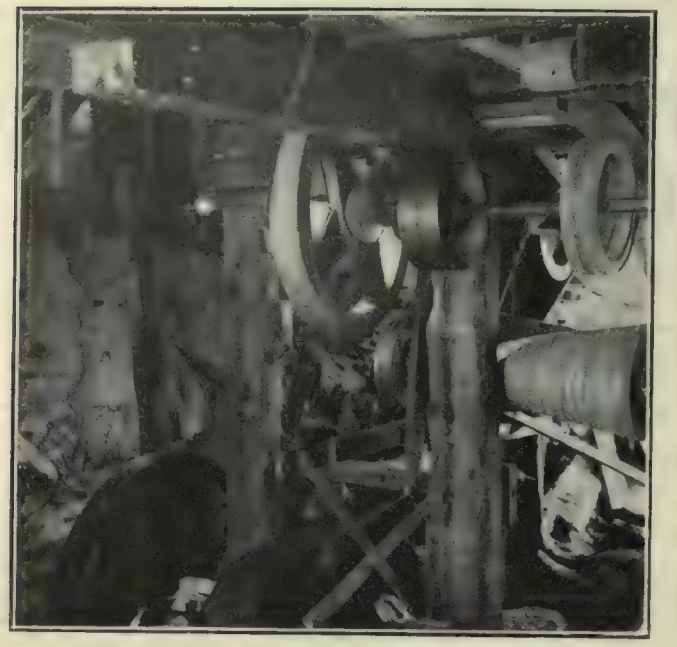


FIG. 6—DRIVING MECHANISM IN PIT BELOW "UP AND DOWN" SAW

bellows, into rather impure iron. It was run either into pigs for casting or into blooms for conversion into wrought iron. The blooms, which were specially shaped pigs, were transferred to the bloomery, see Fig. 9, while at white heat and were pounded under "tilt" or trip hammers—by which means the impurities were expelled and the iron converted into rods or plates of wrought iron. In the slitting mill, which was a primitive shear, the wrought-iron plates were cut into nail rods and distributed among the farmers who spent the long winter evenings in converting them into hand-made nails.

Between 1770 and the end of the century, Tyler did a thriving business building saw and grist mills and producing iron for the district thereabouts and even for far distant customers. He had his own quarries on the southeastern slope of Mount Ascutney, where he quarried and shaped his millstones from the biotite granite, so well adapted to the purpose. Numerous Tyler millstones, which because of their nature have outlived long ruined and forgotten mills, are to this day lying in the beds and along the banks of streams all over New England—lasting memorials of their maker. In addition to being the pioneer mechanical engineer and iron master, Benjamin Tyler was a brilliant inventor. He greatly improved the crude sawmills and gristmills of his time, invented a new type of waterwheel, and at the time of his death was at work on a threshing machine which he had brought to a point of practical usefulness. That the inventive strain of the Tylers did not die out with him is attested by the fact that his grandson Benjamin Tyler Henry was destined to be one of the most notable Windsor mechanics, and of whom much will be later on said in connection with the development of the Winchester repeating rifle.

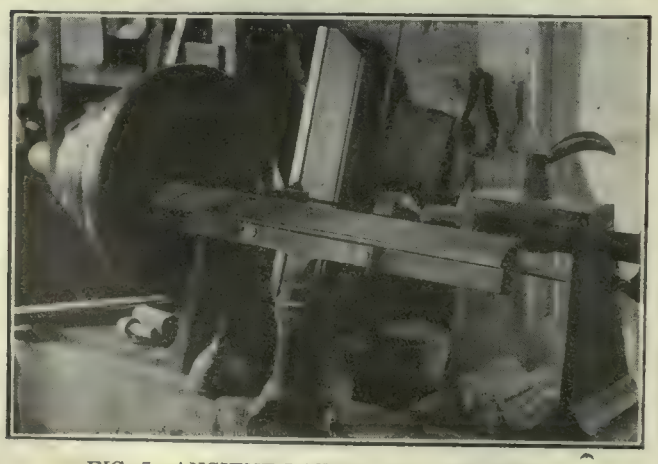


FIG. 7—ANCIENT LATHE IN OLD SAWMILL

Captain Samuel Morey of Oxford, N. H., and Fairlee, Vt., was the second famous engineer and inventor of the Windsor region, and the builder of the canal and locks at Bellows Falls, and at other points above. Samuel Morey, whose portrait is shown in Fig. 10, was born at Hebron, Conn., in 1762, and at the age of four made the journey to Oxford in an ox-cart over wilderness trails—his father, Colonel Israel Morey be-

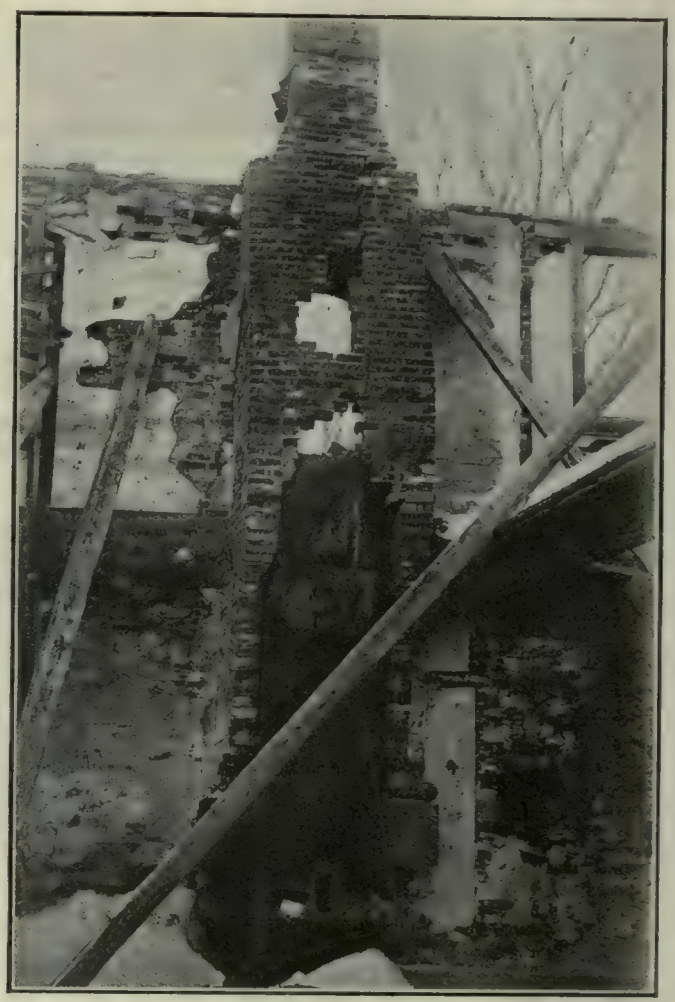


FIG. 8—REMAINS OF A PRIMITIVE FORGE IN THE WINDSOR REGION

ing the second settler of that up-river village. The Moreys owned great tracts of timberland on both sides of the river, and Samuel gained his early experience in civil engineering in building log slides and canals for lumbering purposes, traces of which are still to be seen near Oxford and Fairlee.

In 1780 Morey became interested in the subjects of heat and light as related to mechanics. One of his first inventions was what was locally called the "Steam Spit" for turning a roast of meat before the fire place. This apparatus was suggested by the ancient "Smoke



FIG. 9—AN OLD BLOOMERY



FIG. 10—CAPTAIN SAMUEL MOREY
(Drawn from an oil painting.)
Courtesy of Granite State Magazine

Jack," but Morey derived his power from the steam of the tea-kettle instead of from the draft in the chimney. About the same time he succeeded in generating illuminating gas from steam and tar, which apparatus he describes in articles published in the *Journal of Science and Arts*. These articles brought him into communication with Professor Silliman, of Yale University, and resulted in a lifelong friendship between Morey and that scientist.

The success of the "Steam Spit" led Morey to continue his investigations in the development of steam power, and he gradually developed a successful high-pressure double-acting steam engine of the revolving type. Aside from being one of the earliest high-pressure engines (contemporary with that of Oliver Evans) it was novel in its revolving principle, being much like the Gnome motors now used in airplanes. A working model of this engine, see Fig. 11, which was skillfully made by Morey himself about 1790, is preserved in perfect condition at the Museum of the Vermont Historical Society, and it was from this model that the author obtained his knowledge of the machine. See drawing Fig. 12.

The center of revolution of this model is a valve seat in the form of a disk $1\frac{1}{8}$ in. in diameter, which is mounted on a tube connected with the boiler. In this disk are two recesses, one connecting with the boiler, and the other with the air. The frame of the engine consists of a narrow casting $6\frac{1}{2}$ in. long, having at its center a valve disk corresponding to the valve seat. To one side of the disk projects the bed to which the cylinder is fastened, while to the opposite side projects the slide in which the crosshead works. The cylinder is of brass $1\frac{1}{16}$ in. in length by $1\frac{1}{2}$ in. in diameter. It has a $1\frac{3}{8}$-in. bore and is fitted with a cast-iron piston packed with tow. The stroke is $1\frac{5}{16}$ in. The valve disk has two holes upon opposite sides, so placed as to come

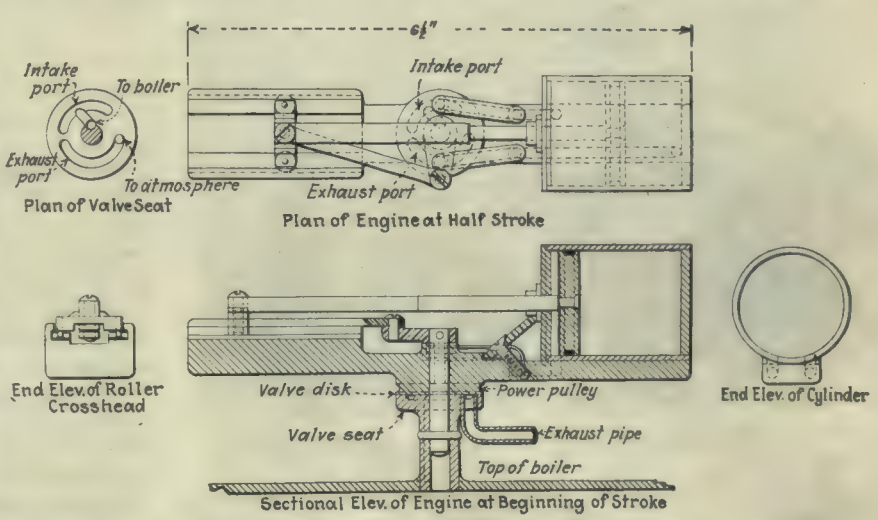


FIG. 12—DRAWING OF MOREY'S ENGINE, 1790
(From the model at the Vermont Historical Society.)

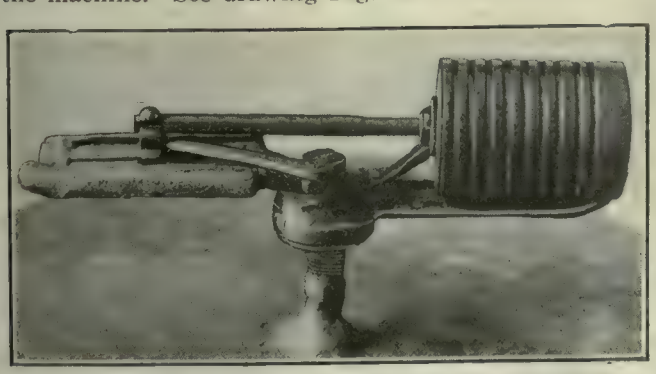


FIG. 11—MODEL OF REVOLVING STEAM-ENGINE MADE BY CAPTAIN SAMUEL MOREY IN 1790
Courtesy of Vermont Historical Society

over the openings in the valve seat during revolution, and these holes are connected by brass tubes to the ends of the cylinder.

The piston rod passes through a stuffing box and carries at its outer end a roller crosshead working in the slide opposite the cylinder, while the connecting rod projects back from the center of the crosshead beneath the piston rod. A crankshaft, serving also as a main shaft for the engine, is anchored vertically in the valve seat and projects through the valve disk, which serves as the main bearing of the engine. At the upper end of the shaft is fastened a crank, to which is attached the free end of the connecting rod.

The valve disk is so placed with relation to the valve seat that as the piston starts from the end of the

cylinder the hole connected with that end comes to the opening in the valve seat which connects with the boiler. This admits steam to that end of the cylinder during the first half of the stroke, it being allowed to expand during the last half. Meanwhile, during the full stroke, the hole connecting to the other end of the cylinder is passing over the opening in the valve seat which communicates with the air. As the steam is admitted the piston is forced down and the entire machine is turned by the reaction upon the fixed crank. When the piston reaches the end of its stroke the holes in the valve disk change places in regard to the openings in the valve seat and the action is reversed, the steam being taken at the opposite end of the cylinder and expelled from the other end into the air. The valve action being automatic, the engine spins upon its disk, getting two power impulses per revolution.

Saving a Cracked Five-Ton Casting

If a user should fail to solve a particularly difficult problem without exhausting every possible means offered by the oxyacetylene process when an emergency occurs which requires more than ordinary results he loses to a large degree one of the greatest assets of a welding and cutting outfit. The service derived from oxyacetylene equipment on work that is the same each day is commonplace. When the unforeseen breakdowns or mishaps occur and there is a vital need for accomplishing something



THE COMPLETED WELD BEFORE BEING GROUND

out of the ordinary it is in such contingencies that the process can be relied upon to repeatedly demonstrate its worth.

A user may go for a long period obtaining satisfactory results without outside assistance, but when "lightning strikes," when help is needed most, what can be accomplished by welding and cutting on an emergency job is sometimes worth many times the value of weeks of ordinary service. Such was the case recently in an Eastern foundry when a large gray iron jet condenser cone unfortunately cracked through its entire length and thickness because it was removed from the sand too soon.

The cone was part of an equipment order contracted for shipment on a certain date. There was no time to make another casting as this would have required from three to four weeks.

Although the foundry has oxyacetylene equipment and is using the welding process to a large extent in the reclamation of defective castings, this 10,000-lb. condenser cone, measuring 10 ft. in diameter at the large end and 3 ft. 8 in. at the small end appeared beyond reclamation by welding to both the management and the foundry operators. Yet unless the cracked cone could be welded the foundry would stand a large loss in money and the harm which would necessarily result from their failure to make delivery as promised. They, therefore, sought in haste the best oxyacetylene engineering advice and service they knew.

Twelve hours after the foundry's call for help an oxyacetylene engineer was on the job to superintend the work. The entire casting was moderately preheated in a built-up charcoal furnace before the engineer arrived. For convenience in welding, the casting was lifted on end and a scaffold was built around it for the operators to work from. Then the cracked area was heated to a cherry red and actual welding operations were begun.

The welding required 8¼ working hours. Eight hundred and seventy-five cu.ft. of oxygen and eight hundred and fifty cu.ft. of acetylene were used. The welded section was 6 ft. long and averaged 2½ in. thick. The accompanying illustration of the completed weld was taken before it was finished off. After the surface had been ground it was almost impossible to distinguish the welded section from any other part of the casting.

The prompt and effective service rendered in this instance accelerated the solution of the foundry's problem. The very satisfactory welding prevented an embarrassing situation as there was considerably more involved than merely the reclamation of the cracked cone.—From *Oxy-Acetylene Tips.*

Visitors in the Shop

By William J. Fisher, Jr.

Every shop has visitors at times some on business, some to see interesting operations, and some for no apparent reason. We had two of the latter class in our shop this summer who came without invitation, stayed several weeks and departed without saying good-bye.

Two wild birds flew into the shop one day and, after looking us over and prospecting around for a while, selected a site for a nest directly behind the starting box of our motor. Here a nest was built, eggs laid, and a brood of fledglings hatched and reared until they were able to fly.

The starting box is bolted to a plank that is in turn nailed to the studding of the side wall of the shop. A space in the plank is cut away to give clearance to the hand, and the hand of the man whose duty it is to start the motor came within an inch of the nest several times a day.

In that end of the shop is located a circular saw for sawing hardwood logs, and this, naturally, made a terrific noise when in operation. A 36-in. lathe was also in constant service near by, and the flying sparks from a dry tool-grinder would be showered all around the nest at times, yet the birds were not disturbed.

Our shop is located within a few feet of a natural park that affords countless home-sites for birds, and the only reason I can assign for the strange preference of this pair is that they had observed the peaceful and benevolent expression that habitually overspreads the countenances of machinists and reasoned therefrom that their peaceful haven would not be disturbed.

Industrial Cost Accounting for Executives

By PAUL M. ATKINS

The seventeenth article—The scheduling or budgeting of expenses —Uses and development of expense schedules—Scheduling of maintenance, power, supply, wage and salary costs

IT IS A comparatively easy matter to record a series of transactions like those which give rise to expenses if adequate provision has been made for them. When the mechanism for expense recording which has been described in the previous article has once been set up and is smoothly running its operation becomes substantially a matter of routine, broken, it is true, when errors are made from time to time. The real utility of such records, however, does not lie in their historical interest, though that phase must not be overlooked, but in the aid which they give in planning for the future.

The executive who is a real leader of his company is the one who looks into the future and evaluates its possibilities. We see the growing realization of the importance of forecasting in the management of a business in the increasing use of charts which endeavor to show the future trend of business, and great progress has been made in recent years in the development of such business aids. As far as the outside business world is concerned, the executive is probably wise to rely on such outside services rather than to try to build up his own except as it may be needed to supplement or fill in gaps which are of vital importance to him. Only the largest concerns can afford individually to embark on such a program on a scale which will bring worth while results. As far as the internal phase of a business is concerned, however, it is entirely up to the company itself to develop means for evaluating the future. No one except the company managers are in a position to establish the records which will make possible such forecasting, and no one but they are interested in it.

The Essentials for Scheduling Expense

Under most conditions, the best way to arrange the analysis of future possibilities is in the form of what is often called a master schedule, a schedule which is developed out of the many subordinate schedules and which, in turn, serves to control them as their preliminary layout is manipulated into more permanent form. Reference has already been made to the schedule in the article on the Control of Production as an Aid to Cost Accounting. It will be remembered that mention was made of the balancing of sales possibilities and factory capacity as the basis for developing such a schedule, and that interlocked with them are such schedules as finances, purchases, labor, and expenses.

As expenses involve in most cases the actual expenditure of money it is evident that the principal channel through which they affect the master schedule is through the financial schedule. Having laid out the tentative sales and production schedules, it is then possible to estimate the expense schedule, incorporate that in a tentative financial schedule and in combination with the other tentative schedules, a definite master schedule can be prepared. When this has been done it is then possible to turn the tentative expense schedule into what is substantially a permanent schedule.

Value of Expense Schedules

Perhaps someone may be on the point of inquiring in regard to the difference between an expense schedule and an expense budget. From many points of view the two expressions are synonymous in that they both deal with a present evaluation of future costs. In the business which is subject to little or no seasonal fluctuation, they are practically the same in all respects, but in the seasonal type of industry they have marked differences. The term schedule is used in the discussion to draw attention to a very important factor in the make up of the expense forecast which is otherwise often overlooked. When speaking of budgets, expenditures over a period of time are commonly thought of, without regard to the time when such expenditures are to be incurred. In dealing with any financial schedule or program, of which an expense schedule is a part, it is quite essential that the time when the disbursement is to be made be known if the finances are to be easily and satisfactorily handled. Where the expenses run along at an even rate as in a non-seasonal business, that essential does not have such significance as in the seasonal industry where the fluctuation in the expenses may be very great from period to period.

There are two uses to which the expense schedules are put in the operation of the business. One has already been described—the aid received in the preparation of the master schedule. The other service consists in acting as a measuring device by means of which actual accomplishment can be measured. It is, of course, desirable to know whether expenses are going up or down, but that knowledge by itself does not mean much. Expenses may be going down and still be far too high. If an expense schedule has been prepared beforehand, then it is possible to see how actual results depart from a scientific forecast of what they ought to be. The comparison furnishes one, the only one, of the ways for measuring the efficiency of departmental managers. Care must be taken in making it to consider any events or developments which may be causes for differences between results and forecast, and which are not under the control of the manager affected. In some cases, causes arise within the business as well as without in the shape of changing business conditions.

There are various ways for going about the develop-

For the author's forthcoming book. All rights reserved.

ment of expense schedules. In some cases, expenses over a long period of time will be used as a starting point and broken up into their details and into shorter periods. Fixed changes, for example, are developed in this manner. On the other hand details may be assembled to form the needed totals. The scheduling of the wages and salaries accounts is usually developed in the latter manner. In all cases, however, two factors must be taken into consideration—the past records and the probable future as expressed in the master schedule.

Our next task is to study some of the principal expense accounts and see how schedules or budgets for them may be worked out. In the article dealing with the fixed charges the method for working out the fixed charge schedule was explained in such detail that further discussion of it here is hardly necessary. It must be remembered that the schedule for fixed charges and the actual amount of those charges is the same because of the nature of the expense, and so there can be no deviation of actual from scheduled charge.

The Scheduling of Maintenance Expense

The various maintenance accounts present some interesting problems. There is no question about the certainty of these costs, but their amount and the time of the occurrence are frequently not easily determined. Let us consider the building maintenance first. The regular house-keeping work as the daily and weekly clearing has been so aptly called, may be scheduled with a considerable degree of accuracy. Under exceptional circumstances time studies are made and definite standards set for sweeping, removing chips and washing windows. If this is not done records of past performance give usable though not so accurate data with which to work. When the time required is known and the probable future rate of wages for the work has been determined it is not difficult to ascertain the labor cost. The materials used can also be ascertained from past records and the price forecasted with reasonable accuracy. Usually the cost of such articles as brooms and cleaning powders are not so great as to cause any marked departure of estimates from actual expenditures.

When we consider the more extensive overhauling which must be done from time to time, it is not so easy. An investigation on the part of the plant engineer ought to give a good basis for estimating the expense. The plant engineer should make a periodic inspection of the buildings and prepare a report showing the probable extensive repairs for the forthcoming fiscal period. The report should also indicate at what time the work should be done, a matter which will depend upon the season of the year for exterior repairs and on the busy and slack seasons for those within.

Provision must be made for the distribution of the repairs, the benefits of which are to be obtained over a considerable period of time. Such items as new surfacing of floors or of roofs fall in this class. Ordinarily it is not necessary to make such repairs more often than once every three or four years, and so it is hardly appropriate to charge against one year the costs which properly should be allocated to several years. In such cases, therefore, only the part which it is decided really belongs to the year in question should actually be entered in the schedule.

The third class of building repairs, the emergency class, which result from unexpected breakdowns, can be estimated only on the basis of past experience. However, after records have been kept for a period of years, it is usually possible to estimate very closely the actual expenditures of such nature.

For building maintenance it is frequently necessary to work on the basis of the entire building and then pro-rate the resulting schedule to the several departments on a floor space basis. Such items as the repairs to walls, roof and foundation can only be handled satisfactorily in some such manner. The expense of toilets and locker rooms can be handled as totals, but the distribution should be on the basis of the number of employees in the several departments and not on the floor space. Some departments like the store-room properly bear a large portion of the total building expense because of the space they occupy, but because they have few employees their use of locker and toilet rooms is small.

When the various items have been obtained in some manner it is then necessary to sum them up to give departmental totals taking care to show monthly variations. For some purposes monthly variations are smoothed out, particularly when burden rates are being prepared on the basis of scheduled expenses, but for the purpose of making up the financial schedule it is necessary to show the fluctuations in detail.

In studying the problem of the maintenance of machinery, we find many of the same problems as have already been discussed in connection with buildings. In fact, it is often hard to draw a line in the records and schedules between these two classes of maintenance for the regular cleaning and general upkeep. The men who clean the floors often oil and wipe off the machinery at the same time. On the other hand, in some factories it is common practice to have each man take care of his own machine and to allow a certain amount of time each day or each week for the purpose. Under the latter conditions the scheduling of the machinery cleaning expense is not difficult.

Recording Maintenance of Equipment

The second class of machinery repairs, the extensive overhauling from time to time, can also be estimated without any serious difficulty in most cases. The same kind of report from the plant engineer that was described in the discussion of the repair of buildings is often helpful. In addition, if the plant register is kept as was described in the article on Depreciation and Other Fixed Charges a record of the overhauling repairs to each machine in the plant is at hand. The record will show the amount and dates of former repairs, and in connection with the plant engineer's report should furnish any needed information for the scheduling of the repair expense. As in the case of buildings, the unexpected breakdowns can be provided for only by a general estimate.

One of the important points to remember in connection with the scheduling of the maintenance of the equipment already described, and of the group called furniture and fixtures in addition, is that the amount of the expense very often does not fluctuate in the same sense as the variation in the volume of business. The dull seasons are usually the times when the larger part of this kind of repair is carried on since it does not interfere with production and men are commonly available. That fact needs to receive due consideration in the preparation of the schedules, for it has peculiar significance in connection with the financial schedule.

The cost of tool maintenance is in a rather different class from the other kinds of maintenance in respect

to its scheduling. Here we ordinarily find that the repairs vary in the same sense and substantially in the same ratio as the volume of production. This is particularly true for the edge tools which are rapidly used up by repeated sharpening. Hence the schedule for the expense will follow very closely that for production. It should also be remembered, in this connection, what was said in a preceding article about the method of treating depreciation of tools. Instead of having a reserve for depreciation account for the asset, the tools are carried at one-half of their original cost value and all tools issued to replace those worn out are charged to the tool maintenance accounts. Where the method is followed, it is, of course, necessary to include the probable cost of tool replacement in the scheduled tool maintenance.

Liability insurance is an item which appears in practically all departments and hence must be provided for in detail in the expense schedule. Since the premium usually depends on the amount of the payroll and that in turn on the production schedule, the amount of the liability insurance can be forecasted without difficulty in all cases where production can be estimated with some degree of accuracy.

Power is consumed by many of the departments of the average factory. Its scheduling is easier where it is purchased from outside suppliers than when it is produced by the factory itself. It is not so simple even under the former conditions as might appear at first glance for the price of power not only may fluctuate from year to year but it also varies per unit with the amount consumed.

When the plant produces its own power the problem becomes decidedly more complex. It consists essentially in scheduling the expenses of the power department many of whose expense accounts are very similar to those already discussed. There is one, however, which deserves attention at present—the account for coal and other fuel. It will be found that the consumption of coal does not fluctuate gradually but is apt to make sudden jumps up or down. The reason is that it takes a certain amount of coal to get up steam and only a comparatively little more to materially increase the supply of power. After the economic limit of the boiler capacity has been reached, it is necessary to start another boiler and the whole process is repeated.

Scheduling Power Expense

In addition, the same situation holds true for the engines as well. It requires a certain amount of steam to run one at all, and after that the supply of power can be rather rapidly increased to a certain point and then it is necessary to connect up another engine. In the seasonal industry particularly it is desirable to have several well balanced units of boilers and engines in order to prevent overlapping and to eliminate the unutilized production of power. To schedule the power expenses with any degree of accuracy, it is necessary to have a definite production schedule as a basis and then the interpretation of that schedule in terms of units of power to be consumed.

Supplies are another item which often present certain difficulties. It should be remembered that there are two kinds of supplies. There are the usual general supplies employed in the current operation of the department. Past experience is perhaps the best guide in the scheduling of these expenses. It is rather important that the probable changes of price be forecasted for the products largely used as supplies as the figures are quite as necessary as the information in regard to the rate of consumption.

The other kind of supplies which have been called direct supplies are those which go directly into the product, but which for various reasons cannot be charged directly to the manufacturing orders. Such items as glue, enamel and screws are illustrative. The supplies follow the fluctuations in the volume of business about as closely as any charge which is not debited directly, and the schedule, therefore, can be worked out directly from the production schedule.

Wages and Salaries

Wages and salaries are important expenses in almost every department. Department heads and the company officers present no difficulties in this respect, unless bonuses are paid. Usually the latter depend on the net earnings of the business and hence should be charged directly to profit and loss as a distribution of profits and so do not need to be considered in the cost calculations. The rate of salary of these men is known in advance, and no matter how dull business may be they are indispensable and hence must be paid. Many of the office employees and sub-foremen in the factory are substantially in the same class.

When workers like inspectors, instructors, move-men, and the minor employees in the office departments are considered, the question is not quite so easy to answer. The number of such employees will vary as the volume of business varies but not in the same proportion exactly. However, if the production schedule is known a very close approximation to the amount to be paid them can ordinarily be made.

There are other expense accounts which have not been mentioned here which must be scheduled also, but space does not permit further elaboration. Enough has been said to indicate the methods which must be employed to accomplish the scheduling of the commoner ones, and in general the others follow much the same lines. There are one or two which should not be scheduled. Reclamation of errors is one of them. The manager may know that inevitably mistakes are bound to occur and that it will cost money to rectify them. It is very poor psychology, however, to schedule a definite amount. It has a tendency to make the employees think that they have an allowance for that purpose and that if they come within it they are really doing pretty well. The goal should be to eliminate such expenses altogether. The retainer accounts are another example.

The scheduling of expenses which has been discussed in the preceding paragraphs is on the basis of actual scheduled production, and its prime purposes have been pointed out. For the preparation of burden rates by any satisfactory method it is necessary to schedule ex-expenses on the basis of normal production in order to obtain a ratio of normal expenses to normal production. Such elements as fixed charges will be the same for both schedules and many of the others can be developed at the same time quite conveniently. Of course, if the scheduled production is on the basis of normal plant capacity the two schedules coincide throughout.

The scheduling of expenses like all other efforts to foresee the future is of very great importance to the success of a business. Foresight, it is found, is not so much a matter of guess work as it is a careful analysis of past events and a thoughtful weighing of future possibilities in the light of such analysis.

Magnetic Inspection of Steel

IN A paper presented at the 26th annual convention of the American Society for Testing Materials, held at Atlantic City, June 26 to 29, 1923, a new method for inspecting steel by the use of its magnetic properties was presented by A. G. DeForest. By a suitable combination of two independent magnetic circuits, it has proved possible to determine the effects of two different factors entering into the treatment of steel. The method has been applied to a study of the different magnetic effects of the quenching and drawing processes on one per cent (100 point carbon) tool steel and 18 per cent tungsten high-speed steel. The apparatus has also been used in testing the hardness of cold-rolled steel irrespective of minor changes in the carbon content. The development of an accurate test which can be used commercially will increase the uniform behavior of tools and similar products and indicate the process of manufacture responsible for the undesirable changes which take place.

The outstanding advantage of the magnetic method of test lies in the fact that it is non-destructive. This is, however, not its only advantage. In magnetic testing, the effects of what appear to be the internal stresses concomitant to structural changes, are evaluated.

Taking, for example, a cutting tool which has been subjected to heat treatment, including both the quenching and drawing. A physical test, such as a hardness measure, will give a single factor-result and one which is not able to differentiate as between, for example, an overquench followed by an overdraw, or an underquench followed by an underdraw. It is, however, a characteristic of magnetic data that intermediate processes in thermal treatment leave a definite stamp on the material and subsequent treatment does not entirely efface the effects of an earlier step.

Effects of Thermal Treatment

It is the thermal treatment more than any other process, that causes the wide variation found in tools of commercially similar composition. An error of omission or commission in the quench or draw, or both, means decreased uniformity of production. A test method which serves to identify, even in part, that particular step in a thermal process in which the departure from routine procedure occurred, is of great value.

It is not pretended that the paper presented covers a complete research or offers a full solution. Since, however, the results are obtained by a method believed to be entirely new and one which has found successful commercial application during the past two years, it is felt that publication at this time will stimulate others in the field of magnetic inspection and facilitate the gathering of additional magnetic data.

Taking, for example, the testing of small case-hardened chains such as are used to prevent skidding on automobiles. Here the factors to be measured and guarded against are brittleness at one end of the scale and softness at the other. It is immaterial, from the point of view of acceptability, whether the chain is soft because of insufficient depth of case or from improper quenching. Both will give a soft chain.

At the hard end, a coarse structure with a moderate case reads higher than a similar case of normal structure. Hence the factors which make for brittleness read in the same direction and make a single measurement sufficient. If all other factors are constant, the magnetic reading is proportional to the depth of case. In the machine described by Mr. DeForest the sensitivity is adjusted and the zero is shifted, by changes in the circuit to give the same acceptance limits for all sizes. The use of this inspection method has enabled the manufacture of a much more uniformly acceptable product with practically no change in the production equipment.

This method permits of a rapid test with portable apparatus and commercial alternating current. A separation can be made between the effects of different variables which enter into the quality of the finished product. A single measurement can, under favorable circumstances, be adjusted to read the desired combination of several factors influencing a complex property, such as strength, hardness or brittleness.

Different Ways of Figuring Overhead

By John R. Godfrey

"Overhead" is one of the most overworked words in the English language and, like charity, it covers a multitude of sins. It is the alibi of high costs and high prices and many consider it an adequate excuse for all sorts of unnecessary expenses and careless management. And it's the greatest opportunity in the world for more self-delusion than anything I know.

"What's your overhead, Bill," asks Sam, "mine went up to 200 last month." "Don't see how you keep out of the sheriff's hands, Sam," Bill replies, "I never let mine run over 90." And neither of them knows just what the other means. Sam counts everything but labor and material as overhead while Bill's bookkeeper throws a lot of indirect costs in general expense.

Many count overhead just as Sam does, but use labor alone as the base line. Others count the same way except that they use labor and material added together, as the base. It's easy to see how it makes a heap of difference about the percentage, whether you take labor alone or count in material also.

There's one shop I knew of where labor was 16 per cent, material 55 per cent and overhead 29 per cent of the total cost of the product ready to deliver to the sales department. If you count overhead on labor alone it is 181 per cent, but if you use material and labor as a base, the overhead percentage drops to about 40 per cent, without changing the actual dollars you pay for supervision, insurance, etc., in the least.

Then there's the question of the kind of overhead. There's a heap of difference between overhead which simply adds to the total cost of getting out work, and overhead in the shape of new machines which not only reduces the direct labor costs on the work, but also reduces other indirect costs as well. A machine, for example, which enables one man to double his output per day, cuts the direct labor cost in two. It also doubles the output on the floor space occupied and reduces the costs all along the line.

It might help some if we studied costs separately instead of lumping them in one group. High machine overhead is usually a good sign, while clerical overhead may easily be an indication of wasteful management.

The real answer is the total cost of the article ready to be sold. Increased machine overhead is usually an economy, if you pick the right machines.

Book Reviews

Employment, Hours and Earnings in Prosperity and Depression, United States, 1920-1922. By Willford Isbell King, of the staff of the National Bureau of Economic Research. One hundred forty-seven pages, 6x9 in., cloth boards. Published by the National Bureau of Economic Research, Inc., 474 West 24th St., New York City. Price $3.10.

This book gives the results of an inquiry conducted by the National Bureau of Economic Research with the help of the Bureau of Markets and Crop Estimates and the Bureau of the Census for the President's Conference on Unemployment. The years 1920, 1921, and part of 1922 are covered in the report, and a picture is provided of industry in one boom and in one depression and in the transition period connecting them. The data were secured from questionnaires, types of which are shown. There are many statistical tables that will convey information in proportion to the amount of study expended upon them. The author has, however, made a thorough analysis and presents conclusions that are in themselves a summary of the statistics. That these conclusions are without bias is indicated by the fact that all reports of the Bureau of Economic Research must be approved, before publication, by the board of directors, twenty-one in number, representing widely divergent interests and points of view.

Mr. King gives a statement of eight ways in which knowledge concerning conditions of employment in the United States has been increased, by the report, and as they furnish a brief analysis of the book they are reproduced here:

1.—It shows the relative responsiveness of different industries to the forces giving rise to the business cycle.

2—It indicates the comparative ability of large and small scale business to resist such forces.

3—It analyzes the shifts of population from one industrial field to another.

4—It traces the variations in hours and earnings of employees that accompany the change from boom to depression.

5—It presents an approximately complete record of the seasonal changes occurring in the conditions of agricultural labor.

6—It gives a picture of the distribution of farm employees according to hours and earnings.

7—It measures the importance of part-time employment in the chief industrial fields.

8—It enables us to estimate the approximate total reduction in employment brought about by the depression of 1921.

Aluminum Repairing. By William H. H. Platt. Seventy pages, 5x7 in., cloth boards illustrated. Published by the D. Van Nostrand Co., 8 Warren St., New York City. Price $1.50.

A book giving detailed instructions on the repairing of aluminum sheets and castings and the attaching of copper, brass and steel to aluminum by tinning, sweating and burning, with sheet iron jigs.

The instructions are practical and complete. Anyone engaged in aluminum repairing will find the book a great help. Its size makes carrying it in the pocket convenient.

Motor Transportation of Merchandise and Passengers. By Percival White. First edition, cloth-board covers, 6x9 in., 486 pages, 76 figures. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y. Price $4.

A book giving an excellent perspective of a broad field is this volume that treats all phases of the subject of transportation by means of motor vehicles. Motor transportation is considered as a rapidly developing business activity, all branches of which should naturally be understood by those responsible for the direction of its work.

As stated in the preface, the book is addressed to those who for the first time are approaching the subject of commercial highway transportation, as well as to those who, although already versed in it, are anxious to find a presentation of other aspects of the question than those with which they are familiar. It should prove of practical guidance to those in authority in all phases of the motor transportation business.

The real value of the book lies in its scope. This volume is probably the first to treat merchandise and passenger transportation by motor vehicles in relation to each other and in relation to other methods of transportation. Economic phases are considered which often do not receive the attention of automotive engineers.

The vehicle, the road and the profitable operation of vehicles over the road are treated as factors of equal importance. The author sees great possibilities in co-ordinated transportation, as motor transport must bear a certain relation to the other means of transport already developed. Motor transport does not inaugurate a new era, as did the railroads, but it makes possible more complete development of the facilities of transportation. Networks of truck and bus routes are now developing.

One of the most important points put forth is the need for and growth of organization. It is stated that "we may expect to see transport companies of the future belonging to one of two classes: (1) Large companies with adequate capital and thoroughgoing organizations; (2) small companies which, though units, are so co-ordinated as to be virtually part of an association which thereby derives the benefits of good organization."

The problems that are the same for both trucks and buses are considered, as well as those that require a different solution for each type of machine. Among the latter are the subjects of vehicle design, maintenance, personnel, scheduling and routing, revenue, and legislative control. Road building and the broad subject of traffic regulation come in for treatment. The text is supported by charts and illustrations.

Probably the best idea of the subject matter of the book can be gained from the chapter headings, a list of which are here given: The Carriage of Goods, Truck Design and Equipment, Truck Maintenance and Service, Tires and Wheels, Trailers, The Truck and the Railroad, Truck Legislation, The Establishment of Express Lines, Terminals, The Truck on the Farm, The Truck and the Factory, The Truck and Raw Materials, Principles of Motor Truck Delivery, Delivery Applications, The Motor Vehicle in Public Service, Organization and Personnel, The Carriage of Passengers, Bus Transportation Problems, Bus Construction and Maintenance, Bus Operation, Taxicabs, Cost Accounting, Insurance, Traffic and the Highway, Highway Construction and Maintenance, the Economic Development of Highway Transport.

Trade Association Activities. Prepared by L. E. Warford and Richard A. May under the direction of Julius Klein with an introduction by Herbert Hoover. Three hundred and sixty-eight pages, 6x9 in. Published by the Department of Commerce and sold by the Superintendent of Documents, Government Printing Office, Washington, D. C. Price, $0.50.

By publishing this book dealing with trade association activities, the Department of Commerce has supplied a large amount of information concerning a movement which has taken on much acceleration during recent years and which has not been thoroughly understood by the public. It is believed that this book will do much to dispel the uncertainty as to the standing of trade associations which has been aroused by attacks upon them. In the course of an introductory statement, Commerce Secretary Hoover says:

"The constructive purposes of trade associations unfortunately have been confused with the minority of activities which have been used as a cloak for action against the public interest. It is also true that a vast amount of action in public interest has been lost and even great national calamities brought upon us by lack of co-operative action. All who know the situation in such matters realize that the problems of co-operative action are mainly the concern of smaller businesses. The material in this book has been brought together not from the point of view of educating big business, but with the idea that the legitimate trade associations and other forms of business co-operation are the real basis for promotion of smaller businesses.

"If we are to have a comprehensive economic system, it seems to me that the time has come when we should take cognizance of the necessities. The growing complexity of our industrial life, its shift of objective and service, requires the determination of an economic system based upon a proper sense of rightful co-operation, maintenance of long-view competition, individual initiative, business stability, and public interest.

"The trade association as a facility for the promotion and self-regulation of industry and commerce has become, by reason of its scope and activity, an important American business institution. There are several hundred organizations in the United States which clearly come within the strict definition of the term and more than a thousand others which undertake to perform some of the services rendered by the avowed trade associations.

"Notwithstanding the importance of this institution, as an economic factor, generally speaking, the American public is little acquainted with either the extent or the character of its work. The following pages undertake to present a picture of the organization, administration and operations of trade associations with a view to meeting the need for public information on the subject and further, in order that a business facility which is economically useful when properly conducted, may not suffer discrimination by reason of misapprehensions regarding its purposes and accomplishments."

Twenty years ago the public was only imperfectly informed as to the real objectives being sought by Chambers of Commerce and Boards of Trade. At that time the Department of Commerce produced a book defining those activities. At present the situation in regard to trade association activities is much the same. Among other things the book presents for the first time an exhaustive list of the names and addresses of trade associations. In addition, these associations are classified by commodities or service and by functions.

The chapter on the legal aspects of the trade association situation is of particular interest since it comes from Nelson B. Gaskill, of the Federal Trade Commission. It has been assumed that the Federal Trade Commission is not particularly friendly to the movement. In his chapter, Mr. Gaskill says:

"The trade association is not a combination in restraint of trade with one hand tied. It is not a medium for the exchange of business secrets, for the sole benefit of those who join in the exchange. It is not a new arrangement for the accomplishment of any object which needs, because of the law, to be pursued stealthily and in the dark. It is an expression of an interest common to all in any industry in which it arises, seeking to benefit the individual by bettering the entire industry and the public which the industry serves. It serves where the individual acts. It instructs where the individual learns. It works for the individual, but never instead of him. And while the attention of the individual may be focused on himself and his own interest, the aims, objects and ideals of the trade association are fixed in the wider field of the welfare of the whole group, the whole industry and the whole public dependent upon it." Mr. Gaskill concludes, however, with the admonition that the trade association must "hitch its wagon to a star."

Construction and Use of Automatic Screw Machines. Three hundred and fifty pages, 6x9 in., illustrated. Published by the Brown & Sharpe Mfg. Co., Providence, R. I., paper binding. Price, $1.

A very useful and complete treatise on Brown & Sharpe automatic screw machines combining construction descriptions, operation and adjustment requirements, and descriptions of tools and attachments. The book is well illustrated by photographs and diagrams and written in simple, clear language.

The first four chapters explain the various parts of the machine, their functions, give directions for proper erection and care, show how to set up the machine for a job, and how to make necessary adjustments. A description of standard tools and how to use them follows. This section has received special attention and the material is presented with particular care, the statement being made that "the success of the automatic screw machine in producing work with a high degree of accuracy, well finished and at a very rapid rate depends to a great extent on the selection and setting of the tools used."

The section devoted to the important matter of cam design and machining is of particular interest, as the standardized methods of cam figuring, machining and operation are carefully and clearly demonstrated. The use of practical examples is a feature of this section which will greatly assist the reader to a clear understanding of the principles governing the standard practice in the use of these cams.

The final chapter contains descriptions of special attachments, their use and how to set them up. Nearly a hundred pages at the back of the book are filled with belting diagrams, tables of approximate cutting speeds and feeds, and tables of data for figuring and machining cams. A comprehensive index is provided. The book is an important addition to the literature on this subject and will be welcomed by all who are interested in the operation of automatic screw machines.

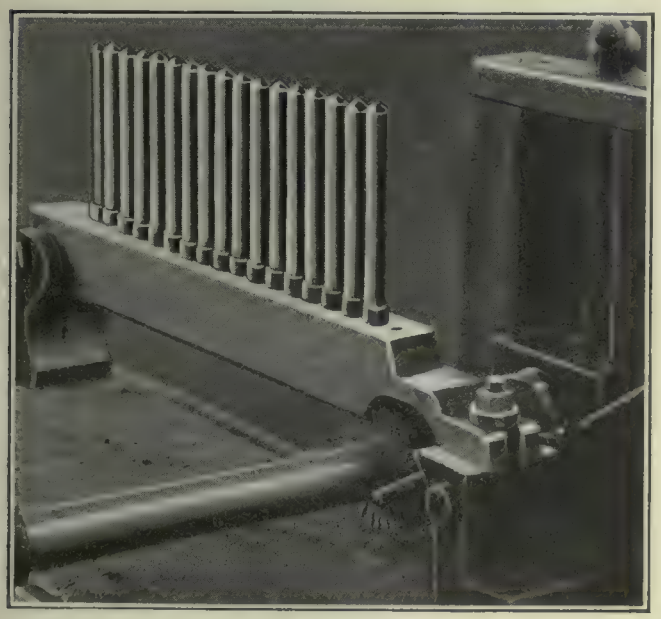
Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Milling the Tangs on Taper-Shank Drills

By Frank Avey

Not long ago the manager of a small shop that makes special drills in considerable quantities, showed me a simple fixture for holding taper-shank drills while milling the tangs. The fixture shown in the illustration consists of a bar of machine steel in which seventeen



MILLING THE TANGS ON TAPER-SHANK DRILLS.

holes have been drilled and taper reamed to receive the turned shanks of the drill blanks. The ends of the shanks project far enough through the bottom of the bar to allow the two milling cutters to machine the tangs at one pass. The drill blanks are lightly driven into the taper holes with a mallet, and are removed the same way, after the holding bar, which is hinged on one end, is swung up away from the cutters.

With this type of fixture no trouble is ever experienced with chips, as they immediately drop down onto the table out of the way. The tangs are also always milled in the same relation to the taper shanks provided the operator keeps the dirt out of the holes and off the shanks when inserting the drill blanks.

Floating Holders for Reamers

By J. T. Towlson
London, England.

As a machine shop foreman, responsible for the accuracy of the work produced by the men under my direction, I must confess that I am no ardent advocate of floating holders for reamers, particularly when accuracy of product is imperative. Perhaps a short account of an actual experience will serve to show why.

Certain details of work were required to be bored to what is called in shop parlance a "wringing fit" to the 1-in. plug gage. The price was close and a considerable number of pieces was required. We were provided with reamers and floating holders which the management confidently expected would insure making the holes all of the proper size. These reamers and holders were used on various engine lathes by different men, with the result that there was a variation of several thousandths in the size of the holes produced; none of them being *under* size.

The product of all the turners except two was spoiled. These two—old experienced men—completed their work with holes that were "dead to size." Upon investigation it was found that these men were afraid to risk their reputations by using the floating contraptions and had carefully laid them aside while they bored their holes to within a few thousandths of size and finished them with hand reamers in the regulation manner. Notwithstanding this, their output was fully up to that of the workmen who had used the floating holders, presumably for increasing the output.

Neither the management nor myself were satisfied with the condition, however, as accuracy and high output depended almost entirely upon the unusual degree of skill possessed by these two men. The floating reamers were abandoned and reamers having a forward pilot, working in a hole ground in position in the lathe spindle were substituted, carrying the job through with the necessary degree of accuracy.

Floating holders for reamers are, it would appear, a sort of sop to the presumed inaccuracy of alignment of head and tail stocks and if such misalignment really exists, and varies with different lathes, how is it possible to ream a hole that will compare in accuracy with that produced by a reamer that precisely co-ordinates with the geometric axis of the spindle?

This reasoning, supported by experience, has inclined me to abandon the use of the floating holder for reamers, for it is my firm conviction that if the head and tail stock are dead in line, no floating compensation is necessary, while if they are *not* in line no scheme of floating holders will compensate for the error.

A Quick Method of Pointing Pins

By R. H. Kasper

A large number of small pins were to be formed to a point on one end. As the work did not require great accuracy it was not considered advisable to use a lathe for the purpose. Instead, the work was done quickly by grinding in the following manner: A piece of round stock was drilled on one end so that the pin would turn freely in the hole and also extend beyond the end of the rod. By placing a pin in the hole and holding it against the edge of an abrasive wheel the friction caused the pin to turn, grinding an even point on the end.

Babbitting Large Bearings by Centrifugal Machine

By Frank C. Hudson

In order to secure dense metal in the babbitted bearings used on machinery of various kinds, the General Electric Co. has built a centrifugal babbitting machine for bearings 12 in. and larger in diameter, as shown in Fig. 1. The machine consists of two heads, each with a chuck-carrying spindle, and both driven by the same motor. The head *A* is adjustable, so as to accommodate bearings of different lengths, and also to permit the loading of the chucks and the removal of the completed bearing. The bearing is held in the two chucks, which are tied together by tie rods as indicated.

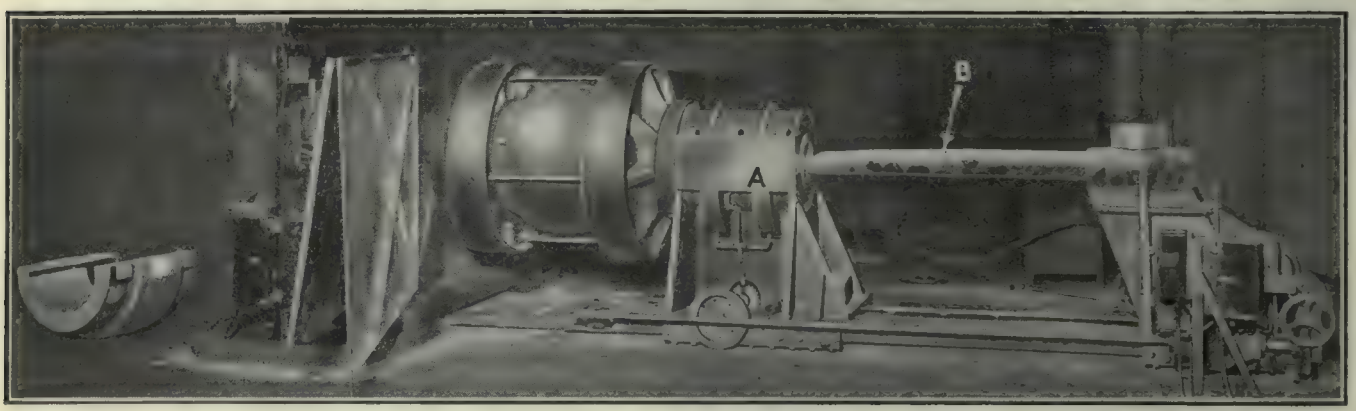


FIG. 1—CENTRIFUGAL BABBITTING MACHINE FOR LARGE BEARINGS

The bearing is first preheated to almost the melting point of the babbitt. The babbitt is then brought to a slightly higher temperature than is the usual practice, and introduced into the bearing shell through the trough *B*, which is pushed through the hollow spindle of the head *A*, so that the highly heated babbitt runs directly into the revolving shell. The peripheral speed of the bearing is set at about 1,200 ft. per minute for all sizes, and has been found to give excellent results in securing a dense metal.

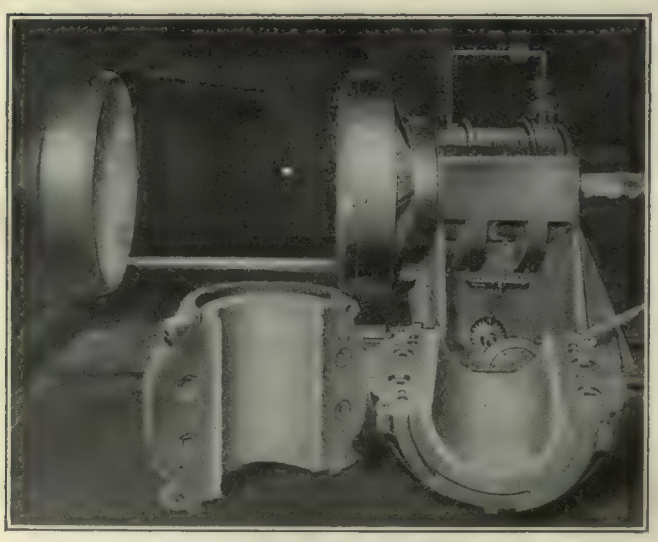


FIG. 2—DETAILS OF CHUCKS AND BABBITTED BEARING

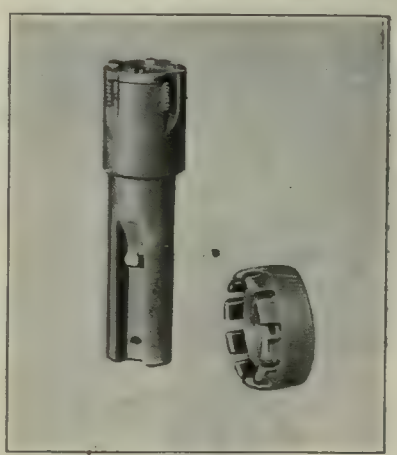
It takes about 3 hours to complete the babbitting of a 12-in. bearing, this time including the chucking of the bearing shell, putting in the tie rods and preheating the bearing. The actual running time of the machine is from 5 to 7 min., depending on the size of the bearing being poured. It is, of course, necessary to predetermine the amount of metal to be poured inside the shell, in order to secure a lining of the proper thickness.

Fig. 2 shows a more detailed view of the head of the machine, together with a large bearing which has just be babbitted. It will be noted that the babbitt is held in place by dovetailed grooves running around the periphery, as is customary in many plants. Babbitt linings cast in this way have a uniform density at all parts of the shell and do not require peening.

A Non-Stripping Tap

By Tom O'Reilly

The tap shown standing on end in the illustration has a feature that is as simple as it is handy. The tap is for use in the turret lathe, but instead of being clamped in, as is the usual method, the setscrew in the turret is screwed down until the end just clears the bottom of the slot shown in the shank of the tap, so that the tap can be moved in and out by hand. When the operator is starting the tap into the work, of which a sample is shown alongside the tap, he feeds the turret forward so that the setscrew engages the pin shown in the bottom of the slot and thus forces the tap into the work. After the thread has been started, the pressure is released and the tap feeds itself through the turret, being fed along just enough to keep the tap in place. The scrap due to stripped threads has been greatly reduced by this method. Another important feature is that the tap does not have to be backed out of the hole. As soon as the last thread of the tap is through the work, the work is removed from the chuck and the tap is pulled through and slipped back into the turret.



A NON-STRIPPING TAP

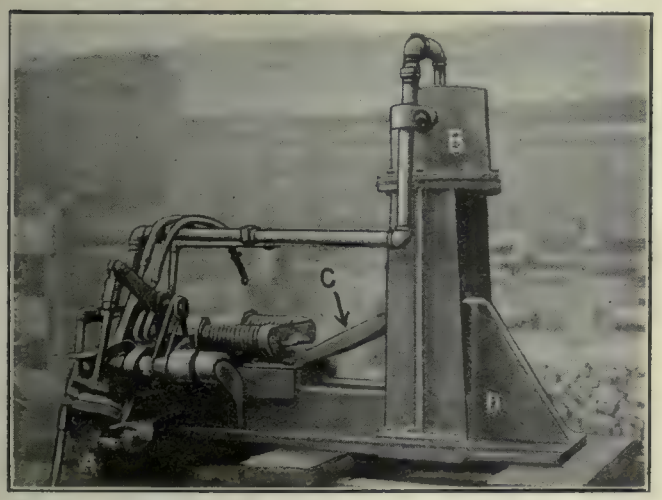
The photograph was taken in the shop of the Triangle Tool & Pattern Co., Detroit, Michigan.

An Unusual Bolt Header

By Clifford H. French

The bolt header shown in the accompanying illustration was found in the yard of a dealer in second-hand machinery of all kinds in Aberdeen, Wash., not very long ago.. It is of unusual design, and, unfortunately, bore no name plate or other distinguishing mark. It was evidently operated by compressed air, which probably ties it up with some railroad shop, where it had probably been built in an emergency and had finally given way to a more powerful or more efficient machine.

The bolt to be headed is clamped by means of pressure exerted by the air cylinder *A*, which is unmounted from its trunnion bearings. The pressure for heading is obtained from cylinder *B*, which operates a sort of crosshead hidden behind the broad upright supporting the cylinder. Power is transmitted to the heading dies by means of the toggle shown at *C*, the heavy abutment *D* taking the thrust of the toggle and keeping the cross-



AIR OPERATED TOGGLE JOINT BOLT HEADER

head in line. The heavy springs shown return the dies when the air pressure is released in the cylinder, so that the finished piece of work can be removed and a fresh piece put in place ready for forming at the next stroke.

The various air connections are shown quite clearly at the left.

Guarding the Grinder's Eyes

By Milton Wright

The question of goggles—to wear, or not to wear—has long been the subject of vexatious dispute wherever grinding wheels are used intermittently, as for sharpening tools in the machine shop. There can be no doubt that the safety of one's eyes is assured by wearing goggles when grinding a lathe or planer tool but, unless under very exceptional circumstances, the number of men who will "take a chance" is still far in excess of that of the more cautious and conservative ones.

The scheme shown in the accompanying illustration is by no means new, neither is it anywhere near so widely used as it ought to be. It demands no extra movements of the operator, takes none of his time, and does not obstruct his vision. He will, instinctively and without question, take advantage of the protection it affords.



GUARD FOR GRINDING WHEEL

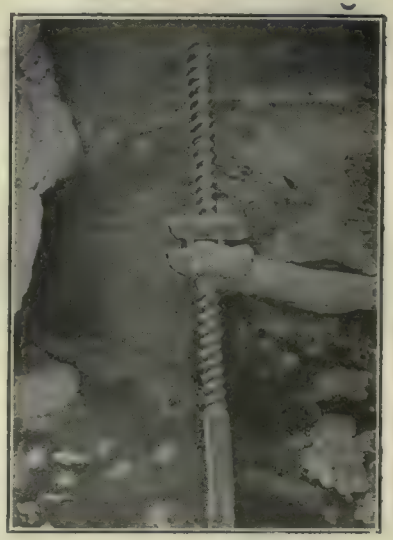
A pane of glass of generous size, a suitable frame made up of scrap materials, and a couple of bolt holes tapped into the hood of the machine are about all that is required. The cost is negligible—less than that of the average eye accident—and every tool-grinding machine should be so equipped.

The electric lamp shown in the picture is not in the right place. It should be under, not above, the glass in order to avoid reflections.

Old Hay Press with Hand-Cut Wooden Screw—Discussion

By Walter G. Elliott

I have noted with interest the article under the above title by H. E. Crawford, on page 706, Vol. 58, of the *American Machinist*. During the great war, in Palestine, I discovered by accident an underground cave at a small village in the Judean Hills outside Jerusalem, and in it was an old wooden olive press as shown in the inclosed photograph. Our Padre, with the aid of an interpreter, made inquiries and discovered from the oldest inhabitant that its exact age was not known but that it dated back many hundreds of years. The screw is entirely of wood and about 8 in. in dia. Though the threads show signs of wear, I think you will agree that it is still very clearly defined. I agree with Mr. Crawford that many of us would be stumped to do such jobs today and especially under the conditions existent at the time the screw was made.



HAND-CUT WOODEN SCREW IN AN OLD OLIVE PRESS

Two Handy Tools on the Sante Fe

By Chas. F. Henry

The Sante Fe repair shop at San Bernardino, Calif., has a number of interesting devices, two of which are illustrated herewith. The first is a hand-operated hydraulic arbor-press, as shown in Fig. 1. It consists of a crosshead carrying the hydraulic cylinder and plunger, which is mounted on the uprights shown. The base is a substantial iron casting, the whole being supported on a convenient wooden cabinet in which various appliances are kept.

Power is applied by the hand lever *A*, which operates the pump used in forcing down the piston. The coil spring *B* returns the plunger when the release valve is opened, making the press quick acting. The overhead rail and chain are for supporting the outer end of any long pieces of work which may require it.

The machine shown in Fig. 2 has been built especially for milling the keyslots in crossheads and piston rods. The pieces to be milled are mounted on the V-blocks at *A*.

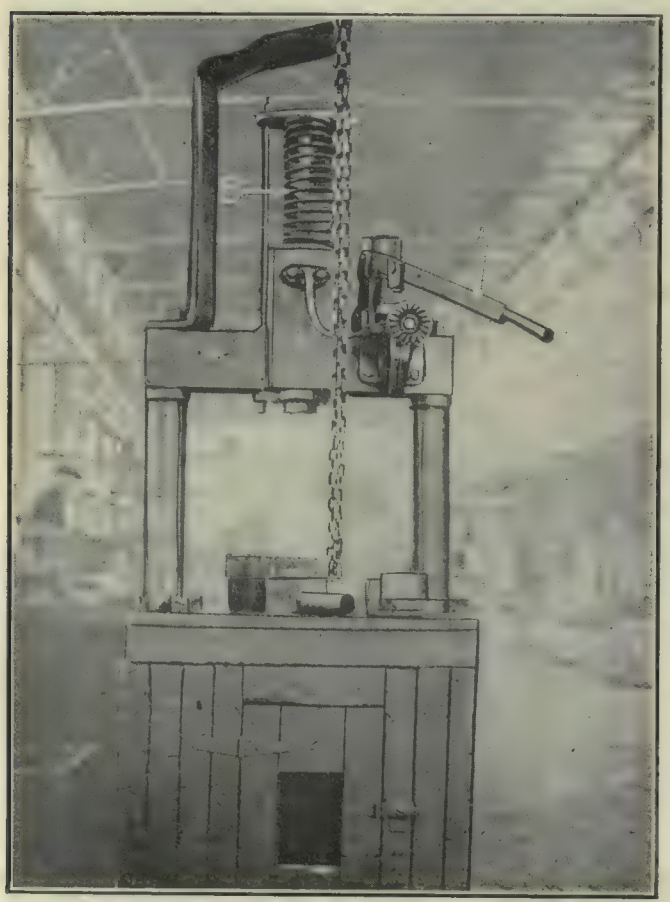


FIG. 1—HAND-OPERATED HYDRAULIC ARBOR-PRESS

so that the starting holes for the slots are in a vertical position and in line with the spiral milling cutter *B*. The cutter is fed through the starting hole by a screw and hand wheel *C*, until a pilot on the lower end of the cutter enters a supporting bushing, which is part of the vertical frame.

With the milling cutter in position, the flanged pulley *D* is in line with the larger pulley *E*, which drives the feed screw for moving the table with its work, in the direction of the cut. The feed belt is put in place after the work and cutter are all set for milling. The crank *F*, is also provided, so that the work may be quickly moved to any desired position, or for hand feeding at any time. It will be noted that power for driving the milling cutter is supplied by the air motor *G*, as is very common in railroad practice. The motor is kept from turning by the two uprights.

Both of these views also give a good idea of the construction of the shop of the Atchison, Topeka & Sante Fe Railway and it will be seen that it differs considerably from the old type of railway shop building. They show



FIG. 2—MACHINE FOR CUTTING PISTON-ROD KEYWAYS

one of the high bays which is provided with traveling cranes sufficiently heavy to handle any work of this department. The windows on each side of the monitor roof give good light and aid in securing proper ventilation. This shop is one of the newer buildings of the Sante Fe, this road being keenly alive as to the need for modern shop buildings.

Two Ways of Making a Core—Discussion

By M. E. Duggan

On page 308, Vol. 58, of the *American Machinist* there appeared an article under the above title by F. C. Edwards of Birmingham, England, in which Mr. Edwards professed to be "astounded" by some remarks that I had made in an earlier contribution; especially at my expression of doubt as to the ability of the average patternmaker to predetermine the operations of the molder and my statement that the word "proper" does not appear in the patternmaker's dictionary.

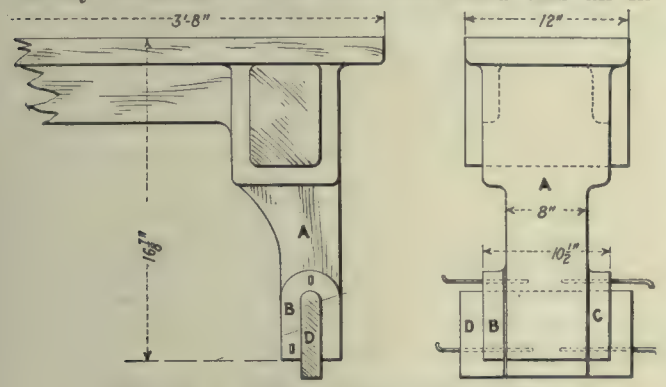
There was nothing in my remarks to cause consternation. The patternmaker whose early training in molding and core-making practices has been neglected is poorly fitted to predetermine the operations of men in these departments, and the acquisition of knowledge of the above-mentioned practices after he has reached the status of a journeyman is an up-hill task indeed.

Not long ago my attention was directed to a pattern, a section of which is shown in the accompanying sketch. It was well made and nicely finished, but the maker thereof was evidently not familiar with a certain detail

of molding practice or he would not have overlooked the difficulty of setting the core *D* in the mold after the pattern was withdrawn.

The loose pieces *B* and *C* were intended to be drawn "out and up" after the pattern was removed. Then the question arose: how was the molder to insert the one-piece core *D* through the narrow part of the mold at *A* and get it down into place at the bottom.

Many foundries would have considered this an in-



SETTING A CORE UNDER DIFFICULTIES

excusable mistake and would have returned the pattern to the maker for correction, but in this case the molder overcame the defect and set the core in three sections as the sketch shows.

The end sections were set first by lowering them to the bottom of the mold and sliding them endwise to their respective places. The middle section was then set and secured with chaplets placed at each side between the core and the mold. The core was made more secure by passing nails through the middle section into the end sections.

All this was of course a waste of time and labor, which waste would have been obviated by making the pattern correctly in the first place. The molder also took a long chance on the production of the casting, especially when its size and weight are considered.

A Few Lathe Kinks

By Herbert F. Crawford

When it comes to utilizing space efficiently, it is hard to beat the small experimental shop of Burr Struble in Portland, Ore. And, as is usual in such shops, there

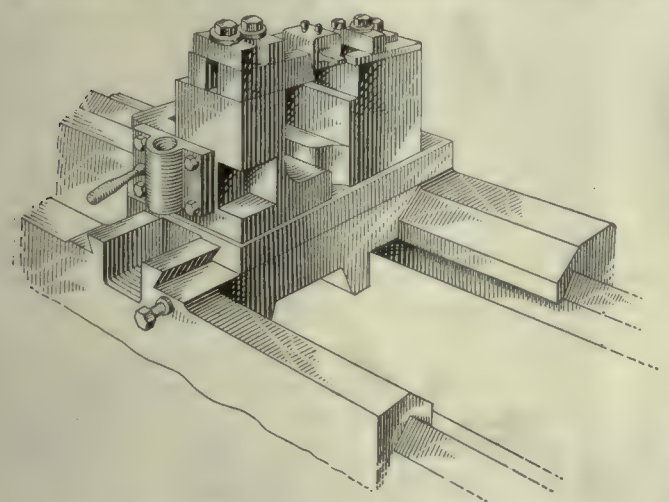


FIG. 1—SPECIAL TOOL BLOCKS ON CROSS SLIDE

are many interesting little kinks which can be of service elsewhere.

One of these is the way in which a small engine lathe is used for such jobs of repetition work as occasionally come into such a shop. Two special tool blocks are mounted on the cross slide, as shown in Fig. 1. These tool blocks perform in about the same way as those on the cross slide of a hand screw machine, the cutting-off tool being in the rear tool post as usual. It will be noted that the front tool block carries two tools, and this arrangement can, of course, be varied to suit the particular work in hand. As shown, there is an outside turning tool and a counterboring and facing tool that overhangs.

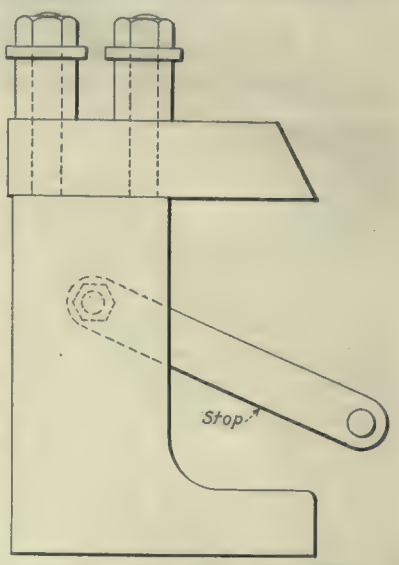


FIG. 2—STOP FOR LOCATING STOCK

In addition to the cutting-off tool, the rear tool block carries a stock stop on one side. This stop, as shown in Fig. 2, drops down out of the way after the stock has been located for position.

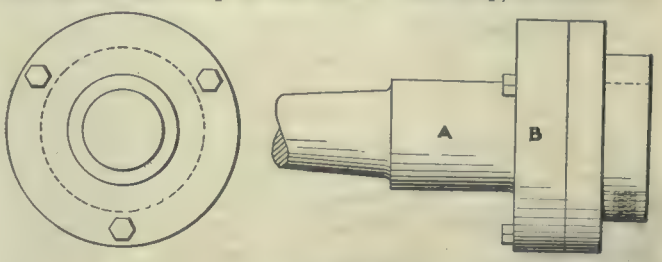


FIG. 3—SMALL ECCENTRIC CHUCK

Having quite a number of small eccentrics to turn in a bench lathe, Mr. Struble made the chuck shown in Fig. 3, which requires very little explanation. The shank *A* which fits into the lathe spindle carries a front portion *B*, that can be adjusted to the small amount of eccentricity desired, and locked in this position by the screws shown. Duplicate eccentrics can be made without difficulty by means of this device.

A very convenient little collet which can be used directly on the nose of the lathe spindle is shown in Fig. 4. If the spindle is not provided with the sharp taper necessary it can be bored, or if the spindle has a large hole through it, a bushing can be used. The main object, however, is to avoid the necessity for using a draw-in rod through the spindle, the chuck being closed by means of the nut *A* on the front end.

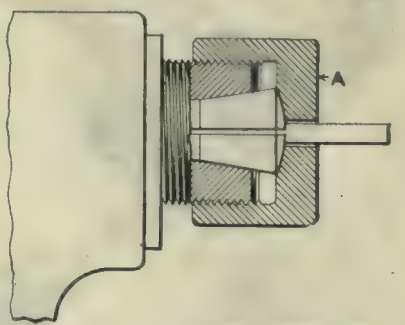


FIG. 4—A COLLET WITHOUT DRAW-IN ROD

American Machinist
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KENNETH H. CONDIT AND FRED H. COLVIN
Editors
July 26, 1923

Analyzing the Overhead

THERE is much loose talk about overhead and, unfortunately, much of the keeping of accounts with regard to it is done in the same loose way. Often everything except direct labor is lumped into overhead, and practically no attention paid as to what items go to make it up.

Every shop pays more or less attention to the items which go to make up direct labor, probably because the pay roll has to be met at regular intervals. They analyze operations and leave no stone unturned to reduce the cost of individual operations to the minimum. But it often happens that indirect labor costs creep up without being noticed. A new clerk here or there, additional card systems and many other items, all help to make up a total which entirely offsets many of the small savings in the shop.

It will probably pay almost any concern periodically to go over its overhead expenses and analyze them very carefully. All items which are not directly productive should have the same careful scrutiny as is given shop costs, if not more. Taking the cost of gages for example, it might be well to find if the gaging system itself was right. Does the man who designed the gages, or who laid down the tolerances, thoroughly understand the most modern gaging methods? Has he required special gages in cases where standard gages would have served the purpose if he had understood the use of unilateral tolerances?

These are only a few items to look after, but it may be found that much that now goes into overhead can be reduced in volume, and the lowering of indirect costs is healthy from every point of view.

What Is Good Design?

ONE OF THE most consistent performers at meetings of the Society of Automotive Engineers came through as usual at the recent meeting of that association. We have not attended an S.A.E. meeting for a long time without coming away with an idea for an editorial from something said by Henry M. Crane. It may have been some drily humorous comment brought forth by a discussion or it may have been some carefully thought out point made in the course of an address.

This time it was an off-hand statement of the designer's ideal. "The utmost simplicity is the acme of good design." Here is a thought that might well be framed and hung in every drafting room for certainly there is much machine design that is far short of Mr. Crane's "acme."

Few designers, of course, expect to achieve the ultimate in simplicity or any other feature in their first designs. Compare the automobile of fifteen years ago with the motor car of today. Then it wore most of its works on the outside. They were easy to get at, it's true, and that was sometimes necessary because of the uncertainty of their functioning. Today such things as lubricating systems are built into the engines where they are more nearly dirtproof and foolproof.

The old engines were much more impressive as mechanical contrivances to awe the uninitiated but from a design standpoint they were far from the beautifully compact and protected units found in most modern cars.

Simple designs are desirable for other machines besides motor cars and where competition has been keenest and production greatest the best results are usually to be found. In most fields, however, the utmost in simplicity has not been reached. The designers, therefore, may well take Mr. Crane's terse definition as a standard to reach for. Not only will its achievement mean engineering advancement but increased sales as well, for most of us appreciate the beauty of simplicity and are attracted to it even to the extent of paying for it.

Rewarding the Plugger

THERE is never much of a problem about rewarding the genius whose brilliancy sticks out by some stroke of invention or system, and makes an impression on the multitude. These men are usually in sufficient demand so that they can almost name their own salary, and get it. And yet there are many cases where men of this kind have, for one reason or another, left the concern and still the business went on much as before.

The plugger is a different proposition. He isn't brilliant or he wouldn't be a plugger. But he very frequently knows his job so thoroughly that it is difficult to replace him if, for any reason, he leaves. He is skilled in his particular line and there are none too many of that kind. He rarely makes a demand for more pay, because he isn't built along the genius line. And yet no business can get along with all geniuses and no pluggers. The pluggers are really the ones that keep the ship afloat.

The genius has many brilliant ideas, but being a genius, he is temperamental and you never know whether he will be on the job two days a week or six. And he is very apt to be out seeking inspiration just when you need him most.

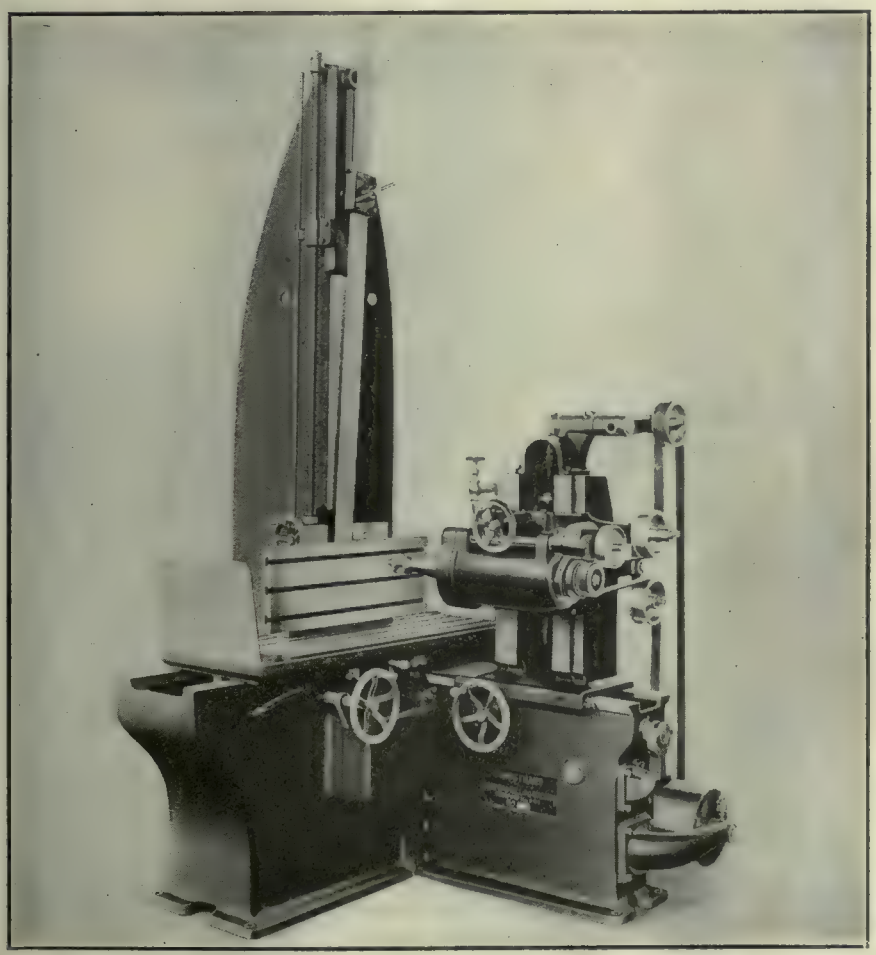
The plugger on the other hand is always on the job. You know he will be there the next morning and that any special shipment will go out on time. He is dependable in every way, that's because he is a plugger. And dependability has a very definite value to any business, even though it is not easy to measure in dollars and cents.

The plugger deserves more consideration in the way of rewards, either in cash or in some other method of payment, than he usually receives. For without the plugger we would have a hard time keeping any business steadily on its forward way.

Shop Equipment News

Sundstrand Radius, Internal and Surface Grinder

Of particular interest to the railroad or general purpose shop is the Sundstrand heavy duty radius, internal and surface grinder, recently placed on the market by the Rockford Milling Machine Co., Rockford, Ill. The principal feature of the machine is the pendulum motion for such work as grinding locomotive radius links, but the machine is easily converted for internal and surface grinding by swinging the pendulum out of the way, or removing it. The pendulum mechanism is independent of the rest of the machine.



SUNDSTRAND RADIUS, INTERNAL AND SURFACE GRINDER

A standard spindle is furnished for radius link grinding and light surface grinding, and can be adapted for internal grinding by a planetary motion, imparted through gearing which is adjustable in the spindle head while in motion. For heavy duty work a heavy grinding spindle will be furnished on order.

The base is made from two heavy castings and has bearing surfaces for the horizontal table and the spindle column. At the back of the base is bolted the vertical column for the radius bar, which also serves as the motor bracket when the machine is arranged for motor drive. This construction is evident from the illustration.

The link radius is adjustable by means of a handwheel to any length between 18 in. and 100 in. For radius grinding the work is held on the 12 x 36-in. vertical table, which is secured to the radius bar and given its oscillating motion through the horizontal table. The horizontal table measures 16x48 in. and has a 50-in. longitudinal motion through hand or power feed. The oscillating motion is automatically controlled.

The spindle column has a maximum horizontal movement of 14 in., controlled by hand, but power feed can be furnished. The spindle head has a vertical adjustment on the column of 20 in. The spindle is mounted in ball bearings in such a way that, it is stated, the wear can be taken up by a single nut. Sleeves of different sizes may be applied, and the mechanism for imparting a planetary motion to the spindle is also contained in the housing. The planetary adjustment, with a throw of $\frac{7}{8}$ in., permits grinding a hole $1\frac{3}{4}$ in. larger than the diameter of the wheel.

Motor drive is recommended and a motor of $7\frac{1}{2}$ hp. at 1,200 r.p.m. is required. An oil pump for cutting coolant is regularly furnished, together with necessary tools and splash guards. Special fixtures and attachments will be made on order.

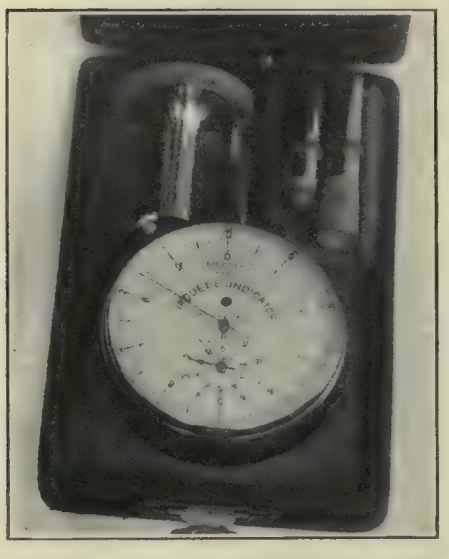
The total height of the machine is 12 ft. 2 in., and the floor space required is 81 x 114 in. The net weight is 6,800 pounds.

O-Z Direct Reading Tachoscope

A combined anti-magnetic chronometer and revolution counter, called the O-Z direct reading tachoscope, is now offered by O. Zernickow, 15 Park Row, New York, N. Y. The standard time unit adopted for this instrument is 6 sec. and, in this time, accurate readings of r.p.m. or, using the disk wheel supplied, ft. per min. may be secured.

The operation of the tachoscope is simple, as it is necessary only to hold the spindle against the revolving shaft, press the push button and let it fly back. When the pointer of the indicator comes to rest, the r.p.m. may be read directly from the dial. The operation of the push button sets

the counting mechanism at zero from the last reading and winds the watch movement. It is, therefore, unnecessary to reset the counter after each reading, since the last reading remains on the dial until the instrument is positioned for a new reading and the push button depressed. A colored disk on the dial of the counter indicates the direction of rotation and the set of graduations to



O-Z DIRECT READING TACHOSCOPE

be used. Left hand rotation and the use of the red graduations are indicated by a red disk, and the color of the right hand disk and graduations is black. One revolution of the large pointer indicates 1,000 r.p.m., or 333⅓ ft. per min. if the measuring wheel is used; and 10,000 r.p.m., or 3,333⅓ ft. per min., are indicated by one revolution of the small pointer.

The diameter of the dial is 2 in. and the net weight of the instrument is 6 oz. A carrying case, 4½ x 3 x 1¼ in., is furnished together with a rubber point, a funnel center and a measuring disk, as shown in the illustration.

It is said that the instrument is designed to stand up to 30,000 r.p.m. and is fitted with pivots and bearings suitable for such speeds.

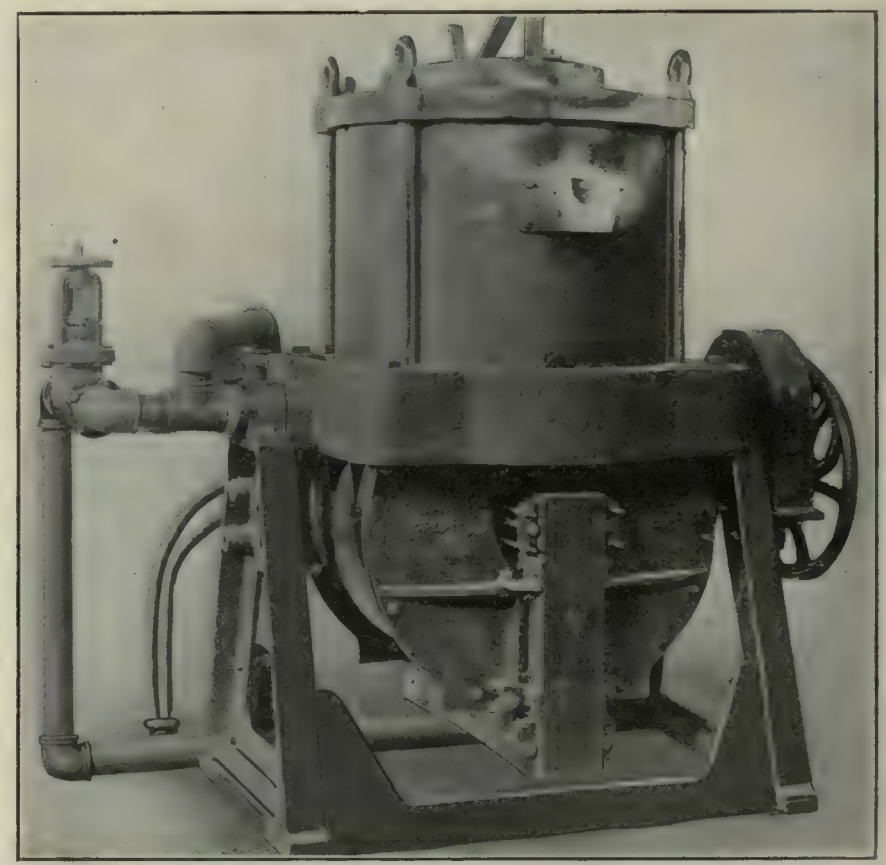
G. E. Induction Furnace for Melting Non-Ferrous Metals

A development in induction-type furnaces has recently been made by the General Electric Co., Schenectady, N. Y., and is illustrated herewith. This furnace is particularly adapted for melting non-ferrous metals.

The melting chamber, at the top of the furnace, resembles an ordinary crucible, and has a charging door on one side and a pouring spout on the other. There is also a door in the cover which may be used for charging or for a vent. Distinct from this chamber, but communicating with it through ports, is another chamber, in the form of a hollow cylinder, encircling a primary winding and one leg of a laminated core. Molten metal in this secondary chamber constitutes the secondary of a transformer and the heat in the furnace is generated by the secondary current which flows around the cylinder, through the resistance of the molten metal, when alternating voltage is applied to the primary winding. The secondary chamber is located below the melting chamber.

An important feature of this furnace is a positive circulation between the melting chamber and the heating chamber effected by the magnetic force of repulsion, which exists between primary and secondary in the transformer. An axial displacement of the primary, relative to the secondary, causes the fluid pressure due to this force to be greater at one end of the secondary cylinder than at the other. The molten charge flows from the end under higher pressure to the melting chamber, with a return flow from the chamber to the other end of the cylinder.

The furnace lining is constructed of refractory parts, previously formed and fired, assembled with cemented joints in the furnace. This construction decreases time and expense of replacement and permits inspection prior to assembly. The lining is surrounded by layers of heat-insulating material. Since the secondary chamber must be full of molten metal when starting, the furnace is at its best when operating continuously on the same kind of metal. When melting intermittently, the residual charge must be kept in a molten condition between heats by applying a low voltage sufficient to supply the radiation losses. When the furnace has been completely emptied, a priming charge of molten metal must be placed in the secondary chamber before starting.



G. E. INDUCTION FURNACE FOR MELTING NON-FERROUS METALS

It is stated that the furnace has been used on red and yellow brass and on copper with pronounced success. For yellow brass, the furnace illustrated has a total holding capacity of 1,200 lb. and a pouring capacity of 750 lb., and this capacity can be poured each hour with an input of 75 kw. which gives a power consumption of not over 200 kw.-hr. per ton. Intermittent operation increases

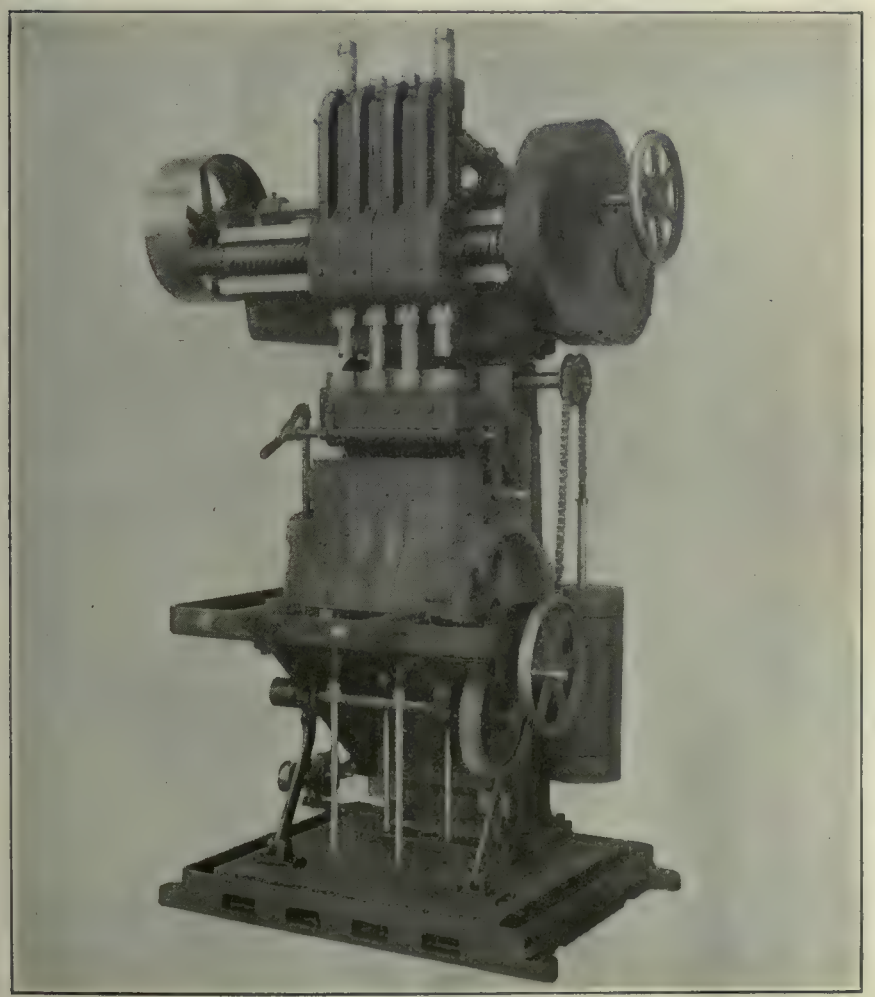
the power required by the amount necessary to supply the radiation losses during standby periods. The metal loss is less than 1 per cent.

The furnace proper is mounted on a strong frame which is provided with trunnions supported in bearings on pedestals. The form of furnace illustrated revolves about its approximate center of gravity when pouring, and another form is arranged to rotate about a line passing through the pouring spout. The former is tilted by means of a handwheel and gearing, the latter by means of a motor controlled by a standard drum switch that gives rapid and easy operation.

Moline Cylinder Lapping Machine

For lapping the bores in automobile cylinders, the Moline Tool Co., Moline, Ill., has recently developed the machine shown in the accompanying illustration. This machine is designed along the same general lines as the Moline "Hole Hog" multiple drilling and boring machines, the principal difference being that the spindles can be reciprocated vertically at any desired speed while rotating.

The machine is strongly built, in consideration of the heavy class of work upon which it is intended to operate, but it is, at the same time, comparatively simple in design and easy to operate. The machine shown in the illustration is built with four heads, but heads can be supplied for any number of cylinders. Each spindle is encircled by a bronze spiral gear, and all the gears mesh with, and are driven by, a horizontal spiral in the cross rail of the machine. Power is delivered to the horizontal spiral through a set of slip gears which can be changed when it is desired to change the spindle speed of the machine. Any desired speed of revolution or reciprocation can be obtained. A ball thrust bearing at either end of the spiral minimizes both friction and wear. The reciprocating motion is imparted to the spindles by the use of a crankshaft and connecting rods from the same kind of motor as that for which the cylinder is intended, in order that the same stroke may be obtained. The length of the stroke can, however, be changed as desired.



MOLINE CYLINDER LAPPING MACHINE

The machine is built with a stationary rail and a table that slides vertically, the table being counterbalanced so that it can be easily raised. In the machine illustrated, the table is elevated by the use of a hand wheel which operates a set of spur gears and a rack pinion, but power elevation can be supplied if desired. To operate, the cylinder block is mounted on a fixture on the table, which is then raised, with the laps entering the cylinder bores, to a point high enough so that the laps will operate in the spaces traveled by the pistons. Work can be changed quickly and easily. A set of adjustable supports underneath the table of the machine prevents the table from being lowered beyond that point which is most convenient for the operator.

The spindles are of a fine grade of steel and are hardened and ground. All bearings are of bronze, and oil cups are so situated that ample lubrication is assured. A pump and piping for supplying oil to the cylinder bores is furnished with the machine. The necessary holding and locating fixture is also standard equipment, and honing or lapping tools will be supplied if desired. A clutch pulley makes it possible to drive the machine from a lineshaft or countershaft, or direct from a motor, as desired. The floor space required is 5 ft. square and the net weight of the machine is 6,200 pounds.

"Viscolac" Finish for Wood and Metal

A new material, which is known as "Viscolac," has been developed by E. I. Du Pont De Nemours & Co., Wilmington, Del., and is now in use in many wood- and metal-working industries including the manufacture of automobiles and furniture.

"Viscolac" is a pyroxylin solution, which is developed from cotton, and provides a finish for wood and metal which, it is said, is so durable, tough and hard that it will resist high temperatures, hot or cold liquids and soap and water. It does not readily chip or crack and air-drys very quickly.

St. Louis Roller Bearing Belted Motor-Driven Grinders

The St. Louis Machine Tool Co., 932 Loughborough Ave., St. Louis, Mo., has recently made improvements in its line of grinding and polishing machines. Roller bearings are now available for the spindles, as well as babbitt and ball bearings, which were formerly supplied. Roller bearings can be furnished on the Nos. 7, 8, and 10 polishing machines, such as shown in Fig. 1, and also illustrated on page 780, Vol. 55, of the *American Machinist*. The Nos. 7, 8 and 9 grinders of the type illustrated in Fig. 2 can also be fitted with roller bearings. There are four bearings, two located close to the wheels and two close to the driving pulley. The construction is such that the parts can be easily disassembled for inspection of the bearings.

Both the polishing and the grinding machines can be arranged with motors mounted overhead for individual drive. A bracket is bolted to the rear of the pedestal and arranged to carry the motor so that it is out of the way of the operator. Means are provided for keeping the belt tight. The advantage of the arrangement is that the motor is removed from the dust and grit which is apt to be encountered at the spindle of the machine. It is in such a position that it can be easily kept cool and is always open for inspection, which would not be the case with a motor mounted directly on the spindle and completely inclosed.

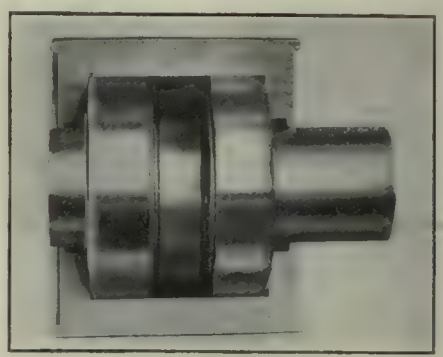
Belt guards of the type shown in the accompanying illustration can be furnished, or the top of the column may be completely closed if it is desired to drive the spindle by belt from a shaft below the floor. The machines can be furnished with both tight and loose pulleys mounted on the spindle when it is desired to drive directly from a lineshaft. In this way the spindle can be stopped when the operation of the machine is not required.

This type of drive can be employed on practically all sizes of machine, although it is here shown adapted to a large unit. On page 860, Vol. 55, of the *American Machinist*, a similar type of drive applied to a small grinding stand was illustrated, which shows the adaptability of the arrangement.

St. Louis Roller Bearing Loose Pulley

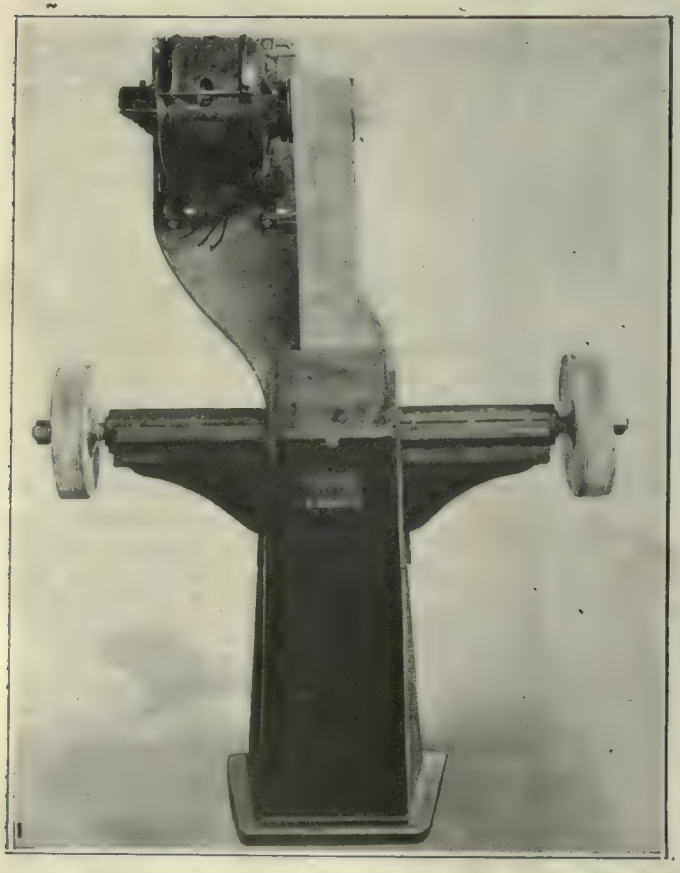
A roller bearing loose pulley manufactured by the St. Louis Machine Tool Co., St. Louis, Mo., and recently placed on the market, is shown in part section in the accompanying illustration.

This pulley is equipped with a pair



ST. LOUIS ROLLER BEARING LOOSE PULLEY

of adjustable taper roller bearings and is sold in any size from 2½ to 22 in. in diameter. For the small size the bearings are mounted directly on the shaft, and for the other sizes on a sleeve. The pulley has an oil hole and felt washers for proper lubrication of the bearing surfaces.



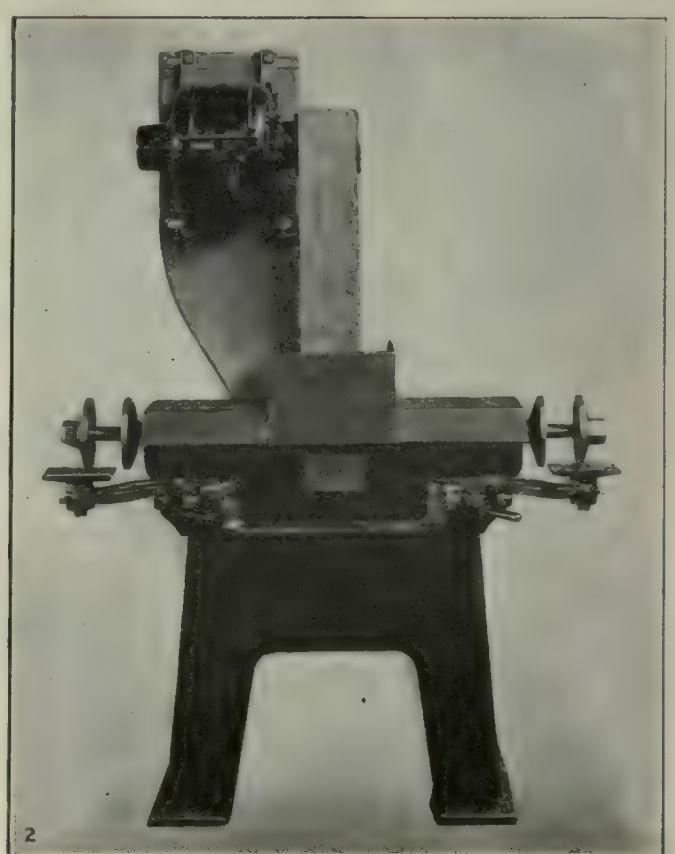


FIG. 1—ST. LOUIS MOTOR-DRIVEN ROLLER-BEARING POLISHING MACHINE NO. 7. FIG. 2—ST. LOUIS MOTOR-DRIVEN ROLLER BEARING GRINDER NO. 7

Louden Push and Pull Traveling Crane

An addition to the line of conveying machinery made by the Louden Machinery Co., Fairfield, Iowa, consists of a push and pull traveling crane, built in two sizes with load capacities, respectively, of 1,000 pounds and 2,000 pounds.

The bridge of the crane carries the crane track, consisting of a section of special Louden T-rail from which the load is suspended on a standard Louden carrier, and this crane track may be connected with any number of overhead carrying tracks running from the craneway. For aligning the crane with the outside tracks, a strong latch is arranged to catch and hold the crane track in alignment with the outside tracks while the load is being transferred from the crane to another crane or track. The crane remains locked in alignment until a chain is pulled to release the latch. When the ends of the tracks are disengaged a safety guard is automatically lowered so that loads cannot run off the open ends of the tracks. In the design of the crane an effort has evidently been made to keep the weight down as much as possible, consistent with the rated load capacity, so that the fully loaded crane may be handled by one man, who simply pushes or pulls the load in the desired direction.

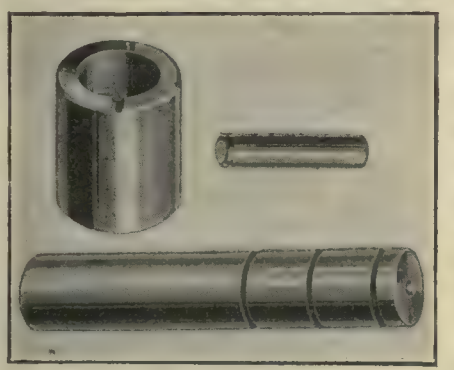
The bridge of the crane consists of two channels back to back, between which the crane track hangers are bolted. The ends of the channels rest upon malleable iron two-wheeled trucks and are securely bolted. Each truck wheel shaft runs in two Hyatt roller bearings which are mounted in dust-proof housings and fitted with grease cups. A squaring shaft, to which one wheel on each truck is fastened with setscrews, runs the length of the crane.

The 1,000 pound crane is built in spans up to 20 ft. and the 2,000 pound crane in spans up to 30 ft. It is claimed that the crane cannot be accidently thrown off the rails because it is so constructed that the ends cannot drop more than ½ in. without catching on the rails.

Danly Standard Pins and Bushings

In the manufacture of standard die sets, a line of standard leader pins, dowel pins and bushings, has been developed by Danly Machine Specialties, Inc., 4,911 Lincoln Ave., Chicago, Ill., and has recently been placed on the market.

The standard leader pins are made



DANLY STANDARD PINS AND BUSHINGS

of steel, carbonized, hardened and ground on centers to a tolerance of ±0.0002 in. from listed diameters. They are available in diameters from ½ in. to 1½ in. and in a variety of lengths from 4 in. to 9 in. Press fit allowances are made at one end.

Standard bushings are made in straight, shoulder and extra long styles. The inside diameters vary from ½ in. to 1½ in., and the corresponding outside diameters from $\frac{13}{16}$ to 2 in. They are furnished in lengths from 1½ in. to 3¼ in. An allowance of 0.0002 in. on the inside diameter is made for lapping and the press fit allowance on the outside is 0.002 inches.

The dowel pins are made of drill rod, hardened, drawn and ground. It is claimed that they can be driven in or out of holes without upsetting or bulging. Standard dowels are ground to within ±0.0001 in. of listed diameters, and 0.001-in. oversize pins are also carried in stock. Both standard and oversize pins are furnished in fifteen sizes from $\frac{5}{16}$x$\frac{5}{8}$ in. to ½x2¾ inches.

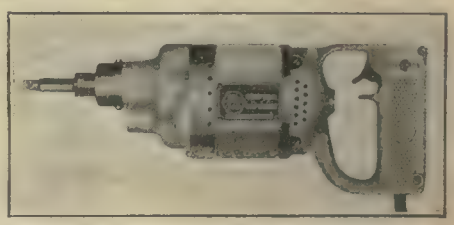
Black & Decker Light-Weight Electric Screwdriver

A recent addition to the large line of electric tools manufactured by the Black & Decker Manufacturing Co., Baltimore, Md., is a light-weight electric screwdriver, weighing 7 lb. and equipped with pistol grip and trigger switch.

The spindle, driven by a motor adapted for either direct or alternating current, carries a socket into which the screwdriver bits are inserted and held by a spring-pressed ball in a groove. No tools are required for changing bits.

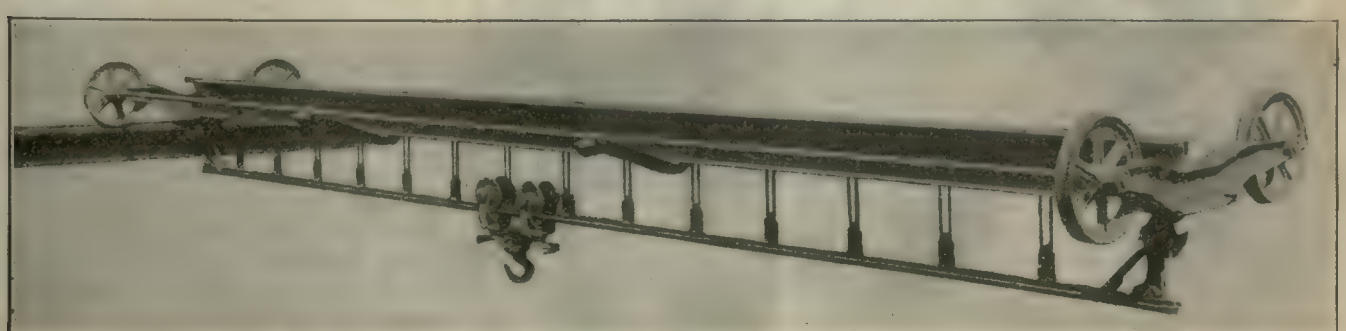
A clutch is provided so that the spindle is stationary except when pressure is applied against the screw by the operator. It is unnecessary, therefore, to start and stop the motor for each screw.

Socket wrenches can also be sup-



BLACK & DECKER LIGHT-WEIGHT ELECTRIC SCREWDRIVER

plied for the same tool thereby making it useful for running up studs or nuts. The no-load speed of the screwdriver is 350 revolutions per minute. With a proper lead hole, it is claimed that this tool is capable of driving a No. 14 wood screw 2½ in. long into hard wood, without stalling.



LOUDEN PUSH AND PULL TRAVELING CRANE

"American" Toolroom Lathes

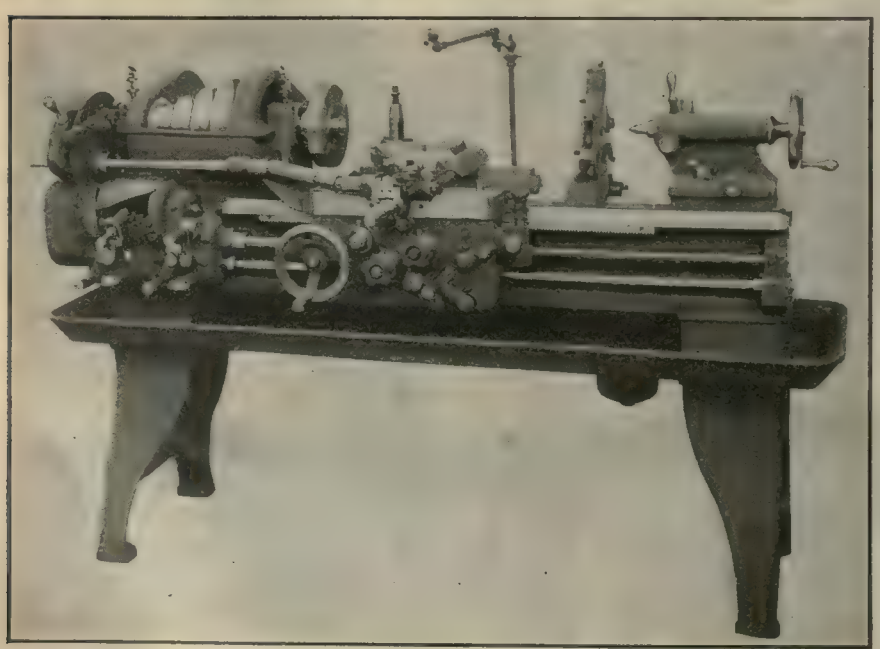
The toolroom lathe shown in the accompanying illustration is a machine that has recently been placed on the market by the American Tool Works Co., Cincinnati, Ohio. This machine can be furnished with either of three types of headstocks; namely, single back-geared head, double back-geared head or automatically oiled all-geared head. The type of head illustrated is used on all lathes up to 20 in. in size and provides eight spindle speeds, four direct speeds being afforded by the 4-step cone pulley.

A 3-step cone double-back-geared head of the quick-change, friction type is used on the larger sizes. Both the first and the second back-gear speeds on this head are secured by means of a frictional connection between the back-gear shaft and the gears. With this friction type of head it is claimed that changes can be made instantaneously from one back-gear range to the other without stopping the lathe, and that convenient control of starting and stopping is had by means of the speed control lever at the front.

The automatically oiled all-geared head provides twelve spindle speeds in geometric progression. This head is under instant control through either of two levers, one located at the right side of the apron, the other at the left side of the head. These levers operate a friction clutch incorporated in the driving pulley, or in the driven gear if the machine is motor driven. An external band brake operates in unison with the friction clutch, being engaged when the friction is released. This head may be used with a variable-speed motor drive by removing one gear unit and its operating lever and thereby producing four mechanical speed changes instead of twelve.

By means of a geared pump located inside the head, oil is pumped from a reservoir in the bottom of the head to a filtering and distributing tank in the head cover. After filtering, the oil gravitates to the various head bearings through oil pipes leading from the filter reservoir. Since the oil pump supplies considerably more oil to the reservoir than the bearings will consume, the surplus overflows and cascades over the gear teeth.

Either an a.c. or d.c. constant- or variable-speed motor is used for individual motor drive. It is mounted on a planed pad on top of the head and is connected by means of three helical gears to the initial shaft in the head. Other types of motor mountings, such as belt or silent chain connection between motor and driving shaft, or a motor mounted on the rear of the cabinet leg and belted to the driving pulley, may be supplied. Electrical apron control, which provides start, stop and reverse, is part of the regular equipment on motor-driven lathes. Mechanical control, with start, stop and brake, is provided for other types of drive, in the regulation manner.



"AMERICAN" CONE-HEAD TOOLROOM LATHE

A "drop V" type of bed is used which gives an additional turning capacity over the nominal swing. The apron is of the double-plate, box construction, giving all studs double support. It has steel gears and a removable rack pinion. Except on the 12-in and 14-in. lathes, the tailstock is provided with four clamping bolts for binding it securely to the bed, the two rear bolts being carried to the top of the barrel for convenience in clamping. The compound swivel is rectangular in form, and on all sizes above 16 in. it is equipped with four bolts for clamping into position. Full length taper gibs are employed on both the top and bottom slides of the compound rest.

The lathes are furnished in all sizes with the lead screw and feed rod independent of each other. The lead screw is preserved exclusively for threading, while the feed rod is used for all other feeding operations. On these machines no speeding up nor compounding is required to secure the coarse leads and feeds, the power transmission to the carriage on heavy work being direct through the cone and tumbler mechanism. An auxiliary quadrant in connection with the quick-change mechanism permits the application of change gears for cutting special threads not provided in the regular thread range. All bearings have renewable bronze bushings that are constructed to form annular oil containers, and feed the oil to the bearing by means of a felt strip inserted in a slot cut in the bushing.

Equipment which may be furnished includes taper, draw-in, universal and plain relieving attachments, collets, special coarse and fine thread ranges and metric screws.

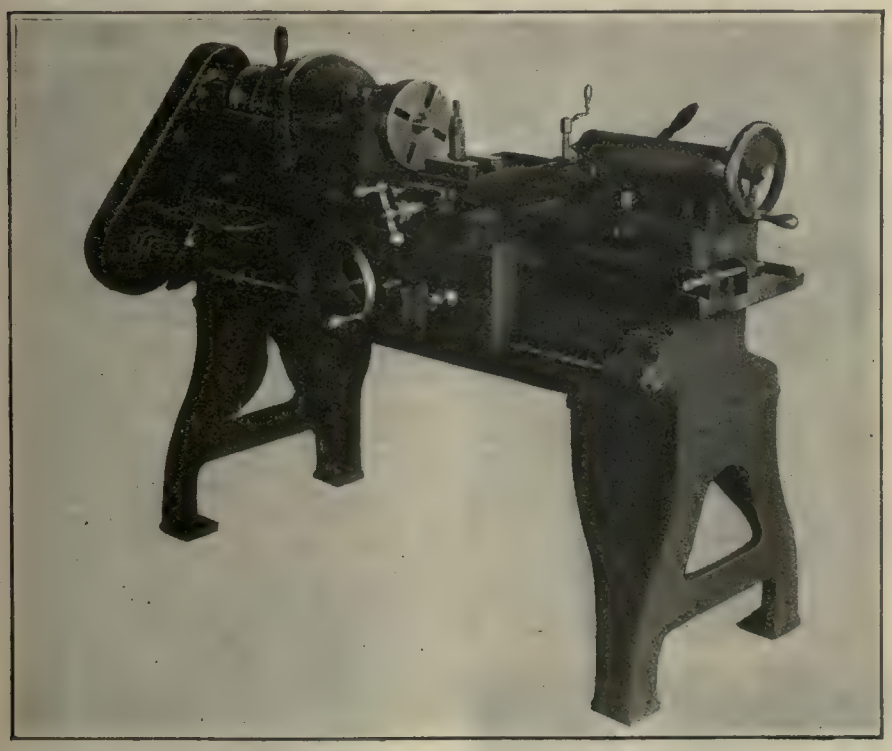
The machines are built in eight sizes ranging from 12 to 27 in. inclusive. The actual swing over the bed ranges from 14½ to 30½ in. and the base length of bed from 5 to 10 ft. The boxed weight without attachments of the all-geared-head lathes ranges from 1,870 lb. for the smallest size to 10,050 lb. for the largest, and the space occupied by the same lathes when boxed ranges from 52 to 191 cu. ft., respectively. The boxed weight of the double back-geared-head machines ranges from 1,680 to 9,100 lb. while the single back-geared-head weights range from 1,650 to 4,000 lb. The space occupied by these machines ranges from 50 to 189 cu. ft. and from 50 to 79 cu. ft., respectively.

Lynd-Farquhar Taper Turning Lathe

The Lynd-Farquhar Co., 419 Atlantic Ave., Boston, Mass., has recently placed on the market a lathe that is expressly designed for turning tapers.

The main feature of the lathe is an upper or auxiliary bed, capable of swiveling about a point midway of its length, and upon which the ways for the headstock and tailstock are machined. The ways upon which the carriage traverses are integral with the main bed.

The tailstock is provided with the usual wrench-operated clamping bolt which not only locks it against endwise movement upon the swivelling bed, but also clamps the latter to the main bed. Two eccentric clamps, operated with the same wrench, have a like function with respect to the headstock.



LYND-FARQUHAR TAPER TURNING LATHE

To turn any taper within the range of the lathe, the clamps of both head and tail stock are loosened and the upper bed is swung out of parallel with the main bed. The amount of departure from parallelism is indicated by the position of a witness mark in relation to a graduated sector at the end of the bed. The upper bed may be swung in either direction, the range being sufficient to turn any commercial taper.

At whatever angle the upper bed is swung, the live and dead centers remain in line with reference to each other, and the work thus retains a full and true bearing upon the centers. The line of centers is not, however, parallel to the line of traverse of the carriage, and the resultant work is, therefore, tapered to an included angle equal to twice the amount of departure as indicated upon the graduated sector. With the witness mark at the zero line of the sector, the lathe will do straight turning.

As the lathe is designed to do only plain turning upon comparatively small diameters, it has neither lead screw, change gears nor back gears. It is driven by a 3 in. belt to the three-step cone of the headstock and has but three spindle speeds, unless a multiple speed countershaft is used. A splined feed shaft along the front of the bed traverses the carriage through the usual mechanism. A clutch and knockout rod, with adjustable dogs, stops the feed automatically at any predetermined point.

Because of the sidewise movement of the headstock when setting the lathe to turn tapers, gears cannot be used to transmit power to the feed shaft, and a silent chain is therefore used instead. Five sprockets are furnished, and with such diameters that, by combining them in different ways, nine changes of feed are obtainable. Sprockets of other diameters for additional changes of feed can be furnished if desired.

The feed chain drives a gear that revolves upon a stud at the end of a short arm, the arm being pivoted upon the axis of the feed shaft. Angular adjustment of this arm compensates for varying sprocket center distances caused by the sidewise movement of the head, and maintains proper tension upon the driving chain.

The apron of the carriage is double and supports the gear studs at both ends. All studs are hardened and ground and are bronze bushed. The feed worm and wheel are enclosed and run in oil. Felt wipers at the ends of the carriage wings keep the ways free from dust and chips. The cross-slide is of the "rise and fall" type with wide and heavy bearing surfaces. The elevating screw passes through a ball nut, which allows the screw to adjust itself to varying angles, and is enclosed by dust caps and felt washers to exclude dirt. The barrel of the tailstock overhangs, so that the extra width of the carriage does not prevent the cutting tool from being brought close to the tail center.

The spindle is of steel, hardened and ground, and runs in composition bearings. A large thrust bearing sustains the endwise pressure of the cut. The cone pulley runs upon independent ball bearings and is locked to the spindle by a friction clutch which is operated by a conveniently placed lever. With the cone running continuously, the spindle may be stopped and started by means of this clutch lever which, in reverse position, operates a brake for stopping the spindle quickly.

The lathe swings 16 in. over the ways and 5½ in. over the carriage. A distance of 16 in. is available between centers in the extreme position of the tailstock. It occupies a floor space of 6½x2½ ft. and weighs 2,000 pounds.

Kulp "Theft-Proof" Electric Lamp Bulb

An electric lamp bulb that is so constructed that it is practically impossible to remove it from a socket into which it has been screwed, has recently been placed on the market by Lester Kulp, 7732 N. Marshfield Ave., Chicago, Ill.

The bulb is made with a porcelain base, over which is slipped the brass

sleeve that is threaded to screw into the lamp socket. Assembling this sleeve to the bulb is the last operation in the process of manufacture, and just before the sleeve is put on, a few drops of hot solder are dropped into a vertical groove in the base. When the solder cools, it adheres to the



"THEFT-PROOF" ELECTRIC LAMP BULB

sleeve and holds it solidly on the base. When the lamp is put into service, it is screwed into a socket until the sleeve is in the full depth of the socket, then the lamp is given an extra turn which shears the solder. The bulb can now be turned either way without breaking the contact, but cannot be unscrewed from the socket while it is uninjured. If a lamp becomes damaged so that it is unfit for service, it can be removed by breaking the bulb and inserting the finger into the sleeve.

Chrobaltic "Five-Armor" Heat-Treating Containers

The containers illustrated herewith are for the purpose of holding tools made of high-speed steel during heat-treatment, and have been recently placed upon the market by the Chrobaltic Tool Co., 509 Railway Exchange Building, Chicago, Ill.

Since the heat-treatment of high-speed steel requires a temperature of from 2,200 to 2,210 deg. F., ordinary containers used for this purpose are comparatively short lived. It is claimed for the "Five-Armor" containers that they can be subjected to 2,350 deg. F. without injury.

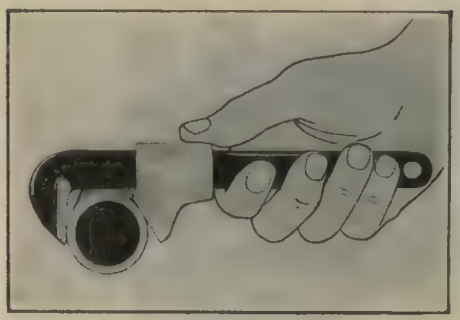
Tools to be heat-treated should be placed in a container and packed in charcoal. The cover is then put on. The box and contents are first preheated and then raised to the temperature point in the critical range where the carbide transformation takes place.



CHROBALTIC "FIVE-ARMOR" HEAT-TREATING CONTAINERS

Albany "Red and Ready" Wrench

The Albany Hardware Specialty Mfg. Co., Albany, Wis., is now marketing a wrench of the quickly adjustable type, called the "Red and Ready Rench."



ALBANY "RED AND READY" WRENCH

The tool is constructed of tool steel, drop forged, properly tempered and finished in red enamel. It is quickly adjustable for various sizes of nuts, bars or pipes, and can be used, it is said, to seize and turn pipes and bars which are located close to wall or floor. It is claimed that, by proper manipulation, the wrench will operate on a hex nut in a manner similar to a ratchet wrench. The 7-in. size has sufficient capacity for 1-in. pipe, 1$\frac{5}{16}$-in. round bar or $\frac{3}{4}$-in. hex nut.

Twin Disc Clutch Pulley

The Model B-14 Twin Disc Clutch manufactured by the Twin Disc Clutch Co., Racine, Wis., has recently been adapted for use on machine tools, and is now being marketed. The illustration shows the salient features of the device.

The belt pulley runs loose on the shaft and is provided with an oilless bronze bushing. The saw-steel driving plates, which are faced with asbestos friction material, are fastened to the pulley and project between the plates of the driven member, which is splined to the shaft. The outer end of the driven member is threaded for a ring upon which the releasing levers are pivoted. The ring is prevented from turning by a spring-pressed pin arranged to enter one of a series of holes in the movable plate. Adjustment for the friction surface wear is made by pulling out this pin and turning the releasing mechanism clockwise until the pin enters the next hole. Release springs between the plates of the driven member eliminate drag.

These clutches can be furnished



TWIN DISC CLUTCH PULLEY

in five sizes, ranging from 6½ to 14 in. in diameter and in capacity from 1.6 to 5 hp. Elimination of countershafts, decreased belt maintenance and ease of adjustment are among the advantages claimed.

News Section

Railroad Performance in First Half of Year

New high records for six months' traffic and efficiency were established by the railroads of the United States, as a whole, according to a report of the Car Service Division of the American Railway Association. The report emphasizes the fact that the railroads have achieved in the first six months of 1923 all the aims set forth in the program of the Association of Railway Executives on April 5 of this year.

The achievements of the railroads are outlined as follows:

"In the first six months of 1923 the railroads hauled the largest traffic ever hauled in any six months in their history.

"In June, 1923, they hauled the largest traffic ever carried in any one month.

"For the week ended June 30, they loaded 1,021,770 cars with revenue freight, exceeding the largest previous week's loading in history by 3,231 cars.

"In the first six months of this year 79,240 new freight cars were put in service and 1,998 new locomotives, leaving July 1, on order 96,855 freight cars and 1,902 locomotives.

"The total number of bad order freight cars has been reduced from 216,011, or 9.5 per cent in January, to 190,411, or 8.4 per cent in July.

"Bad order locomotives have been reduced from a total of 15,549, or 24.1 per cent on Jan. 1, to 11,450, or 18 per cent July 1. Locomotives in need of heavy repair have been reduced from 13,587, Jan. 1, to 10,326, or 16.2 per cent, in July.

"The number of repaired locomotives and cars turned out of the railroad shops per month has far exceeded the performance of previous years.

"The average daily movement of all freight cars has been increased from 27.9 miles in April to 28.6 miles in May.

"The reserve bituminous coal stocks have been increased from 6,756,886 tons, Jan. 1, to 10,667,371 tons in July of this year."

Increase Given Shopmen By N. Y. Central

The 30,000 shopmen employed on the New York Central R.R. were given an increase of 3 cents an hour by an agreement entered into by Vice-President J. G. Walborg for the road and a committee from Shop Craft Federation No. 103, headed by Bert M. Jewell, president of the railway department of the American Federation of Labor.

The increase is retroactive to July 1, and makes the rate for mechanics 73 cents an hour. Prior to the strike of 1922 the rate was 77 cents.

Indirectly the increase affects 25,000 men employed on the Michigan Central R.R. and other lines leased by the New York Central R.R. with which agreements are to be made, the subsidiaries usually following the lead of the operating company.

The agreement also provides for changes in shop rules which, pending action by the unions, were not announced last night. Unofficially it was stated that the matter of piece rates, in which the Central has insisted upon maintaining the system in such shops as it has been introduced, was left open.

Brig. Gen. Peirce Dies in Washington

Brig. Gen. William S. Peirce, assistant chief of the Ordnance department, died recently in Washington, D. C. Gen. Peirce was exceptionally well known among machine tool makers, especially those who dealt with the government during the war.



BRIG. GEN. WILLIAM S. PEIRCE

He was born in Burlington, Vt., in 1864 and after attending the University of Vermont for three years he was appointed to the United States Military Academy from which he was graduated in 1888 and assigned to the artillery. During his military career he was at the Watervliet Arsenal, the Springfield Armory, the Sandy Hook Proving Ground and the Rock Island Arsenal. For a short time he was stationed at the Midvale Steel & Ordnance Co. plant.

On Feb. 13, 1919, Gen. Peirce received the decoration of the Distinguished Service Medal for his exceptional work performed at the Springfield Armory of which he had charge. It was at the suggestion of Gen. Peirce that the American Society of Mechanical Engineers undertook the revision of certain of the War Department's specifications with the idea of making the Ordnance department's design conform more nearly to recognized commercial practices.

Railroads Good Buyers in Chicago

Dealers in the Chicago district report a rather slow movement of machine tools this week. Industrial buying is particularly dull. The Santa Fe and the Illinois Central R.R. closed on machine tool orders which were pending for some time and the Pere Marquette bought about fifteen machine tools for its shops. Jos. T. Ryerson & Son and Manning, Maxwell & Moore are said to have received the major part of these orders, and rumor has it that the latter was the principal seller to Battey & Kipp, the engineers who made rather extensive purchases for the Denver & Rio Grande. The Chicago, Burlington & Quincy Ry. has not yet placed orders on the large list which it issued some time ago.

Labor shortage in Chicago and Illinois has practically disappeared. According to the State Department of Labor, there are now approximately a hundred applicants for the same number of positions. The Chicago Branch of the National Metal Trades Association conducts an employment department which is an excellent barometer of employment conditions. That department reports an adequate supply of skilled workers including tool makers and general machinists. The metal trades plants are slowing up in operations, although June was the banner month in point of activity for Illinois industries since the improvement phase of the current business cycle began, according to the State's statistician. Production even showed a moderate tendency to expand over the previous high point reached in May which is a remarkable condition.

After several weeks of almost complete inactivity, sellers of pig iron noted with satisfaction the receipt of several inquiries from foundries for a few thousand tons of iron.

Holslag Wins Transformer Patent Suit

The decision of the examiners-in-chief of the patent office awarding priority of invention on an apparatus for and a method of arc welding with alternating current and relating particularly to a transformer having a special arrangement of primary and secondary coils and a so-called flux diverter, to Claude J. Holslag, has been confirmed by the Commissioner of Patents.

The original action was brought by Charles B. Walters who claimed to have been the inventor, but after an exhaustive examination of evidence it was decided that Mr. Holslag was the inventor and that the Electric Arc Cutting and Welding Co., Newark, N. J., owner of the patent, has the exclusive right to make and market. With this decision as the authority, the company states that prosecutions will be commenced against any users of tools having the infringed patent.

Indiana Expecting Busy Autumn

The market seems suddenly to have fallen below normal in the machinery business in Indianapolis. Reports from various of the larger dealers show business to be anything but satisfactory. Much of this is attributed to the season of the year. Many executives of the larger factories and purchasing agents are away on vacations and those, with whom the final decision rests seem to be missing when the dotted line is presented for signatures.

General industrial conditions also are having much to do with the situation. Those industries closely allied with the construction business seem to be the only ones to show any particular life. Dealers in brick-making machinery are having a better business than had been expected. The last year has seen more activity with brick manufacturers than any in history and the plants, which have been run continuously since shortly after the first of January are beginning to show wear and tear. Manufacturers and dealers in saw mill machinery say their business is holding up well and from indications will continue until late in the fall.

With the approach of the wheat harvest there is developing some activity among flour milling interests. Officials of the Nordyke & Marmon Co. here, manufacturer of this sort of machinery, say in view of wheat prices there is likely to be a lot of wheat held by the farmers for better bids, but this is having little effect on repairs and installations in the flour mills. Decreases in flour prices will mean more business for the mills which means more machinery. Road building machinery and special machinery for maintenance purposes is in big demand, branch house managers here say.

The tool business is not showing a satisfactory volume. Most of the large railroad shops here have cut their working forces to minimum, the divisions having terminals here having nearly completed their rehabilitation programs as planned early in the year.

Buying Continues in New York District

The Summer season of quietness is upon the Metropolitan district and dealers in all lines report that business is not as brisk as it has been during the other months of the year. This condition was not unexpected and most dealers are content with making a comparison with the same period last year when business was practically at the vanishing point. This July there are at least signs of improvement and a most hopeful future to look forward to. The Fall promises big business and indications are that the opening will be early.

Railroads are still buying for shops and fair sized orders are reported by several dealers who sell to the carriers. Machinery for repair work in automobile plants is also finding a market due to the let up in automotive production that gives the manufacturers a chance to overhaul their plants. There is not much encouraging news from the textile districts, but industrials seem to have gained ground and buying is reported from several centers.

The used tool field is not as active as it was, but as in the case of the new tool field those in the business state that the cause is merely the warm weather and not connected with economic conditions.

One dealer states that he will be much surprised if business does not resume its usual proportions by Aug. 15, while another dealer expresses the belief that September will be early enough for the renewed activity.

No Slump in Cincinnati Business

The machine tool houses in Cincinnati are keeping up about the same volume of business during July as they did in June. Some of the manufacturers say that orders have declined since last month while others state positively that their production is larger this month than last. Considering the fact that it is now mid-summer, orders coming in to the local plants and production of the various machine tool companies show that business is at least normal. In most cases it is better than it was at this time last year.

Although the Department of Labor at Washington recently made public a statement saying that there is an acute shortage of labor in the Cincinnati district, Cincinnati machine tool manufacturers find that the labor situation is better now than it has been for several months. The shortage has not been noticed to any great extent in the machine tool industry of this city.

Railroads are still actively in the Cincinnati market, although they are not buying as heavily as they were several weeks ago. The Chicago, Burlington & Quincy R.R. has purchased a large number of engine lathes here since the first of the year. The Atchison, Topeka & Santa Fe R.R. also has been a heavy buyer of lathes. The Pennsylvania, New York Central, Southern, Northwestern and Michigan Central railroads have been in the local market lately making purchases of machine tools.

Business is fair at present among those plants turning out conveying machinery. Many inquiries, however, are coming in which are expected to develop very soon into good business. Here the automotive and textile manufacturers are doing some active buying. The General Motor Co. and the Ford Motor Car Co. have been buying standard equipment. It is anticipated that the conveying machinery houses will have an increase in orders within a short time.

Machinery for the gas industry is being sold to some extent in the Cincinnati market. Business on machinery in the Pittsburgh territory is good for Cincinnati manufacturers. Westinghouse and the General Electric Co. have been doing constant buying in the Cincinnati market and have been big factors in keeping the volume of sales up to a high standard.

One of the Cincinnati machine tool houses states that it has exported a few radial drills recently to Japan. Other companies say that they have been doing a small export business which, however, does not mount to large figures. Railroads have been in the market for radial drills and some orders have come in from the Pacific Coast. Ball-bearing machines are being sold to automotive concerns in satisfactory numbers.

Robert W. Hunt Suddenly Dies in Chicago

Robert Woolston Hunt, founder and president of the Robert W. Hunt Co., of Chicago, died at his home in that city on July 11, at the age of 84 years. Funeral services were held in Chicago on July 13 and interment the following day at Troy, N. Y.

On Dec. 9, 1838, Mr. Hunt was born in Fallsington, Buck Co., Pa. He spent several years learning the practical side of iron making in the rolling mills of John Burnish & Co., Pottsville, Pa., and later took a course in analytical chemistry in the laboratory of Booth, Garrett & Blair. Upon the completion of this he entered the employ of the Cambria Iron Co. of Johnstown, Pa., and for them, on Aug. 1, 1860, established the



ROBERT WOOLSTON HUNT

first laboratory in America as a direct part of an iron or steel organization.

In the fall of 1861 he entered the U. S. military service and was in command of Camp Curtin at Harrisburg, Pa., with the rank of captain. Upon being mustered out of service he returned to the employ of the Cambria Iron Co. and was sent by it to the works at Wyandotte, Mich., where experiments with the new Bessemer process of making steel were being conducted. He was placed in charge of the experimental works in July, 1865, and so continued until May, 1866, when the Cambria company called him back to Johnstown to take charge of its steel business. It was at this mill later, and largely under Mr. Hunt's direction, that the first commercial order for steel rails ever made in America was rolled.

Later he assisted in designing and building the Bessemer works of the Cambria plant and in 1873, moved to Troy, N. Y., to become superintendent of the Bessemer works of John A. Griswold & Co., and in 1875 he became general superintendent of the Albany & Rensselaer Iron & Steel Co. During those years of active connection with steel rail manufacture he almost completely rebuilt the various works of this company and he also patented many

details of iron and steel metallurgical processes and machinery, including in conjunction with others, the first automatic rail mill tables.

Upon leaving Troy in 1888 he removed to Chicago and established the bureau of inspection, tests and consultation now known as the Robert W. Hunt Co.

Mr. Hunt was twice president of the American Institute of Mining and Metallurgical Engineers, past-president of the American Society of Mechanical Engineers, past-president of the American Society for Testing Materials, and past-president of the Western Society of Engineers. He was also a member of various other technical societies both in this country and Europe. Just one day before his death, the board of directors of the American Society of Civil Engineers had made Mr. Hunt an honorary member.

In 1912 Mr. Hunt was awarded the John Fritz medal for his contributions to the early development of the Bessemer process and in June of this year he was given the Washington award of the Western Society of Engineers in recognition of his achievements. He was for many years a trustee of the Rensselaer Polytechnic Institute and in 1916 received from it the honorary degree of Doctor of Engineering.

Mr. Hunt was a member of a large number of clubs, including the Chicago, Mid-day, Saddle and Cycle, and the South Shore, Glen View and Chicago Golf clubs. He was married in 1866 to Miss Eleanor Clark, of Ecorse, Mich., who survives him.

Personals

A. S. MOODY, assistant Northwest manager of the General Electric Co., has been appointed local manager of the Los Angeles office of the same company, to succeed R. L. CASH, who has been transferred to Schenectady. Mr. Moody is well known in the electrical industry on the Pacific Coast, having been identified with the General Electric Co. in that section for the past 16 years.

WILLIAM WHIGHAM, vice-president of the Carnegie Steel Co., Pittsburgh, Pa., has been elected a member of the executive committee of the citizens' committee on the city plan of Pittsburgh. During the past year he served as chairman of the citizens' committee on waterways.

P. F. FREEMAN, formerly engineer of tests with the Pittsburgh Testing Laboratory, has opened offices as a general consulting engineer in Pittsburgh.

H. A. SCHAUPP, of Johnstown, Pa., has been appointed secretary to W. W. Welsh, superintendent of the open hearth department of the LaBelle works of the Wheeling Steel Corp., Wheeling, W. Va., and has entered upon his duties.

FRANK N. SPELLER, metallurgist of the National Tube Co., Pittsburgh, Pa., has had the degree of doctor of science conferred upon him by the University of Toronto, Ont.

L. F. CARLETON has become Western representative of the Martin Marking Machine Co., of Turner's Falls, Mass. His headquarters will be in Chicago.

NORMAN BENSON, of Benson Bros., Australia, is visiting manufacturers in this country.

PROF. ROBERT H. SMITH, head of the mechanical laboratory at the Massachusetts Institute of Technology received the honoray degree of Master of Science at Rhode Island State College recently. Prof. Smith has been identified with M.I.T. for many years and is well known in the machine tool industry.

FRANK J. JARECKI has purchased the Manhattan Machine & Tool Works, Grand Rapids, Mich., and has changed the name of the concern to the Jarecki Machine & Tool Co. Mr. Jarecki was president and manager of the old company.

J. J. SIEFEN has left the Grand Rapids Brass Co. where he has been superintendent for the past two years and has become the manager of the Bennett Brass Co. which he has organized at a capitalization of $150,000. The Bennett company has purchased the assets of the Regle Brass Co. of Greenville, Mich.

CHARLES F. WOLCOTT formerly with the Pennsylvania R.R. has been appointed district manager of the car service division of the American Railway Association with headquarters at Pittsburgh.

JAMES E. AUTEN, for three years general purchasing agent for the LaFayette Motors Corp., Milwaukee, has been appointed works manager of the four-cylinder car division of the Nash Motors Co., in Milwaukee and assumed the duties July 15. B. W. TWYMAN, general manager of the division since its establishment four years ago, and GEORGE BECHTEL, for a similar period general superintendent, have resigned.

FRED H. DORNER, M. E., vice-president of the Milwaukee Engineering Society, and territorial sales representative of several large machinery manufacturers in Milwaukee and Wisconsin, has been elected the first president of the Professional Men's Club, International, just organized in Milwaukee. WALTER C. LINDEMANN, chief engineer and secretary, A. J. Lindemann & Hoverson Co., manufacturer of stoves, ranges and electric heating appliances, has been elected a director.

CHARLES W. MCKAY has been appointed manager of the division of valuation and appraisement of the Roberts-Pettijohn-Wood Corp., consulting engineers, Chicago. Mr. McKay was formerly president and general manager of McKay & Sherman and later of Charles W. McKay and Associates, valuation engineers.

Business Items

The new $500,000 foundry and shops of the National Cast Iron Pipe Co., at Birmingham, Ala., will be completed and ready for beginning operations about Aug. 15, officials of the company advise. The plant is equipped to make pipe under what is known as the De Levaud process.

The foundries and shops of the William J. Oliver Manufacturing Co., of Knoxville, Tenn., a company which went into the hands of a receiver some months ago, were purchased at auction this month for $100,000 by L. C. Gunter, of Knoxville, who has been acting as receiver since the failure of the company. Mr. Gunter's bid was the only one received, and he was acting for the bondholders. The plant, which is one of the largest of its kind in the South, has been estimated to be worth up to half a million dollars.

Fire of undetermined origin completely destroyed the building and all equipment of the foundry and shops of the Midway Foundry Co., of Burlington, N. C., July 10, causing a loss estimated at about $60,000, little of which was covered by insurance. It is understood that the plant will be rebuilt this summer.

The Shenango Furnace Co., Pittsburgh, Pa., operating a blast furnace at Sharpsville, Pa., is arranging for the rebuilding of the portion of the subsidiary works recently destroyed by fire, with loss estimated at about $35,000, including equipment.

The Cincinnati Enameling Co., of which Robert Heuck is president, will establish its business in one of the former plants of the Cisco Machine Tool Co., Elmore St. and the Baltimore & Ohio R.R., Cincinnati. The enameling company has secured a long lease with the privilege of purchase. Posesssion is given immediately and the new concern expects to start installing its equipment early next week.

A $60,000 structure is to be erected by the William Stacey Storage Co., Cincinnati. It will be of reinforced concrete and will be used for a warehouse and light manufacturing.

The William Powell Co., valve manufacturers, Cincinnati, will start work shortly on a $70,000 addition to its present plant.

Obituary

SAMUEL VANCAMP, vice-president of the VanCamp Hardware & Iron Co., Indianapolis, Ind., died July 5, in the New York City Hospital.

Mr. VanCamp, who was a son of Cortland VanCamp, founder of the VanCamp company, had not been active in the management for some time. He suffered a stroke of apoplexy six years ago and had been a semi-invalid since then. After spending the Winter at Miami, Fla., he, accompained by his wife and daughter, Lillian May VanCamp, sailed for France, in May, to obtain the services of a specialist in Paris. His condition became critical and the family returned to this country Sunday on the Aquitania. He was forty-five years old.

ROGER P. REDIER died recently in Paris. Mr. Redier was formerly European manager of the Allied Machinery Co. of America and had been manager of the Paris office of R. S. Stokvis & Son. He was well known to many machine tool makers in this country.

J. HARRY KITT, aged 57 years, died recently at Niagara Falls, N. Y. Mr. Kitt was for many years the traffic manager for the Carborundum Co. and was an authority on traffic matters.

News of Washington Activities

By Paul Wooton

THE storm center of the anthracite report of the United States Coal Commission is the recommendation that the President be authorized to declare a national emergency, in case of a deadlock between operators and mine workers and be empowered to take over the operation of mines and the distribution and marketing of the product. The operators fear that this would prove to be nationalization's entering wedge. Labor objects to it because there at least would be the coercion of public opinion brought to bear to make men work against their will. The public, however, seems to regard the measure with favor, not that it is anxious to see the Government undertake any business activity, but because it believes the industry will avoid any invoking of the emergency powers and with that alternative hanging over them will reach an agreement.

The recommendation of the Coal Commission in regard to emergency powers simply brings to the fore one of the big issues in our national life, it is pointed out. It has been recognized with increasing appreciation that some means must be found to break a deadlock between employer and employee when the continuance of that deadlock affects importantly the public welfare. The fact that the Coal Commission has made a concrete suggestion for the handling of such a situation insures the consideration of that and alternate plans at the forthcoming session of Congress.

The fact that the Commission has endorsed, in effect, a combination of big business interests, under suitable regulation, throws into the congressional arena another highly controverted problem of our industrial life. It has been very popular in Congress for many years to lambaste any large business enterprise on the assumption that being big is evidence of its predatory character. Opinion, even in Congress, is changing to the point where the efficiencies of big business and the various benefits to the public of combinations, are becoming apparent. It is true that the Coal Commission admits the possibilities of unjustifiable profits on the part of the anthracite combination, but on the whole its report shows that it was not afraid to commend it despite the fact that it is big.

New Light on Big Business

The other outstanding feature of the situation is the furor created by the published statement that the Attorney General influenced the report of the Commission. Members of the Coal Commission denounce the statement as being entirely false. No one acquainted with the Commission's membership would believe for a minute that they would brook any political interference with their findings. The difficulty is that there is a large number of persons within the coal industry more than anxious to believe the tale. In addition there is a portion of the public always willing to believe a story of sinister motive. It is admitted that the allegation has carried further than most untruthful statements. For that reason it will not be surprising if the Commission should take rather drastic and unusual methods to establish the malicious character of this charge.

The report reveals that the Commission believes the public is entitled to sit as an observer in the affairs of business. It is something like the position of the administration toward European affairs. Mr. Harding does not believe the Nation should accept any of the responsibilities of the reparations commission, but he has a very decided opinion that the United States is entitled to know what the Commission is doing. The Coal Commission is very determined in its belief that the Government should stay out of the coal business, but it believes it should know what is going on in that industry.

There are some engaged in the coal business who believe it would show the proper spirit were the industry to subscribe to some such sentiment as this: "We accept the main idea of the report that the public, through the Government, is entitled to know what we are doing. We are gratified to know that the public wants us to continue the conduct of this business. We think we can handle it better than anyone else. We agree with the Commission that we have a responsibility in providing uninterrupted service."

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb....	$0.0337	$0.034	$0.0276
Cold finished shafting.....	per lb....	0.0428	0.042	0.0355
Brass rods.....	per lb....	0.1825	0.1850	0.1650
Solder (½ and ½)	per lb....	0.276	0.2862	0.21
Cotton waste...	per lb....	0.1231	0.1231	0.101
Washers, cast iron (½ in.)...	per 100 lb.	4.66	4.66	3.83
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100...	3.08	3.08	3.11
Lard cutting oil	per gal...	0.575	0.608	0.575
Machine oil....	per gal...	0.349	0.349	0.36
Belting, leather, medium.....	off list....	37%	42½%	46⅔%
Machine bolts up to 1x30 in.	off list....	44¼%	44¼%	53⅓%

Philadelphia Experiences Busy Summer

Manufacturers of high tension power equipment in Philadelphia had a larger volume of business in the first six months of this year than in the twelve months of 1922. There is a lively demand for substation equipment from the Northeast and middle Atlantic and Southern states, it was said by J. H. Dilks, general manager for the Electric Power Equipment Corp., producer of equipment from 7,500 to 220,000 volts.

This company has recently established an agency in South Africa, and orders for its equipment have come from there. There was some falling off in the orders last month compared to the month before.

Philadelphia manufacturers of textile machinery have had some orders sent to New Zealand, but the general foreign business has not been good. Production of textile equipment has not been as great in Philadelphia as production in some other lines.

Delivery to Philadelphia of upward of 10,000 tons of steel for the towers for the new Delaware River Bridge to Camden, N. J., was begun recently. Construction of the towers on the steel piers sunk to bedrock in the river will begin shortly. The delivery was from the Steelton plant of the Bethlehem Co.

While there was some dullness in a number of industrial lines, due to the midsummer season, many manufacturers express the belief that business generally is settling on a substantial basis. With this in mind many of them are preparing for an active Fall business.

It is the generally expressed opinion that underlying conditions in the steel industry are good. Many of the plants have orders from the railroads. The building program is progressing satisfactorily, with demands for equipment and materials used in all lines of construction.

Work at the plant of J. G. Brill & Co., car builders, and at the Baldwin Locomotive Works is proceeding at full capacity. Textile manufacturers are working full time, and generally throughout the industrial centers the situation is proclaimed to be satisfactory.

Jones & Laughlin Plan New Mill

The Jones & Laughlin Steel Corp. has tentative plans under way for the building of a new mill at Hammond, Ind., it is understood, where a site totaling 440 acres has been located. The new plant will include rolling mills, machine shop, power house, bar mill and other structures, estimated to cost close to $5,000,000, with equipment.

Cost of Living Shows Slight Decrease

The cost of living in the United States on June 15, 1923 was 60.1 per cent higher than in July, 1914, according to figures collected monthly by the National Industrial Conference Board. Between May 15 and June 15, 1923, there was a decrease of two-tenths of one point or one-tenth of one per cent. The only changes in the budget within the month were a decline in the cost of clothing and an increase in food prices. Between July, 1920, when the peak of the rise in the cost of living since 1914 was reached, and June, 1923, the cost of living dropped 44.4 points or 21.7 per cent.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THE election of a so-called radical to the Senate from Minnesota and a further slight decline in wheat were the outstanding events of last week. They are really correlated for it has long been realized that the price of wheat is a political factor in the United States.

But neither the discontent of the farmers as expressed at the Minnesota polls nor the probability that the Republicans will lose control of the Senate have had much effect on the markets.

The fact that wheat has sold at less than $1.00 a bushel in Chicago, which means not more than 75 cents to the average farmer, may somewhat reduce the purchasing power of the Middle West. But when we come to examine the record current quotations do not seem to justify the gloom they have generated in some quarters.

In September, 1922, wheat sold at under a dollar in Chicago, but we had prosperity nevertheless, and with everyone being urged to buy a barrel of flour and eat an extra slice of bread it is quite possible that because they have been so widely advertised the low prices of last week may prove to be the lowest of this season.

There is much in the history of the commodity markets to encourage this hope. When everyone was besought to buy a bale of cotton in 1914 the market for that staple commenced to improve and it generally happens that corn starts up when it is announced that the farmers are burning it.

The bales bought or the corn burnt did not make any appreciable difference in the supply, but they advertised the comparative cheapness of cotton and corn so effectively that many were induced to buy large quantities in the hope of profit. The psychological conditions of the market were therefore reversed and the decline was arrested.

These precedents lead me to doubt the likelihood of any further decline of importance in wheat, for the expected rarely happens in the speculative markets. It is, moreover, quite possible that the clamor that has been raised about the lack of an export demand for our grain may compel the administration to take a more aggressive interest in the economic reconstruction of Europe, in which case we should probably have a market for more grain than we would care to sell.

At all events the Stock Exchange was not much disturbed by the sinister interpretation put upon the week's news by the press and some prophets who have recently embraced the philosophy of pessimism. The market has been dull and most stocks have moved slowly upward with the railroad shares in the lead. This is not surprising for unless there is some cataclysmic depression it is likely that 1923 will be the best year in the history of American railroading.

And since it seems impossible that with a record movement of goods business can be bad it is logical to expect that the industrial and commercial profits of the year will also be large.

This conclusion is supported by the reports of the savings banks and life insurance companies published during the week. For the fiscal year ended June 30, 1923, savings bank deposits were increased by $680,000,000 and the new business written by the forty leading life insurance companies during the first six months of this year

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aggregated $3,922,000,000, which is an increase of 24 per cent upon last year's record.

Surely there cannot be anything seriously wrong with a nation whose people are as prosperous and as thrifty as these figures indicate.

And while it suggests extravagance rather than thrift, another indication of our prosperity is to be found in the announcement that 13,200,000 golf balls will be "consumed" in the United States this year. But the protectionists will be grieved to learn that of this number over 3,000,000 will have been imported.

Another announcement that is more important in its cheerful significance is that an aggregate of over a billion dollars has already been loaned to the farmers by the twelve Federal Farm Loan Banks and the seventy-six Joint Stock Farm Land Banks thus far established.

As not more than 6 per cent can be charged on these loans the average saving as compared with the rates previously paid is probably 1½ per cent per annum. On a billion dollars this means a total of $15,000,000 a year, which will help to alleviate the pain caused by the decline in wheat.

This recital of some of our economic blessings and advantages is printed because there is a disposition in some parts of the country to insist that hard times must follow what is described as the triumph of discontent and radicalism that was evidenced at the Minnesota election.

To this view those who are familiar with economic history of the country will find it difficult to assent. Radicals there always have been and will be, but as land owners, as investors in stocks and bonds, as depositors in savings banks and policy holders in the life insurance companies, the majority of the American people are capitalists and it is idle to expect, as well as foolish to predict, that they will tolerate any serious effort to disturb the capitalistic regime.

Upon this hypothesis it may be safely assumed that present conditions, which are eminently sound, will find their logical reflection in activity at fair profits during the coming Autumn and Winter.

Merchants' stocks everywhere are small. Crops everywhere are reasonably good. Credit is everywhere abundant at fair rates and everyone who is willing to work at fair wages is employed.

This is a combination that is unbeatable and while it exists the talk of hard times in which some are indulging is nonsense or worse. It is inspired chiefly by those who are in a perilous position as a result of their misadventures on the short side of the speculative markets and it leads one to wonder whether such operations should any longer be permitted.

The commodity markets as a whole have been quiet and featureless. They call for but little comment and the foregoing generalizations are offered as better worthy of consideration than a detailed discussion of fluctuations that have been slight and meaningless.

The outlook in Europe is gradually improving. The Federal Reserve statement shows a gain of 1.1 per cent in the reserve ratio and there is every indication of normal activity when the crops are harvested and the vacation season is ended.

Florida Railway Buying Equipment

The Interstate Commerce Commission has authorized the Florida East Coast Railway Co. to assume liability for $2,000,000 of equipment trust certificates to apply on the purchase of the following equipment: Fifteen mountain-type locomotives at $59,200 each; five switching locomotives at $34,250 each; fifteen steel baggage cars at $23,000 each; two mail cars at $29,000 each; one dining car at $50.000; ten caboose cars at $4,286 each; 200 forty-ton steel flat cars at $1,785 each; 200 forty-ton ventilated box cars at $2,995 each.

Germany's Perplexing Finances

Selling machine tools a complicated problem for the German builders—How capitalization is accomplished with foreign backers—What the future holds

BY OUR BERLIN CORRESPONDENT

A GLOOMY view prevailed at the annual meeting of the Society of German Machine Building Works with regard to the present situation of the industry as well as to the future prospects. The machine building industry has, it was declared, suffered greatly in the past year and the first half of the current year under the political and economical difficulties of Germany. While the eight-hour day and the legal obstacles against overtime work have been responsible to a large degree for the sluggish supply of raw material, the constantly shifting wages, the labor disputes, the depreciation of the mark rate, the lack of skilled workmen, the confusing taxation laws and the shrinkage of working capital have all increased the difficulties of production, it is claimed.

The constantly regrading ratio of efficiency is looked upon with alarm. According to the investigations made by the Society of German Machine Building Works, the average output per workman by the end of 1922 had dropped below one-half of the pre-war standard. While in 1913 the annual production per man was 7,700 kg., in 1922 it was only 3,900 kilograms.

The supply of raw material was and is constantly insufficient, especially with regard to bars and sheets. Considerable scope was given at the meeting to the question of payment in the case of exports. This problem has been solved by selling at foreign stable currencies. Over 80 per cent of the total machinery export is now being contracted in that way. The remainder —mostly for countries with depreciated currencies—is being treated in the same way as domestic sales. As such countries are frequently transshipping goods bought at the domestic German rates to other countries, several groups of industry have already closed the ring and make no more exceptions in favor of countries with weak currencies.

SELLING METHODS

The machine building industry has not followed this step so far, although a strong inclination exists in some sections. Selling at firm prices has been abandoned altogether, except for machinery from stock or at short delivery. Orders for the future are being accepted at sliding prices only, whereby as a rule one-third of the purchase price is demanded to be paid with order, the second third between the dates of the order and the delivery. Sliding prices are fixed according to the price regulations issued by the various sections of the machine building industry for its members.

In the matter of advance payments two different lines of procedure are considered acceptable. According to one, the buyer has to agree to pay the second third of the purchase price at a fixed time at the rate of the price prevailing at that time, and in addition the difference between this payment and his first payment. At delivery he has to pay the rest of the purchase price at the rate prevailing at the time. The actual purchase price resulting from this mode of payment is at a constantly depreciating ratio to parity and, of course, much higher than its face value would indicate. By the other method only one advance is made before the delivery of the goods.

According to figures submitted at the meeting, the total production of the German machine building industry, comprising all lines of machinery with the exception of the electric and automotive industries, in 1922 was approximately three million tons, of which 500,000 tons or one-sixth was exported. It was mentioned with great satisfaction, that the import during the same time amounted to only 10,700 tons or about 2 per cent of the export and 0.03 per cent of the total production. In spite of this fact, it was declared that a stronger tariff protection of the German machine building industry would be absolutely required in the future.

SLIGHT BUSINESS IMPROVEMENT

With regard to the business situation, a steady decline of the market was observed all through the past year and continued at a greatly accelerated rate in the current year. The revival of business, expected from the downslide of the mark rate, was declared to be slow in coming, except in the machine tool industry, in which a considerable improvement is already noticeable. It is, however, accepted as a fact that the time when Germany could enjoy an individual boom of its own in the midst of universal business depression is over and that not until the reparations problem and the Ruhr war are ended could a return of brighter times be expected. The recent improvement of the business of the machine building industry can be seen from the labor statistics.

At the beginning of May, 72 per cent of the total number of workmen employed in the machine building industry were working full time, 21½ per cent at short time from 9 to 24 hours per week, and the rest were unemployed. The sharp drop of business, which has taken place in the course of the current year can be gaged when considering that unemployment at the corresponding time of last year amounted to only ½ per cent and in December to ⅞ per cent. At the beginning of June the percentage of full time workers had increased to 80 per cent while that of short time workers dropped to 15 per cent. The percentage of unemployed was 5 per cent which largely exceeds that of any of the three preceding years. Since manufacturers are not allowed to dismiss workmen except for excellent reasons, this percentage does not represent the true state of affairs, but is only of value when taken relatively. Under conditions prevailing, the extent it has reached is of grave significance, especially when considering that the state bank has and is extending large credits to works insufficiently employed in the interest of keeping the men in bread and butter. A special organization has been formed for this purpose primarily in the interest of the works situated in the Rhineland and Westphalia, but later it may also extend to works in the German interior. The total of credit extended to the industry amounted at the end of May to over 5,000 million marks, of which the machine building industry has taken the lion's share.

As has been mentioned, a distinct line has been drawn with regard to credit between small and medium-sized firms on the one hand and the large concerns on the other. The latter are supposed to be able to help themselves. The opinions of their capacity to do so are diverging. The true financial situation of the large machine building companies is a closely guarded secret. The views entertained with regard to it even in authoritative circles vary from a picture of enormous wealth of gold capital down to one of financial distress. A few facts have lately taken place which permit a fair estimate. Investigations have shown that the gold capital of the whole German industry constituted by foreign funds accredited at German banks amounts to from 1,500 to 2,000 million gold marks. Of such funds the machine building industry owns perhaps one-fifth part. The amounts deposited in foreign banks have not been ascertained, but from the offer recently made by the industry of an annuity of 500 million gold marks towards reparations, it is quite clear that the gold basis of the German industry is considerably larger than the funds deposited with the inland banks would indicate.

CONSERVING GOLD

It is now an admitted fact, boldly stated for instance in the last annual report of the Magdeburg Machine Tool Works, that the industry is in the habit of transferring every surplus of cash at once into stable currencies. It has become now quite a custom to calculate and pay dividends in gold. A survey of the balance sheets of industrial firms shows that none keep a cash balance of marks. They have only mark debts, which can be discharged advantageously at a depreciated rate. New capital issues do not give a true insight into the financial situation of the industry. In spite of the huge figures they reached in the current year, their total in goldmarks was considerably below pre-war capital requirements and much less than last year's. The ridiculously low rate at which new capital issues are floated creates the impression that such capital issues are not used or wanted for increasing working capital, but more for the reason of watering the stock or broadening the nominal capital basis.

As far as the general requirements of working capital are concerned, the development has gone in another direction, which is becoming more and more marked, the foreign money markets. It is a known fact that foreign capital

has in the course of time acquired a considerable interest in German industry by the purchase of stock on the stock exchange. This interest, in which the machine building industry has probably the larger share, is officially estimated at no less than 10 per cent, but may be considerably higher. Apart from such open transactions, others on a much larger scale are made under the surface. Large blocks of new capital issues are frequently sold to foreign capitalists or given as collateral for foreign credits. There can be no shadow of a doubt, that the German industry is on the road to the internationalization of its capital. How far this movement has progressed is not known, but occasional discretions make it quite clear that a considerable number of German machine building works are under a German name shielding foreign ownership or control.

How far actual need of capital has to do with this development is a matter of conjecture. That the latter case applies in a large measure to the capital transactions concerning a number of Rhenish machine building works, concluded since the Ruhr occupation, is an established fact. The impression, however, is received and well corroborated by facts coming to the surface, that the gloomy views expressed in the numerous complaints constantly heard of the machine building industry are largely exaggerated and that of all the parts of Germany's economical structure this industry has well been able to preserve its strength during past periods of storm and stress.

Long Island R. R. Plans Large Expenditure

The Long Island Railroad will expend $84,000,000 in the next ten years for improvements to uphold its reputation for carrying more daily commuters than any other American railroad, George Le Boutillier, vice-president, said recently. Mr. Le Boutillier was the principal speaker at a "get together" meeting of the Long Island Press Association, the Long Island Association and railway company officials at the Clifton Hotel in Patchogue.

Addressing several hundred guests, Mr. Le Boutillier said:

"I presume everybody is watching to see how many more millions the beneficent Pennsylvania R.R. will contribute toward carrying out this tentative program, but I'm afraid the Pennsylvania cow has already been milked dry, and the money will have to come from other sources. While I am handicapped in this respect, I have the utmost confidence that this money will be forthcoming, for the Long Island Railroad today is earning a profit, and its credit has been restored."

Canadian Railways Will Buy Equipment

The Canadian Government will raise $22,500,000 to be spent on new equipment for the Canadian National Railways through the sale of that amount of fifteen-year 5 per cent serial equipment bonds, it was announced recently in Toronto when the Minister of Finance of the Dominion Government issued a call for bids from Canadian dealers.

American Machine Tools In Russia

The following wireless from Moscow by Walter Duranty appeared recently in the New York *Times:*

"A test in American business possibilities in Russia will be given by a contract just signed between the Russian Foreign Trade Monopoly Department and the Allied American Corp., the pioneer American concern in the Russian field.

"The contract gives the Americans the full rights to conduct an import and export busines independently of the Monopoly Department for the trial period of one year, and provides that the amount of the yearly turnover must not be less than $2,400,000. It also prescribes that imports must not exceed exports in value, but both may go to any limit beyond the minimum named.

The Soviet's New Method

"An interesting feature of the contract, from the American point of view, is that the Monopoly Department no longer insists on half the shares being owned by Russians, as it has in the past for contracts of this kind. The American corporation agrees to pay 50 per cent of its profits to the Foreign Trade Monopoly Department, this undertaking being backed by a bank deposit as guarantee and a further guaranteed minimum.

"It is expected that the greater part of the import business will be in machinery and tools, for agriculture and industry. The allied American Corp. has made exclusive contracts with upward of thirty well-known American firms, including the Ford Motor Co., the United States Rubber Co., the American Tool Works and the United States Machinery Co., to act as their agent in Russia. The exports will be mostly raw products like furs, bristles, flax, timber, caviar and semi-precious stones, which the American corporation will be allowed to buy in the open market through the branches it proposes to establish throughout European Russia and Siberia.

The Importance of Russia's Gold-Secured Currency

"Doubt may arise in the minds of American leaders regarding the medium of payment, inasmuch as the depreciation of the Soviet ruble has become a byword. First, this very American company has done $1,500,000 worth of business here without a cent of bad debts; second, . . . Russia's financial comeback is based on chervonetz, which today, though paper, stands on a par with the dollar and the pound sterling, and this after eight months' experience. Throughout Russia chervonetz is gradually replacing the old paper currency. By the first of next year it is hoped it will be the only money in Russia, and will gradually be replaced by gold and silver currency already being minted to the extent of millions of dollars.

"The real importance of this contract to American business men is that it forms a precedent for the independent activity of Americans in Russia without interference or control on the part of the Soviet organizations."

Robert S. Alter, vice-president of the American Tool Works, has taken an active interest in furthering this work.

Trade Catalogs

Metal Treating Products. American Chemical Paint Co., Philadelphia. The products and processes of manufacturing by this company are briefly described in a booklet that has been issued. Rust problems arising in the construction of steel automobile bodies and parts and in other industries using similar operations are discussed.

Steel Castings. Electric Steel Co., Chicago. The thirty-three bulletins that have been issued by this company since Dec. 28, 1921 are bound together in a booklet that has just been published. Various methods, results and modes of operation are emphasized and illustrated.

Tool Room Lathes. The American Tool Works Co., Cincinnati, Ohio. An exceptionally well illustrated catalog devoted to the toolroom lathe has been issued by this company. Parts and sections are clearly described and the many advantages of the product are pointed out.

Sheet Metal Working Tools and Machinery. Niagara Machine & Tool Works, Buffalo, N. Y. Bulletins 63, 64 and 65 have been issued by this concern. Bulletin 63 describes the straight sided single crank power presses and trimming presses while bulletins 64 and 65 describe the double crank power presses made by this company. All three of the bulletins are well illustrated, contain tables and specifications and are clearly written.

Leather Belting. Chicago Belting Co., Chicago. A folder on leather belting showing the many advantages of good belting over others of inferior quality has recently been issued by this company.

Tool and Cutter Grinding Machines. The Norton Co., Worcester, Mass. A handbook containing some very valuable information on tool and cutter grinding. The book is well illustrated and bound and has chapters of instruction on various phases of grinding.

Tools. DeBats Metals Co. New York City. Tools cast from DeBats metal are described in a folder that has recently been issued by the company. Many features are claimed for the tool such as longer life, double speed, heavier chips with less power and its ability to cut either iron or steel.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

One 10-ton locomotive crane. Hongkong, China. Purchase. Reference No. 7171.

Dredges, either suction or bucket type. Pernambuco, Brazil. Purchase. Reference No. 7130.

Laundry machinery, sandpaper-making machinery and spinning machinery. Montevideo, Uruguay. Agency. Reference No. 7185.

Woodworking machinery. Magoya, Japan. Purchase. Reference No. 7183.

A woodworking machine for cutting, planing and grooving. Torreon, Mexico. Purchase. Reference No. 7103.

Forthcoming Meetings

New Haven Branch of the American Society of Mechanical Engineers. Third annual machine tool exhibit Sept. 18, 19, 20 and 21. Mason Laboratory, New Haven, Conn. A. C. Jewett, chairman.

Association of Iron and Steel Electrical Engineers. Iron and steel exposition, Buffalo, Sept. 24 to 28. John F. Kelly, secretary, Association of Iron & Steel Electrical Engineers, 708 Empire Building, Pittsburgh, Pa.

American Management Association. October 29, 30, and 31 Hotel Astor, New York City.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Iron and Steel—Improvement shown in pig-iron inquiries. Lower iron prices for fourth quarter, checked by growing firmness of the coke market. Steel bars remain firm at $2.40 per 100 lb., despite lower pig-iron and scrap prices. Slightly better inquiries for structural shapes during last two weeks; firm at $2.50 base with few prospects of lowering. Slight falling off in new plate orders. Steel mill operations slowing down gradually.

Advances—Black and galvanized steel sheets, cold finished steel and aluminum ingots, higher in Chicago warehouses. Western lead, for July shipment, advanced slightly during week. Solder up 1c. per lb. in New York.

Declines—Copper weaker; down ⅛c. per lb. in New York. Slowing down in steel, exerting depressing effect upon tin market; quotations ¼c. under week ago. Zinc market lifeless; dropped 10c. per 100 lb. in week. Antimony lower in Cleveland and New York. Steel bars and plates down in Chicago; fabricated brass and copper, solder and babbitt metal, in Cleveland; linseed oil and babbitt metal, in New York.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$29.05
Northern Basic	29.27
Southern Ohio No. 2	29.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.25
BIRMINGHAM	
No. 2 Foundry	25.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	28.76
Virginia No. 2	32.17
Basic	27.76
Grey Forge	27.26
CHICAGO	
No. 2 Foundry local	29.11
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.51
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	27.77
Basic	26.77
Bessemer	28.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5.00@5.50

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.50	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.95	4.45	5.05
Nos. 22 and 24.	3.75	5.00	4.50	5.05
Nos. 25 and 26.	3.80	5.05	4.55	5.10
No. 28	3.85	5.15	4.65	5.20

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00	5.15	4.70	5.35
Nos. 12 and 14.	4.10	5.25	4.80	5.45
Nos. 17 and 21.	4.40	5.55	5.10	5.75
Nos. 22 and 24.	4.55	5.70	5.25	5.90
No. 26	4.70	5.85	5.50	6.05
No. 28	5.00	6.15	5.80	6.35

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
	BUTT WELD				
1 to 3	62	50½	¼ to 1¼	30	13
	LAP WELD				
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	26	11
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
	BUTT WELD, EXTRA STRONG, PLAIN ENDS				
1 to 1¼	60	49½	⅜ to 1¼	30	14
2 and 3	61	50½			
	LAP WELD, EXTRA STRONG, PLAIN ENDS				
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	5.00	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	7.50	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.40	3.90	4.55
Cold finished flats, squares	4.90	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Carbon tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 5/32, 8½c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.25
Tin, 5-ton lots, New York			39.25
Lead (up to carlots), St. Louis	6.00	New York	6.57½
Zinc (up to carlots), St. Louis	6.15	New York	6.60

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.20	27.00	28.00
Antimony (Chinese), ton spot	7.85	9.50	8.25
Copper sheets, base	24.50	23.50	23.00
Copper wire (l.c.l.)	17.25	20.75	16.25
Copper bars (l.c.l.)	22.00	24.00	19.50
Copper tubing (l.c.l.)	27.00	29.00	23.00
Brass sheets (l.c.l.)	19.75	29.25	18.75
Brass tubing (l.c.l.)	25.50	29.25	20.50
Brass rods (l. c. l.)	18.00	29.00	15.75
Brass wire (l. c. l.)	20.25	23.75	.....
Zinc sheets (casks)	10.25	10.10	.....
Solder (½ and ½), (caselots)	29.50	27.75	20.00
Babbitt metal (83% tin)	52.00	48.00	40.00
Babbitt metal (35% tin)	25.00	17.00	16.00
Nickel (ingot and shot)	29.00	.....	35 00
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	12.00	12.50
Copper, heavy, and wire	11.50	11.50	11.50
Copper, light, and bottoms	10.00	9.50	10.50
Lead, heavy	5.00	5.00	5.00
Lead, tea	4.00	4.00	3.75
Brass, heavy, yellow	7.50	....	7.50
Brass, heavy, red	9.50	9.50	9.50
Brass, light	6.00	5.00	6.50
No. 1 yellow brass turnings	7.00	6.00	7.00
Zinc	3.75	3.00	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$23.50	$19.50	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.00	17.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	12.60	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13½x13½, per lb.	10.75@11.00	36.00 per M	.10
Wiping cloths, 13½x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	1.08	1.22	1.28
White lead, dry or in oil	100 lb. kegs.	New York, 14.00	
Red lead, dry	100 lb. kegs.	New York, 14.00	
Red lead, in oil	100 lb. kegs.	New York, 15.50	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.75@5.25	
Coke, prompt foundry, Connellsville	per net ton	5.75@6.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	30%	50-10%	45-5%
1½ and 1½x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	15%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	20%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65 5%
Lag screws, coach screws	30%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	25%	45%	40-5%
Bolt ends, with hot pressed nuts	30%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 9/16 and smaller	60%	.....	...
Semi-finished nuts, ⅝ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅜ in., per 100 lb. (net)	5.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	List net	2.75	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	40%	50-10%	60%
Rivets, tinned	40%	50-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30-10%	30-10%	30-10%
Heavy grade	20-5-2½	30%	20-5-2½%
Rubber and duck:			
First grade	.50-10-5%	50-10%	40-10%
Second grade	60-10%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20

New and Enlarged Shops

Machine Tools Wanted

D. C., Wash.—Dist. Comrs.—receiving bids until Aug. 3 for one 12 in. x 5 ft. engine lathe; until Aug. 2 for one gasoline propelled portable crane with boom and clamshell.

Ill., Chicago—M. Vitek, 4017 South Kedzie Ave. (machine shop)—power drill press, lathe, cylinder grinder, emery stand, belting, hangers, pulleys and shafting.

Ill., Harvey—S. Ward Hamilton Co. (manufacturer of hardwood specialties)—drill presses, medium size punch presses, belting and shafting.

Kan., Winfield—C. H. Benson, 1215 South Main St. (garage)—power drill press, emery stand, power metal lathe, cylinder grinder (used preferred).

Kan., Winfield—Barr Motor Co., H. M. Barr, Purch. Agt.—power automobile cylinder grinder.

Kan., Winfield—G. F. Ganett, South Main St. (garage)—power drill press.

Kan., Winfield—F. W. Guild, 1190 Main St., (garage)—power metal lathe.

Kan., Winfield—L. Moore Implement Co. (garage and machine shop)—power drill press, metal lathe, emery stand, wheel and cylinder grinder (used preferred).

Kan., Winfield—Standard Auto Wrecking Co.—power metal lathe.

Kan., Winfield—Stewart & Wheeler, East 9th St. (fixtures and accessories)—power emery stand and wheel.

Kan., Winfield—Tingle Shop, 214 East 9th St., J. A. Tingle, Purch. Agt.—10 ft. tinners brake and power metal lathe for machine shop.

Ky., Middlesboro—Motch Motor Co.—lathe, air compressor and drill press for proposed $50,000 garage.

La., Shreveport—Bender Steel, Iron & Supply Co.—foundry and machine shop equipment, including lathe, press, drill, grinder, etc.

Md., Baltimore—Carey Mchy. & Supply Co., 119 East Lombardy St.—quadruple punch and shear.

Md., Baltimore—Flynn & Emrich, 305 North Holliday St.—complete machine shop equipment.

Mich., Detroit—Bd. Educ., 1354 Bway Ave., C. A. Gadd, Business Mgr.—eighteen 9 x 36 in. metal working lathes, complete with legs, gears, etc.; six 13 in. x 4 ft., single back geared, engine lathes; one 13 x 56 in. engine lathe; one sensitive floor drill; two 20 in. drill presses; one milling machine; one 14 or 16 in. back geared crank shaper; one grinder for 1⅛ x 1½ x 12 in.; two arbor presses, bench type, to take up to 12 in.; four 9 x 36 in. metal working lathes.

Mich., Marquette—E. G. Davett (automobile repairs)—medium size drill press, emery grinder, air compressor, gasoline storage tank and pump.

Mo., Kansas City — Marshall Mfg. Co., 912 Grand Ave.—two power punch presses.

Mo., Kansas City—Natl. Lead Battery Co., 1601 Oakland St.—one 25 ton punch press.

Mo., St. Louis—Williams Patent Crusher & Pulverizer Co., 813 Montgomery St. (manufacturer of crushers)—No. 5 Mitts & Merrill hub keyseater with or without motor (used).

N. J., Bloomfield—Bast Reflector Co., 122 Belmont Ave.—complete machine shop equipment.

N. Y., Centerfield—L. Parker—garage, repair shop and service station machinery, tools and equipment, including small bench tools, grinder, etc., to replace that which was destroyed by fire.

N. Y., Dansville—Macomber Garage Inc., Ossian St.—air compressor, press, drill, machine and bench tools, etc., for proposed $40,000 garage and service station.

N. Y., Salamanca—Bd. Educ., G. A. Price, Supt.—sheet metal working machinery and equipment, including shear, bender, etc., for vocational school.

N. Y., North Tonowanda—Buffalo Bolt Co., East Ave. and Oliver St.—equipment for manufacturing bolts, for proposed $20,000 addition.

O., Columbus—N. A. Newdick, 368 North 4th St.—machine shop equipment.

Okla., Ponca City — Marland Refining Co.—machinery, small tools, air compressors and pumps for several proposed gasoline and service stations in Kansas.

Ore., Portland—G. H. Kelly, Spaulding Bldg.—machine shop, also saw, planing mill and dry kiln equipment.

Pa., Danville—Pennsylvania Brake Beam Co.—one roll angle straightening machine, capacity ⅜ x 2½ x 2½ in.

Tex., Plainview—C. B. Thomas—8 ft. tinners brake.

Va., Richmond—Chenault Bicycle Co., 1829 West Main St.—drill press and air compressor.

Va., Richmond—Ford Auto Service Co., 110 East Jackson St.—lathe and portable electric drill.

Va., Richmond—W. D. Jones, 207-209 East Jackson St.—portable electric drill and lathe for automobile repairs.

Va., Richmond—New Bell Motor Co., 1624 West Main St.—grinding in machine, drill press and movable jack.

Va., Richmond—Seay & Askew, 1829 West Main St.—drill press and lathe for automobile repair shop.

Va., Richmond—Standard Electric Co., 1821 East Main St.—lathe and drill press.

Va., Richmond—Sycamore Ford Service Sta., 1 North Sycamore St.—drill press.

Va., Richmond—J. F. Vogel, 315 North 2nd St. (bicycle and gun repairing) small lathe for metal turning.

Va., Richmond—West End Garage, 2310 West Main St.—lathe and drill press.

Wis., Appleton—Northern Boiler & Structural Iron Co., Mill St.—plate shears.

Wis., Appleton—Seamless Tube Co. of Wisconsin, c/o M. Rossmeissel, 977 8th St. (manufacturer of boiler sheets and steel tubes)—plate shears, riveting hammers and rolls.

Wis., Milwaukee—Curtis Auto Co., 143 8th St.—repair equipment, hoists, air compressor, gasoline service tanks and pumps for proposed $200,000 garage on Bway.

Wis., Shawano—J. Popp—automobile repair machinery, chain hoist and tanks for proposed $40,000 garage.

Ont., Toronto — Tube Products, Ltd., Bathurst St., G. A. Macguire, Purch. Agt.—machinery, etc., for the manufacture of seamless wrought iron pipe.

Que., Beloeil Village—F. Boucher—repair equipment for garage.

Que., Chambly Canton—H. Desroches—automobile repair and garage equipment.

Que., Chateauguay—Chateauguay Motor Garage, E. Laframbois, Purch. Agt.—repair equipment.

Que., D'Israeli—I. F. Lapointe—complete automobile repair equipment.

Que., East Angus—J. B. Morin, Ltd.—garage and automobile repair shop equipment.

Que., Huntingdon — J. C. Boyd, Lorne Ave.—garage and automobile repair shop equipment.

Que., La Patrie—S. Gabeil—garage and repair machinery.

Que., Louisville—D. Bourassa—garage and automobile repair equipment.

Que., Magog—Patch & Cotterall, Registered, Main St.—additional automobile repair equipment.

Que., Mahog—A. Renaud, Sherbrooke St.—additional equipment for garage and repair shop.

Que., Marbleton—F. A. Porter—automobile repair shop equipment.

Que., Montreal—Central Garage, Ltd., 260 Pine Ave., E.—garage and repair shop equipment.

Que., Montreal—J. Crowe & Sons, 17 St. George St., (blacksmith, machinist and locksmith)—additional machine shop and acetylene welding equipment.

Que., Montreal—E. David, 566 Workman St. (public garage)—complete equipment for 16 stall garage and minor repairs.

Que., Napierville—P. Rancourt—automobile repair equipment.

Que., North Hatley—Lake Side Garage, Ltd., F. W. Ayer, Purch. Agt.—garage and automobile repair equipment.

Que., Notre Dame de Stanbridge—J. Remillard—automobile repair shop equipment.

Que., Sawyerville—H. E. Hurley—garage and automobile repair equipment.

Que., Waterville—D. W. Ayer, Main St.—garage and repair shop equipment.

Machinery Wanted

Calif., Oakland—Elmhurst Press, 9633 East 14th St.—18 or 19 in. model bench paper cutter.

Calif., San Francisco—Amer. Can Co., Mills Bldg.—machinery and equipment for large addition to can factory at Honolulu, T. H.

Colo., Fort Collins—C. Preusch, 608 West Laurel St. (job printer)—pony press, power paper cutter and metal cutter (used).

Colo., Strasburg—News—cylinder press.

Ill., Chicago—Cruver Mfg. Co., 2456 West Jackson Blvd—Miehle 2 revolution job press; 2 roller pony press; Miehle job press, No. 2, 3 or 4 roller; 2 revolution cylinder press; belting.

Ill., Polo—Tri-County Press—newspaper equipment.

Ind., Sullivan—Bd. Educ.—manual training equipment for new $100,000 high school.

Kan., Elkhart—Morton County Progress—perforator and stapler.

Kan., Norwich—The Herald—12 x 18 in. power job press.

Kan., Oxford—Oxford Blacksmith Shop—forge, anvil, power drill press, emery wheel and stand.

Kan., Wichita—F. M. Adell, 316 North Fern St. (contractor)—power machine for making cement bricks, also pulleys, hangers, belting and shafting.

Kan., Winfield—Alexander Print Shop, Cowley County Bank Bldg.—power job press and Miller feeder (used).

Kan., Winfield — D. Cook, East 11 St. (woodwork)—Universal saw, power belt sander, power wood lathe, belting, hangers and shafting.

Kan., Winfield — T. E. Leftwich, 918 Litchfield St. (job printer)—job printing press, power paper cutter, belting, hangers and shafting.

Kan., Winfield—Spoon—Deck Printing Co., B. Deck, Purch. Agt.—job printing press and Miller feeder (used).

Ky., Princeton—Princeton Hosiery Mills—machinery for proposed $40,000 mill.

Mass., Boston—C. W. Hill, 123 Oliver St.—Spott & Butt welder (used).

Mass., Fall River—A. Lagasse, 2147 Pleasant St.—bottle making machines, tank furnace and bottle molds for proposed glass factory.

Mich., Wayne—Arcadian Consolidated Mining Co.—hoisting machinery.

Minn., Red Lake Falls—L. Spillam—newspaper press, job press and other printing equipment.

Minn., Tracy—T. Jenson (general contractor)—one 1,800 lb. pile hammer and nippers (used).

Mo., Liberty—Central Oil & Gas Co.—complete machinery, pumps and equipment for proposed gasoline bulk distributing stations, here and at Henrietta.

N. H., Canaan—Reporter—Wing-Horton mailer.

N. J., Little Falls—Paramont Rubber Co., Consolidated—additional machinery, etc., for plant of Regal Tire & Rubber Co. at Sherbrooke, Que.

N. Y., Buffalo—Amer. Lithographic Co., 111 Swan St.—equipment for making lithographic typographic advertising matter, for proposed small plant on Amherst and Elmwood Aves.

N. Y., Buffalo—C. T. Macris, 121 Heath Ave.—additional machinery and equipment for candy factory at 120 Norwalk Ave.

N. Y., Buffalo—E. N. Mead, 618 Auburn Ave.—equipment for carpenter shop at 165 Marion St.

N. Y., Buffalo—H. J. Otten, 143 Burgard Pl.—equipment for sheet metal products shop.

N. Y., Jamestown — Jenkins-Carlson Printing Co., Arcade Bldg.—printing presses, transmission and conveying machinery, typesetters, etc., for proposed plant at 27 Market St.

N. Y., Jamestown—Union Furniture Co., 226 Crescent St.—additional machinery and equipment for dry kiln.

N. Y., Riverbank—Adirondak Enterprises, Inc.—6 column quarto press, newspaper folder and power paper cutter.

N. Y., Seneca Falls—Wescott Rule Co., 10 East Bayard St.—Colts Armory job press.

N. C., Mebane—The Enterprise—4 page, 6 column press and folder.

O., Cleveland—Cleveland Building Trades Employers Assn., W. P. Carroll, Mgr.—machinery, tools and equipment for carpenter school.

O., Columbus—Franklin Mill & Lumber Co., 375 Dennison Ave., J. S. Jones, Mgr.—one Universal woodworker, sander and mortiser.

O., South Euclid—Henry-Brass Co—machinery and equipment for the manufacture of baskets, to replace that which was destroyed by fire.

Pa., Butler—Record Printing Co.—power perforator.

Pa., Catasaqua—Davies & Thomas—one cupola for foundry.

Pa., New Castle—Consolidated Motors Co., c/o Bd. of Trade, W. O. Dayton, Vice Pres.—assembling machinery and equipment for proposed factory.

Pa., Pittsburgh—Standard Seamless Tube Co., Granite Bldg.—one 10 ton crane.

Pa., Scranton—H. G. Smith & Bro., 313 Vine St.—machinery and equipment for plant for the manufacture and repair of automobile bodies, etc.

Pa., Wilkes-Barre — Woodlawn Farm Dairy Co., North Washington and East North Sts.—dairy machinery and equipment.

Pa., Williamsport—Printer, 868 Rural Ave.—power job printing press, newspaper press, etc. (used preferred).

R. I., Providence—United Electric Rys. Co., 100 Fountain St., H. W. Sanborn, Ch. Engr.—automatic rail bender for heavy rails.

S. C., Columbia—Lorick & Lowrance, 1529 Main St.—sanding machine for flooring.

S. C., Edgefield—W. C. Thompson—complete machinery for the manufacture of sash cord.

S. C., Inman—Builders Supply Co.—automatic lathe for turning table legs.

Tex., Daingerfield—E. Scroggins—complete sawmill and planing mill equipment.

Tex., Dallas—Monte Caro, c/o E. C. Palmer & Co., 405 Lacy St.—newspaper press and job press.

Tex., DeKalb—A. W. Jolly, Box 172 (job printer)—8 x 12 power job printing press, 10 x 15 job press, pony cylinder, stitcher, perforator, punch press and printing equipment.

Tex., Rogers—F. Leahy (contractor)—Fairbanks hopper and seed scales.

Tex., San Antonio—V. E. Curtis, 206 Garden St.—job printing press, newspaper press, etc. (used preferred).

Va., Richmond—Auto Tire Co., 1905 East Main St. (tires and vulcanizing)—buffing machine.

Va., Richmond—Handley Service Sta., 630 North 2nd St.—tire changing machine.

Va., Richmond—H. H. Price, 112 East Jackson St. (newspaper and job printing)—power cutting knife for paper.

Va., Richmond—Store Fixture Exchange, 1823 East Main St.—combination woodworking machine.

Va., Richmond—Stuart Fonk Corp., 1606 West Main St.—air compressor.

Va., Wytheville—R. P. Johnson Co. (machinery dealer)—heavy planer for the manufacture of hardwood flooring.

Wis., Brokaw—Wausau Paper Mill Co., W. L. Edmonds, Mgr.—gate hoist and chains for lifting gates for dam.

Wis., Eau Claire—Lange Canning Co., Mill St.—conveyors for proposed $40,000 addition to cannery.

Wis., Highland—Williams Mining Co.—mill machinery, conveyors, belting and shafting for proposed plant for mining lead ore.

Wis., Kenosha—Nash Motors Co. (automobiles)—forge and small tools for proposed forge shop.

Wis., Madison—O. Lofstjordon, 802 Center Ave.—machinery and equipment, including mixers, conveyors, etc., for proposed cement block factory.

Wis., Milwaukee—Everwear Shoe Mfg. Co., 785 5th St., J. Lange, Purch. Agt.—lasting, vamping and siding machines.

Wis., Milwaukee—Millwork Supply Co., 326 Grand Ave., W. T. Roehring, Purch. Agt.—sanding machine and circle saw.

Wis., New London—Modern Mfg. Co.—belting, shafting, etc., for proposed $40,000 factory for the manufacture of women's wearing apparel.

Wis., Sheboygan—H. Davis, 722 Jefferson St.—large veneer press.

Wis., Silverlake—Riverview Fdry., R. M. Dixon, Genl. Mgr.—equipment for proposed $50,000 foundry, to replace that which was destroyed by fire.

Wis., Stevens Point—Stevens Point Brick Co., 426 Normal Ave.—brick making machinery and conveyors for proposed $40,000 plant, to replace that which was destroyed by fire.

Wis., Wausau—McEachron Apartment Co., 812 Franklin St., H. E. McEachron, Pres.—laundry equipment, including dryers for proposed 50 x 100 ft. apartment building.

Wyo., Glenrock—C. L. Olmstead (cleaning plant)—30 x 30 reversible gear washing machine.

Ont., Glencoe—Glencoe Milling Co., C. Morrison, Dresden, Pres.—complete flour mill equipment.

Ont., Kitchener—P. Gies Fdry. Co., Ltd.—machinery, etc., for the manufacture of gasoline pumps and other specialties.

Ont., London—Box-Board Products, Ltd., 316 Rectory St., W. Nickle, Mgr.—special equipment for the manufacture of cardboard specialties, egg cases, etc.

Ont., London—United System Bakeries, 418 Richmond St.—electrical equipment for proposed branches.

Ont., Port Hope — Port Hope Sanitary Mfg. Co., Ltd.—smelter equipment.

Ont., Toronto—Ford Motor Co. of Canada, 672 Dupont St.—equipment, including furnaces, etc., for proposed $200,000 heat treating plant at Ford.

Ont., Toronto—J. Inglis & Co., Ltd., 14 Strachan Ave. (manufacturer of machinery)—electric traveling crane, sand mixing machinery, etc.

Ont., Trenton — Benedict & Practor—equipment for silver plating plant.

Que., Asbestos — E. Parenteau — equipment, etc., for wheelwright.

Que., Coaticook—D. S. Carou—additional equipment for blacksmith shop.

Que., D'Israeli—C. Octeau—additional equipment, including tools, forge, etc., for blacksmith shop.

Que., D'Israeli—Parent & Frere, A. Parent, Purch. Agt.—additional machinery for sash and door factory.

Que., East Angus—A. Champort (garage)—additional repair equipment.

Que., Frelighsburg—C. Van Antwerp—blacksmith shop equipment.

Que., Gould—R. Morrison (garage)—repair equipment.

Que., Gould—E. Rousseau (blacksmith)—additional forge and other equipment.

Que., Inverness—E. McCrae (saw mill)—additional saw mill equipment.

Que., Inverness—J. A. Precourt (saw mill)—additional equipment, including saws, etc.

Que., La Patrie — V. Drolet—machinery for sawmill, including bandsaw.

Que., La Presentation—W. Menard—additional bandsaw and other sawmill equipment.

Que., Louisville — A. Desrosier — additional equipment for sash and door factory.

Que., Montreal—Cid Electric Heater Co., Ltd., c/o F. J. Laverty, 189 St. James St.—equipment for the manufacture of electrical apparatus.

Que., Phillipsburg—Wallace Sandstone Quarries, Ltd., F. S. Allen, Purch. Agt.—additional quarrying and cutting machinery.

Que., Plessisville — J. Noel—forge and other equipment for blacksmith shop.

Que., Richmond — R. E. McArthur—equipment for blacksmith shop.

Que., Rockburn — W. Gibson—additional sawmill equipment.

Metal Working Shops

California and Oregon—L. R. Lurie, 315 Montgomery St., San Francisco, plans to build automobile stage terminals at various points, here. Estimated cost of complete series will exceed $1,000,000. Pickwick Corp., 683 Market St., San Francisco, lessee.

Calif., Long Beach — The Pacific Steel Corp. plans to build a rolling mill on a 200 acre site, here. Cost will exceed $10,000,000. D. M. Reynolds, 1st Natl. Bank, 707 South Spring St., interested.

Calif., San Francisco — L. Barrett, 415 Taylor St., awarded the contract for the construction of a 2 story garage on O'Farrell St. near Taylor St. Estimated cost $75,000.

Conn., Hartford—A. Goldstein, 226 Bellevue St., is having plans prepared for the construction of a 1 story, 80 x 207 ft. garage on Windsor St. Estimated cost $50,000. Private plans.

Conn., Oakville—The Oakville Co., manufacturer of brass, is having plans prepared for the construction of a 2 story, 70 x 120 ft. factory. Estimated cost $40,000. Lockwood, Greene & Co., 24 Federal St., Boston, Engrs. and Archts.

Conn., West Hartford (Hartford P. O.)—Cohn & Feinsilber, Prospect Garage, are receiving bids for the construction of a 1 story, 100 x 100 ft. addition to its garage on Prospect Ave. Estimated cost $40,000. B. A. Sellew, 721 Main St., Archt. Noted July 5.

D. C., Wash.—T. M. Medford, Archt., 1631 3rd St., N. W., is preparing plans and will receive bids about Aug. 1 for the construction of a garage and warehouse on 1st St. near L. St., N. E., for W. F. Nash, 120 M St., N. W. Estimated cost $100,000.

Ill., Chicago—The Chicago Steel & Wire Co., 103rd and Torrence Sts., is having plans prepared for the construction of a 1 story, 193 x 300 ft. factory to be erected in three units. Estimated cost $500,000. L. G. Hallberg & Co., 116 South Michigan Ave., Chicago, Archts.

Ky., Cynthiana — C. LeBus is having plans prepared for the construction of a 1 story, 90 x 200 ft. garage. Estimated cost $40,000. Manley & Young, 814 West Hill Ave., Knoxville, Tenn., Archts.

Ky., Louisville—R. Rosa, c/o Amer. Mosaic & Tile Co., 309 East Bway, is having plans prepared for the construction of a 2 story garage. Estimated cost $75,000. Joseph & Joseph, Francis Bldg., Louisville, Archts.

Ky., Middlesboro—The Motch Motor Co. plans to build a 2 story, 50 x 180 ft. garage and machine shop. Estimated cost $50,000.

La., Shreveport — The Kansas City Southern R.R. is having plans prepared for the construction of a 2 story, 85 x 500 ft. car shops, to replace the one which was destroyed by fire. Estimated cost $100,000. O. E. Stump, Shreveport, Traveling Engr.

Me., Portland — The Portland-Nash Co. awarded the contract for the construction of a 3 story, 120 x 140 ft. garage and machine shop. Estimated cost $175,000, including machinery. Noted Apr. 19.

Md., Baltimore—Flynn & Emrich, 305 North Holliday St., are having plans prepared for the construction of a foundry, machine, casting and storage building, also boiler house. Estimated cost $75,000. Private plans.

Mass., Boston — The city, City Hall, awarded the contract for the construction of a 2 story, 125 x 200 ft. garage on Albany St. Estimated cost $152,490. Noted June 21.

Mass., Brighton (Boston P. O.)—The Corey Rd. Garage, Inc., 112 Corey Rd., is having sketches prepared for the construction of a 2 story, 106 x 300 ft. garage. J. H. Bickford Co., 6 Beacon St., Boston, Archt.

Mass., Pittsfield — Smith & McCarthy (Ford Agency) are having plans prepared for the construction of a 3 story, 35 x 60 ft. garage. Estimated cost $44,000. G. F. Haynes, 184 North St., Pittsfield, Archt.

Mass., Worcester—The Amer. Steel & Wire Co., Grove St., will open bids in the fall for the construction of a 1 story, 55 x 100 ft. and 20 x 30 ft. annealing plant. Estimated cost $150,000, including equipment. Private plans.

Mo., Kansas City—The Federal Bldg. & Loan Assn., 531 Scarritt Bldg., is having plans prepared for the construction of a 3 story, 96 x 115 ft. garage on 9th and McGee Sts. Estimated cost $75,000. Private plans. H. A. Rubin, 1333 Grand Ave., Lessee.

N. Y., Brooklyn—The Aaron Constr. Co., c/o A. Goldberg, Engr. and Archt., 164 Montague St., will build a 1 story garage on Empire Blvd. Estimated cost $85,000.

N. Y., Buffalo—S. Landt, 494 Elmwood Ave., plans to build a 1 story, 33 x 85 ft. garage and service station. Estimated cost $40,000. Engineer or architect not announced.

N. Y., Buffalo—W. Rixey, 1146 Niagara St., plans to build a garage and repair shop. Estimated cost $40,000. Engineer or architect not selected.

N. Y., Cape Vincent—The Northern Oil & Fuel Corp., Coffeen St., Watertown, has purchased site and plans to build a garage, machine shop, repair and service station on Main St., here. Cost between $20,000 and $25,000. G. W. Lane, Pres.

N. Y., Dansville—The Macomber Garage, Inc., plans to build a garage and repair shop on Ossian St. Estimated cost $40,000. Engineer or architect not announced.

N. Y., Oswego—The state is having plans prepared for the construction of a machine shop in connection with grain elevator, here. State Canal Bd., Albany, Archts.

O., Cleveland Heights (Warrensville P. O.) — Thorsell Bros., Mayfield Rd., have had plans prepared for the construction of a 1 story, 50 x 110 ft. garage. Estimated cost $40,000. H. L. Shupe, 12429 Cedar Ave., Cleveland, Archt.

Ore., Oakridge—G. H. Kelly, Spaulding Bldg., Portland, is having plans prepared for the development of a town site, including saw and planing mill, machine shop, etc., near here. Estimated cost $2,000,000. W. J. Morris, Spaulding Bldg., Portland, Engr.

Pa., Bellefonte—Decker Bros., North Spring St., Chevrolet agents, plan to build a 3 story, 90 x 120 ft. garage, automobile repair shop and supply station on High and Spring Sts. Estimated cost $75,000. M. Decker, Pres. Engineer or architect not selected.

Pa., McKeesport—H. W. Waldbaum, 6th and Walnut Sts., will build a 4 story, 60 x 140 ft. garage. Estimated cost $50,000.

Pa., New Castle — The Consolidated Motors Co., c/o Bd. of Trade, manufacturer of taxicabs, plans to build an assembling plant. Cost will exceed $50,000. W. O. Dayton, Vice-Pres. Engineer or architect not selected.

Pa., Scottdale—The United States Cast Iron Pipe & Fdry. Co., Burlington, N. J., awarded the contract for the construction of a 1 story, 106 x 263 ft. factory, here. Estimated cost $55,000.

Pa., Scranton—A. Anderson, 409 Adams Ave., awarded the contract for the construction of a 1 story, 40 x 160 ft. garage, salesroom and service station. Estimated cost $40,000.

Pa., Sharpsburg — The Natl. Engine & Machine Co. plans to build an addition to its factory. Estimated cost $50,000. Engineer or architect not announced.

R. I., Providence—E. Radding, 144 Westminster St., awarded the contract for the construction of a garage and service station on North Main, Frost and Nashua Sts. Estimated cost $75,000. Noted May 24.

Tenn., Memphis—J. E. Stark & Co., Plum St., plan to build a 64 x 85 ft. planing mill with machine shop addition.

Tex., Dallas—The Bolanz Investment Co., c/o Murphy & Bolanz, Commerce St., plans to rebuild the 2 story factory on Commerce and Dove Sts., which was destroyed by fire. Estimated cost $75,000. Engineer or architect not selected. Texas Wheel & Body Co., Commerce and Dove Sts., lessee.

W. Va., Beckley—W. C. Agee will build a 2 story, 50 x 115 ft. garage. Estimated cost $40,000.

W. Va., Williamson—S. M. Goodloe is having plans prepared for the construction of a 3 story, 50 x 100 ft. garage. Estimated cost $40,000. D. M. Good, Williamson, Archt.

Wis., Appleton—The Northern Boiler & Structural Iron Co., Mill St., will build a 1 story, 60 x 100 boiler shop. Estimated cost $40,000.

Wis., Cambridge—A. Kravick will build a 1 story, 50 x 95 ft. garage and filling station. Estimated cost $40,000. Noted Dec. 21, 1922.

Wis., Fond du Lac—J. Grebe, 22 Rees St., awarded the contract for the construction of a 1 story, 56 x 106 ft. garage and repair shop. Noted July 5.

Wis., Fond du Lac—H. W. Voell, 59 North Main St., is having plans prepared for the construction of a 1 story, 50 x 60 ft. garage and repair shop. Estimated cost $40,000. Private plans.

Wis., Green Bay—The Beaumont Hotel Co., West Main and Washington Sts., awarded the contract for the construction of a 1 and 2 story, 60 x 160 ft. garage. Estimated cost $40,000. Noted July 5.

Wis., Green Bay—The Green Bay Motor Car Co., 316 North Jefferson St., plans to build a 2 story garage on Main St. Estimated cost $50,000. Engineer or architect not selected.

Wis., Madison—W. Brueski, 2805 East Washington Ave., will build a 2 story, 50 x 90 ft. garage and repair shop. Estimated cost $40,000. Noted July 5.

Wis., Milwaukee—The Curtis Auto Co., 143 8th St., is having plans prepared for the construction of a 3 story, 100 x 127 ft. garage on Bway. Estimated cost $200,000. Federal Eng. Co., 444 Milwaukee St., Engrs.

Wis., Milwaukee—The International Harvester Co., 217 Oregon St., is having plans prepared for the construction of a 4 story, 100 x 148 ft. assembling plant and warehouse on Reed St. Owner's Architectural Dept., 606 South Michigan Ave., Chicago, Archts.

Wis., Milwaukee—The Sinclair Refining Co., 425 East Water St., will build a service and filling station, including a 40 x 60 ft. main building and a 20 x 20 ft. pump house. Estimated cost $40,000.

Wis., Neenah—H. and W. Niles, c/o Neenah Boat Wks., plans to build a 2 story addition to boat factory. Estimated cost $50,000. Engineer or architect not selected.

Wis., Port Washington—Schmidt Bros. awarded the contract for the construction of a 2 story, 50 x 100 ft. garage. Estimated cost $40,000. Noted June 14.

Wis., Prairie du Sac—J. U. Schmidt is having plans prepared for the construction of a 1 story, 50 x 90 ft. garage and repair shop on Galena St. Estimated cost $40,000. Private plans.

Wis., Rice Lake—The C. O. Ronning Co. awarded the contract for the construction of a 2 story, 50 x 160 ft. garage. Estimated cost $60,000.

Wis., Shawano—J. Popp is receiving bids for the construction of a 2 story, 40 x 48 ft. garage and repair shop. Estimated cost $40,000. Private plans. Noted Apr. 26.

Wis., Silverlake — The Riverview Fdry. plans to rebuild its 1 story foundry, which was destroyed by fire. Estimated cost $50,000. R. M. Dixon, Genl. Mgr. Engineer or architect not selected.

Wis., Waterloo—Lazers & Sons Motor Co., Marshall, will build a 2 story, 45 x 80 ft. garage, here. Estimated cost $40,000.

Ont., Ford — The Ford Motor Co. of Canada, 672 Dupont St., Toronto, is having plans prepared for the construction of a 1 or 2 story heat treating plant here. Estimated cost $200,000. A. Kahn, Marquette Bldg., Detroit, Mich., Archt.

Ont., Weston—The Brocks Steam Motors, Ltd., 1304 Canadian Pacific R.R. Bldg., Toronto, plans to build an automobile factory here. Estimated cost $500,000. Engineer or architect not selected.

This is NOT the end—

You will find the latest Business Opportunities in the machinery field published in the

SEARCHLIGHT SECTION

of this issue

It will pay you to watch the announcements printed here each week.

Turn Now To pages 100 to 113.

American Machinist
Volume 59 NEW YORK, AUGUST 2, 1923 Number 5

This story won the first prize of $200

It Pays to Replace

BY RUSSELL C. LEGO
Foreman of Machine Shop, The Keystone Driller Co.
Beaver Falls, Pa.

The prizes were offered for the best examples of how a shop saved by replacing old equipment with new equipment. The contest closed July 5

THE following account relates some of the outstanding time- and money-saving experiences that I have encountered during the past several years. The savings that I tell about are being realized every day in the machine shop of which I am foreman.

We thought we were doing fine by turning out three per day of the pulleys shown in Fig. 1 on an old 48-in. engine lathe. But we needed more pulleys and installed a new, up-to-date Niles vertical boring mill on which we get 10 per day.

One in 14 hr. was the rate of production on the steel worm, Fig. 2, when it was made on an engine lathe. Conditions demanding greater output, we put in a Lees-Bradner No. 3 thread miller, with the result that our time on cutting these worms is now 2½ hr. each. With the same machine, production on a smaller worm was increased from 1 in 4 hr. on the engine lathe to 1 per hr. The machine is being operated in conjunction with two others by one man, so beside cutting the machine time, the labor cost is very low.

The pinion and shaft shown in Fig. 3 formerly were in one piece, with cast teeth. The pinion had to be trued and the ends of the shaft had to be turned. The operation was very slow, but we knew no better way, until we installed a 2¾-in. Cleveland automatic and made the part in two pieces.

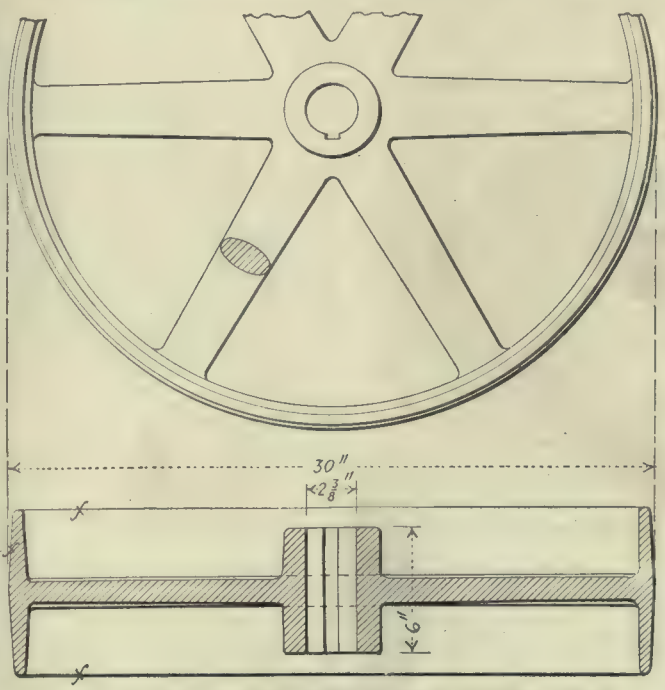


FIG. 1—PULLEY ON WHICH PRODUCTION WAS INCREASED FROM 3 TO 10 PER DAY

The Cleveland automatic gave us plenty of shafts and a turret lathe turned out plenty of pinion blanks, but then we discovered that our old milling machine was not able to turn out enough cut pinions. We installed a No. 4 Milwaukee miller and ended our trouble. The Milwaukee, used with Union cutters, gives us 120 cut pinions per day. By the addition of the Cleveland automatic and the Milwaukee miller we get a cut pinion finished all over at a cost lower than that of the cast pinion with the turned ends. The Milwaukee takes four Union cutters through four rows of pinions at a table feed of 5 in. per min. The limit on the old miller was 2 in. per min. On another pinion we have had a similar experience, increasing the table feed from 1½ in. to 3 in. per minute.

In the case of the steel casting, shown in Fig. 4, finished where marked, the milling time was reduced on the Milwaukee, with vertical attachment, to 20 min., just about one-half the time required on the old machine. The cast-steel gear, Fig. 9, is milled on the same machine, in about one-half the time required on the old miller which it replaced. This gear is in two parts, and the joining faces of the halves are milled. In fact the Milwaukee miller and Union cutters make a time- and money-saving combination which it is a pretty hard job to beat.

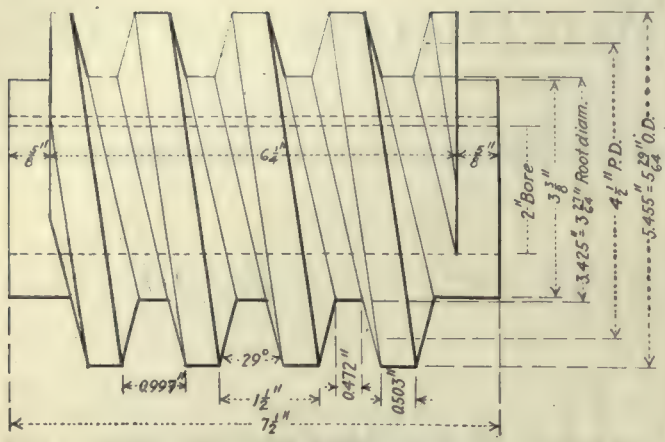


FIG. 2—WORM, WROUGHT STEEL, 1½-IN. C.P., 1½-IN. LEAD, R.H. PRODUCTION INCREASED FROM 1 IN 14 HR. TO 1 IN 2½ HR.

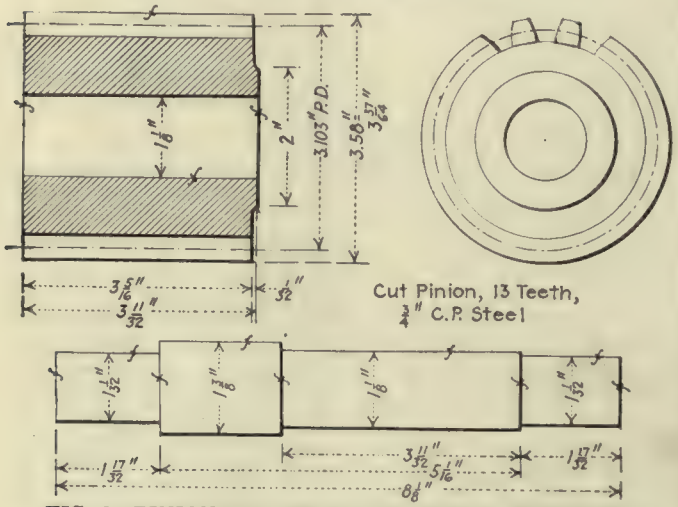


FIG. 3—PINION AND SHAFT ON WHICH IMPORTANT SAVINGS WERE MADE

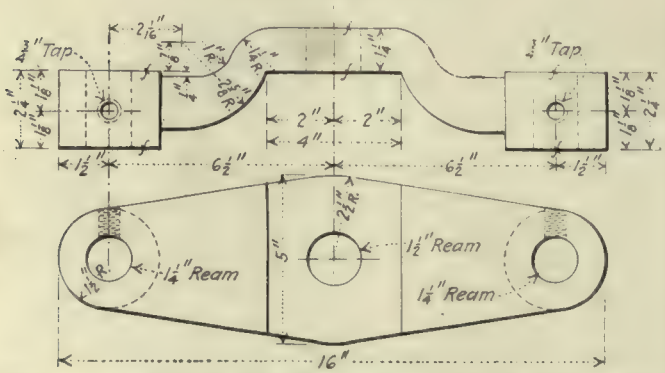


FIG. 4—STEEL CASTINGS ON WHICH THE MILLING TIME WAS CUT ON-HALF

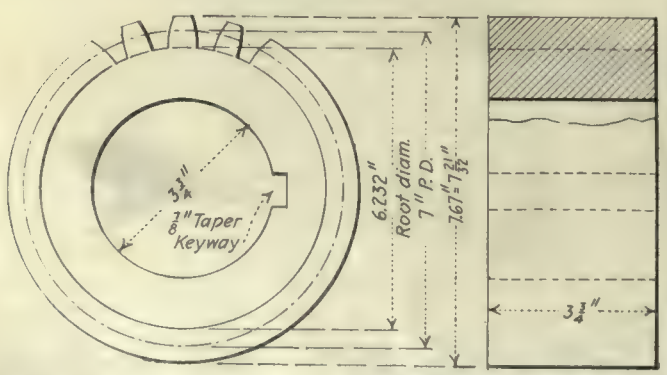


FIG. 5—GEAR, THE BLANK OF WHICH IS MADE FROM THE SOLID FORGING ON A LIBBY LATHE IN 50 MIN.

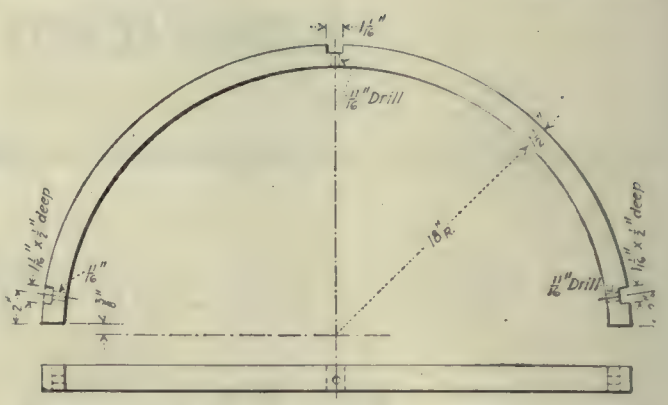


FIG. 6—NOTCHING JOB, DONE ON MILLING MACHINE USING VERTICAL FEED. TIME SAVED, ONE-HALF

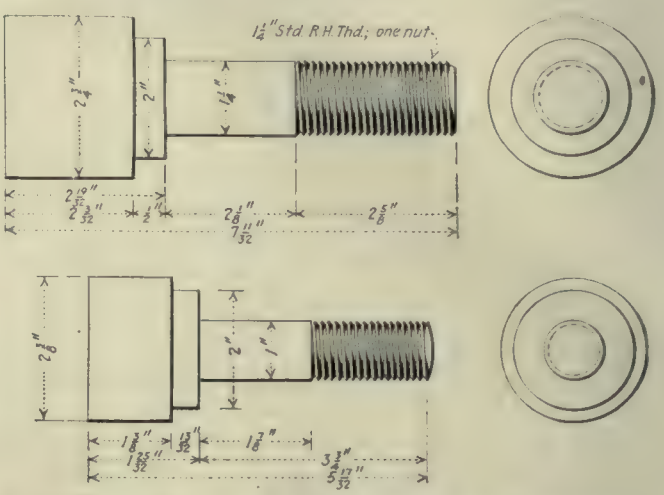


FIG. 7—PARTS MADE ON CLEVELAND AUTOMATIC

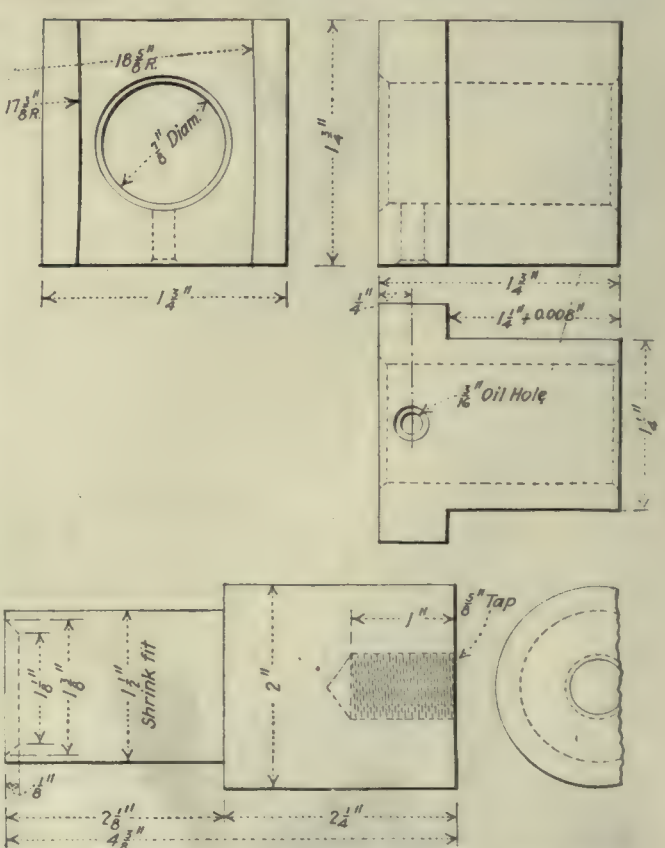


FIG. 8—PARTS MADE ON CLEVELAND AUTOMATIC

The notching job, Fig. 6, is another piece of work done on the Milwaukee. The rate of output is from 75 to 80 per day, a big increase over production on the old machine. The vertical feed of the table is 5 in. per minute.

The parts shown in Fig. 7 were formerly produced on an engine lathe, but a Libby lathe was bought for the job, and it did so well that we have since added ten more Libbys in our different shops. But even the Libby could not keep us supplied, so the Cleveland automatic was put on the job and the result has been at least one-third more production.

The same story is true of the pieces shown in Fig. 8. They were taken from the engine lathe to the Libby and then to the Cleveland automatic. We have recently added two more Clevelands, which are saving time and money every day. The labor cost is very low, as one man operates the three machines.

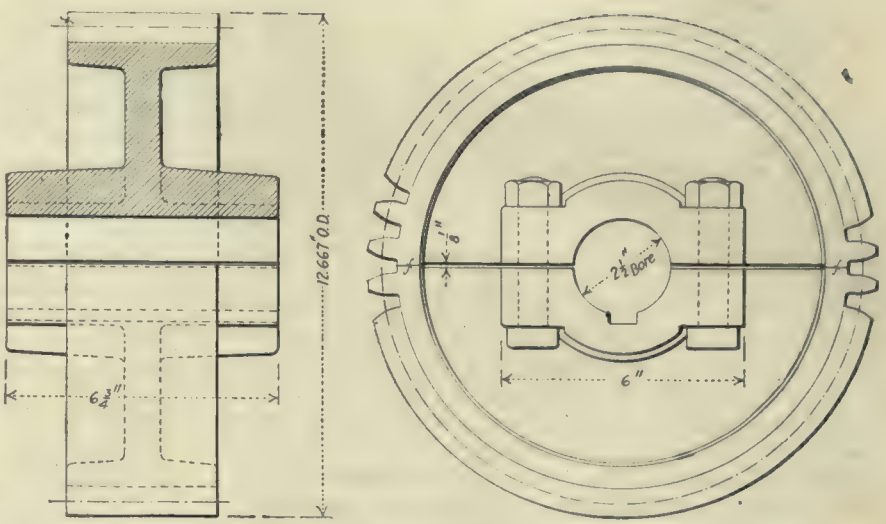


FIG. 9—CAST-STEEL GEAR. MILLING TIME REDUCED ONE-HALF

The blank of the gear shown in Fig. 5 is finished from the solid forging on the Libby lathe in 50 min. This lathe is a great time- and money-saver for us in all of our shops.

We have also installed a Lapointe Machine Tool Co. No. 4 broaching machine on which we finish our bronze bushings with very good results, both in quantity and quality. Our latest additions consist of four Lodge & Shipley engine lathes, three Colburn 48-in. vertical mills, one Milwaukee No. 4 miller, two more Cleveland automatics, one Gray 36-in. planer, one Cincinnati-Bickford radial drill, and one Newark gear hobber. All of these machines are saving time and cutting costs for us every day on their particular lines of work.

As miscellaneous equipment, we have installed a Davis-Bournonville cutting and welding outfit which is a wonderful time-saver for us in cutting structural steel for our finished product; Shepard electric hoists, which greatly facilitate handling work in the shop; and last, but not least, two Elwell-Parker electric trucks which deliver materials from one department to another. The cost of trucking is cut practically in half by their use. Materials handling equipment of today makes big savings and its importance should not be overlooked.

Why the Expert?

By D. C. Wright

A SHORT time ago on a beautiful morning in May, the manager of one of our well-known manufacturing organizations got up from his breakfast, kissed his wife good-by, waved to the children and set out on the brief walk to the plant, filled with a spirit of peace with all of the world. He had put in long hours the day before, and in fact for several days, working out a solution to a problem, which for a time had seemed to threaten the operation of his factory, throw a number of men out of work and generally demoralize production at a time when every pound and unit of output were needed.

He had gone to bed the night before with that feeling of serenity, which can come only after a successful battle fought and won, and he cheerfully looked forward this morning to a day of useful application to some of the pet improvements and policies, which had for long been awaiting the opportunity for serious consideration.

However, his period of self-congratulation was destined to be short, for he had scarcely topped the threshold of his office when he was met by the superintendent of the plant, unctuously conscious of the fact that he was possessed of a fresh batch of bad news, and who without delay set forth to unfold it in all of its lurid horrors.

To make a long story short, the engineer had hardly turned steam into his main equipment that morning before he had noted that there was a decided weave to a portion of one of the machines, where most decidedly no weave was to be expected, and least of all to be desired, and that also there was a bad leak through a portion of the main casting where it was beyond the ability of his experience to figure out the reason.

Being a first-rate engineer, one who was not only keenly alive to his responsibility, but also wise enough to recognize his own limitations, he had promptly shut down and summoned the superintendent.

Superintendent, then Manager, Arrive

The latter had hurriedly arrived upon the scene, since every moment of idleness in this particular piece of equipment meant idleness for a considerable portion of the plant's personnel, to say nothing of the resulting loss in cold dollars and cents for the company; but, like the engineer, he also had to frankly confess that he was "stumped," and a hasty search of the record and files in the engineering department failed to reveal any drawing or diagram that could shed any light upon the internal structure of the particular mechanism which was causing all of the trouble, and which might have enabled any of the high-grade mechanics of the organization to intelligently diagnose the ailment. It was at this point that the manager put in his appearance, and became at once the court of appeal in the case.

Hastily summing up the result of the combined investigations, which had so far been made, the manager hustled to a telephone and got the main office of the

company manufacturing the troublesome machine on the wire, explained the apparent difficulty, set forth all of the symptoms and asked for help, either in the form of advice or direct assistance.

The man at the other end of the wire some hundreds of miles away was very optimistic and stated that fortunately for all concerned one of the company's best expert service men was even at that moment engaged on a job in Blankburg only a few miles from the scene of trouble, and if the manager would simply call a given address by phone, their Mr. So and So would be able to get immediately on the job, and would probably be able to get the job straightened away without delay.

Heaving a sigh of relief, the manager immediately called the address given, and sure enough Mr. So and So was there and would drop everything and come to the scene of trouble upon the next interurban trolley which would get him to the shop in about two hours.

So the men were distributed to other temporary tasks, and everyone set themselves to await with what patience they could the arrival of Mr. Expert, who was to be the prophet to lead them from the land of bondage.

The "Expert" Arrives

Promptly at 1 o'clock a dapper young man with the neatest of neat suits and the fairest of fair complexions walked up to the superintendent outside of the shop and presented himself as the service man of the equipment company.

The superintendent, being a battle-scarred veteran of the wars of shop and foundry, didn't quite kiss the newcomer, but he gave him as warm a reception as his nature permitted and led him without delay into the engine room.

Here, carefully removing his outer wraps and gingerly holding the extension light, which a thoughtful member of the test block gang handed him, the sartorial creation approached the machine and peered long and earnestly at the nickel-plated nuts and piping which extended in the neighborhood of the seat of trouble.

After a few minutes of this sort of thing, the foreman of the job commenced to ply the visitor with hypothetical questions based upon possibilities as he saw them, until, not receiving any very definite answer to any of his queries, he flatly demanded that the newcomer outline an opinion and a course of treatment.

To give the young man credit, he frankly capitulated, and openly proclaimed that he was entirely ignorant of the design, construction or operating principal of the particular type of machine under discussion; volunteered to pitch in and help the mechanics in the shop to find the trouble; or to call up his office at his own expense in order to get expert advise on the subject.

So, reconciled to a further delay, and inwardly cussing a sales promotion policy that would send out cub service men, fresh from school, to monkey with the equipment, which meant the heart and life blood of the plant wherein it might be installed, the manager took the man to his office and arranged to put his call in to the home office.

After the "expert" had made his report to headquarters, the manager himself then took the phone, asked for and got the ear of a veteran engineer in the home office organization, explained in detail the outward signs of trouble, and in a few minutes was equipped with a fair enough understanding of the internal construction of the machine to enable a fair deduction to be arrived at and a course of repair outlined. The engineer at the other end for his part undertook to get a set of detail drawings in special delivery mail, so that they would be in the manager's hands by morning, and volunteered to catch a train and get on the job himself.

Service and Customer Protection Essential

Now the product in question is an internationally known one, familiar to everyone in the power game, and generally considered as a standard. And yet, used as it is in a place, where its continued ability to give service is as essential to the operation of the plant as the drive power on the production machines, the matter of maintaining service and keeping the plants of its users protected against actual shut-down, is entrusted to the tender ministrations of a number of so-called "service men," who have had but a hasty visit to the home plant after completing their schooling in some technical college to acquaint them with the rudiments of the product, and bear no more resemblance to the dyed-in-the-wool "trouble-shooting" mechanic, than the writer's dingy old hat bears to the crown of England.

This is by no means an exaggerated case, but has been carried through in narrative form from start to finish just as an example of dozens of others, with which the writer has come into contact during a strenuous life spent in trying to get out production in the face of every sort of ailment to which the realm of shop equipment is heir.

To be perfectly fair, there have been a number of cases, whose handling as a service proposition has served almost to convert a heart-breaking emergency into a source of pleasure. Real honest-to-goodness experts with grease in their hair, who had come out of the university of the bench and assembly floor only to don the overalls and jumper of the "outside" trouble shooter. These had taken hold of the wabbly or asthmatic machine, engine, motor or compressor, and delving unafraid into its "innards" have ultimately converted the sick child of metal into a husky, willing and useful mechanism, capable of performing its full duty with a promptness and thoroughness that would have done credit to a new machine.

Only why in the name of the gods who watch over sales and advertising, will a lot of real manufacturers of high-grade equipment give of their very best to turn out a good, honest product and then jeopardize the reputation of that product in the field by permitting their cub salesmen and engineers to get their training at the expense of the buyer at the time of all times, when such education is going to cost him dearest in the matter of lost production and idle men?

Would it not be better to pick all service men from an augmented assembly force; or, at the very least, if the organization is not large enough to warrant such an oversize force in this operation, at least insist that each neophyte sales engineer don overalls and for a period perform the tasks within the shop, which will insure his coming into active and intimate personal contact with every portion of the design, construction and operation of the machines in the line, that will be necessary knowledge in intelligently diagnosing the troubles, when that machine gets to be a "key" portion of some plant's operating equipment?

Like Hashimuro Togo, of inquiring mind, "I ask to know."

The New Screw Thread Standard—I

By RALPH E. FLANDERS
General Manager, Jones & Lamson Machine Co.

History of National Screw Thread Commission and A.E.S.C. Sectional Committee—Terminology and definitions from A.E.S.C. report — Explanation of the various terms used

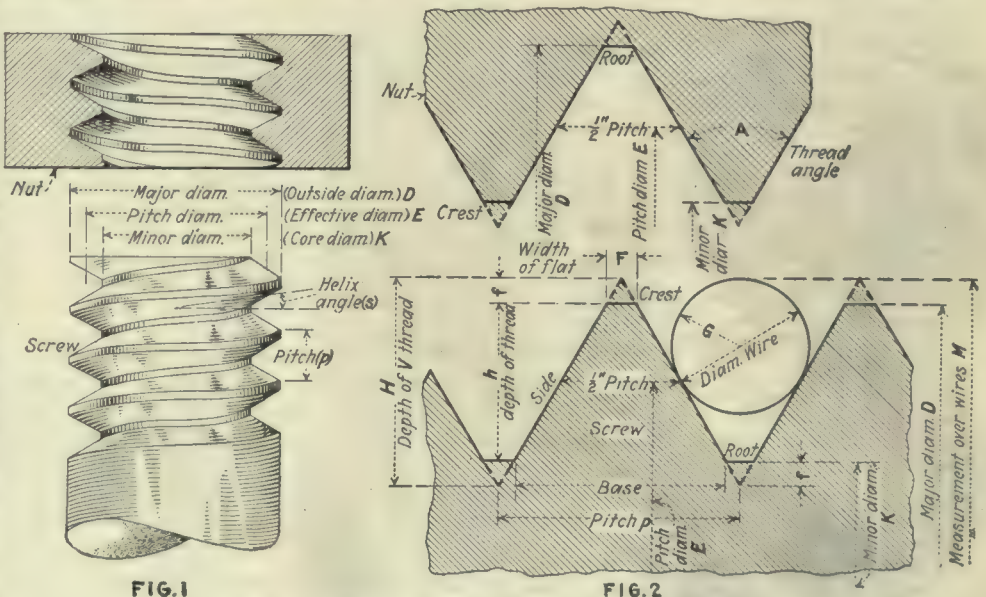
THE SCREW Thread Standard Report has just been made public in its revised form by the American Engineering Standards Committee appointed to review it. It is in many respects the most important piece of standardization work that has yet been undertaken, at least from the standpoint of the machine shop. It has involved the continuous thought of many able men for nearly five years. It has involved inevitable differences of opinion, and long discussion over involved but very important practical considerations. It has finally reached the happy result of having all major differences and most of the minor ones dissolved in mutual agreement by all parties interested. The document is therefore presented to the engineering world as worthy of extended trial and final adoption.

The first or creative part of the work was done by the National Screw Thread Commission, authorized by Act of Congress dated July 18, 1918, and was the outgrowth of difficulties met with in the interchangeable manufacture of munitions of war of all grades. The Chairman of the Commission was Dr. S. W. Stratton, Director of the Bureau of Standards. The result of the work was published in the well known "Progress Report" of Jan. 4, 1921. Much of the material contained therein was at once put to the test of practical application by manufacturing organizations all over the country with excellent results.

In accordance with the object for which it was formed, and at the request of interested individuals and organizations, the American Engineering Standards Committee undertook the examination of this Progress Report to determine its suitability for adoption as an "American Standard." It asked the Society of Automotive Engineers and the American Society of Mechanical Engineers to act as sponsors for this investigation, and on the motion of these two societies a Sectional Committee was formed for this purpose under the chairmanship of Luther D. Burlingame. The object of this body was "to study the Progress Report of the National Screw Thread Commission from the point of view of American industry, to confer with the Commission, and to report to the American Engineering Standards Committee on the several thread standards which this Progress Report contains."

These objects have been accomplished. The report has been condensed to practical proportions for shop use, certain combinations of thread series and fits have been recommended for general practice, and certain changes suggested in the details of the report which have been a matter of conference with the Commission, and on which agreement has been reached.

The remainder of this series of articles consists of a piecemeal presentation of the report with accompanying explanation and interpretation by the writer, who has been a member of the Commission since July, 1920, a member of the A. E. S. C. Sectional Committee since its formation, and a member of the Working Committee to which the Sectional Committee entrusted the detailed examination of the Progress Report. The connection has therefore been an intimate one. Nevertheless it should be clearly understood that the explanation and interpretation here given are purely matters of individual opinion. They are not official in any sense. The only official statements in the case are the two documents: the Progress Report of the Commission, and the Standards Report of the A. E. S. C. Sectional Committee.



FIGS. 1 AND 2—SCREW THREAD NOTATION

The A. E. S. C. report under consideration deals only with "standard screw threads for bolts, machine screws,

nuts, commercial tapped holes, etc." The two fire hose standards were taken care of by another committee, and the pipe thread standard had already been adopted by the A. E. S. C.

Here follows an installment of the text of the report:

I—TERMINOLOGY

1—INTRODUCTION

In this report there are utilized, as far as possible, the non-technical words and terms which best convey to the producer and user of screw threads the information presented.

2—DEFINITIONS

The following definities are given of the more important terms. Definitions of terms which are obviously elementary in character are intentionally omitted.

(a) Words Relating to Screw Threads

1—*Screw Thread*—A ridge of uniform section wound in the form of a helix on the inside or outside surface of a cylinder or cone.

2—*Major Diameter*—The largest diameter of the thread on the screw or nut. The term "major diameter" replaces the term "outside diameter" as applied to the thread of a screw and also the term "full diameter" as applied to the thread of a nut.

3—*Minor Diameter*—The smallest diameter of the thread on the screw or nut. The term "minor diameter" replaces the terms "core diameter" and "root diameter" as applied to the thread of a screw and also the term "inside diameter" as applied to the thread of a nut.

4—*Pitch Diameter*—On a straight screw thread the diameter of an imaginary cylinder which would pass through the threads at such points as to make equal the width of the threads and the width of the spaces cut by the surface of the cylinder.

5—*Pitch*—The distance from a point on a screw thread to a corresponding point on the next thread measured parallel to the axis.

$$\text{Pitch} = \frac{1}{\text{number of threads per in.}}$$

6—*Lead*—The distance a screw thread advances axially in one turn. On a single-thread screw, the lead and pitch are identical; on a double-thread screw, the lead is twice the pitch; on a triple-thread screw, the lead is three times the pitch, etc.

7—*Angle of Thread*—The angle included between the sides of the thread measured in an axial plane.

8—*Helix Angle*—The angle made by the helix of the thread at the pitch diameter with a plane perpendicular to the axis.

9—*Crest*—The top surface joining the two sides of a thread.

10—*Root*—The bottom surface joining the sides of two adjacent threads.

11—*Side*—The surface of the thread which connects the crest with the root.

12—*Axis of a Screw*—The longitudinal central line through the screw.

13—*Depth of Thread*—The distance between the crest and the root of the thread measured normally to the axis.

14—*Length of Engagement*—The length of contact between two mating parts, measured axially.

15—*Depth of Engagement*—The depth of thread in contact of two mating parts, measured radially.

(b) Words Relating to Classification and Tolerances

1—*Allowance*—The difference in dimensions between the minimum hole and the maximum screw.

2—*Tolerance*—A definite difference in the dimensions of either part, prescribed in order to limit the variations in manufacture permissible for a given class of fit.

3—*Basic*—The theoretical or nominal standard size from which all variations are made.

4—*Finish*—The character of the surface on a screw thread.

5—*Crest Clearance*—Defined on a screw form as the space between the top of a thread and the root of its mating thread.

6—*Fit*—The relation between two mating parts with reference to ease of assembly; for example: Wrench fit; close fit; medium fit; free fit. The quality of fit is dependent upon both the relative size and the quality of finish of the mating parts.

7—*Limits*—The extreme dimensions, which are prescribed to provide for variations in fit and workmanship.

3—SYMBOLS

1—*Dimension Symbols*—For use in formulas for expressing relations of screw threads and for use on drawings and for similar purposes the following dimensional symbols should be used:

Major diameter	D
Corresponding radius	d
Pitch diameter	E
Corresponding radius	e
Minor diameter	K
Corresponding radius	k
Angle of thread	A
One-half angle of thread	a
Number of turns per inch	N
Number of threads per inch	n
Lead	$P = \frac{1}{N}$
Pitch or thread interval	$p = \frac{1}{n}$
Helix angle	s
Tangent of helix angle	$S = \frac{P}{3.14159 \times E}$
Width of basic flat at top, crest or root	F
Depth of basic truncation	f
Depth of sharp V-thread	H
Depth of American (National or U. S.) form of thread	h

2—*Symbols for Wire Measurements*

Measurement over wires	M
Diameter of wire	G
Corresponding radius	g

3—*Identification Symbols*—These are for use on correspondence, drawings, shop and store-room cards, specifications for parts, taps, dies, gages, etc., and on the tools and gages themselves.

The basis of the system is the initial letters of the series, preceded by the diameter in inches (or the screw number) and number of threads per inch, followed by the classification of it, all in Arabic characters. If the thread is left-hand the symbols "L.H." shall follow the number of threads. No symbol is used to distinguish right-hand threads.

Examples	Mark
American National Coarse-Thread System	
To specify a threaded part 1 in. diameter 8 threads per in., Class 2 fit	1"-8-NC-2
American National Fine-Thread System	
Threaded part 1 in. diameter, 14 threads per in., left-hand thread, Class 3 fit	1"-14-LH-NF-3
American National Form, Special Pitch	
Threaded part 1 in. diameter, 12 threads per in., Class 4 fit	1"-12-N-4

4—ILLUSTRATIONS SHOWING TERMINOLOGY

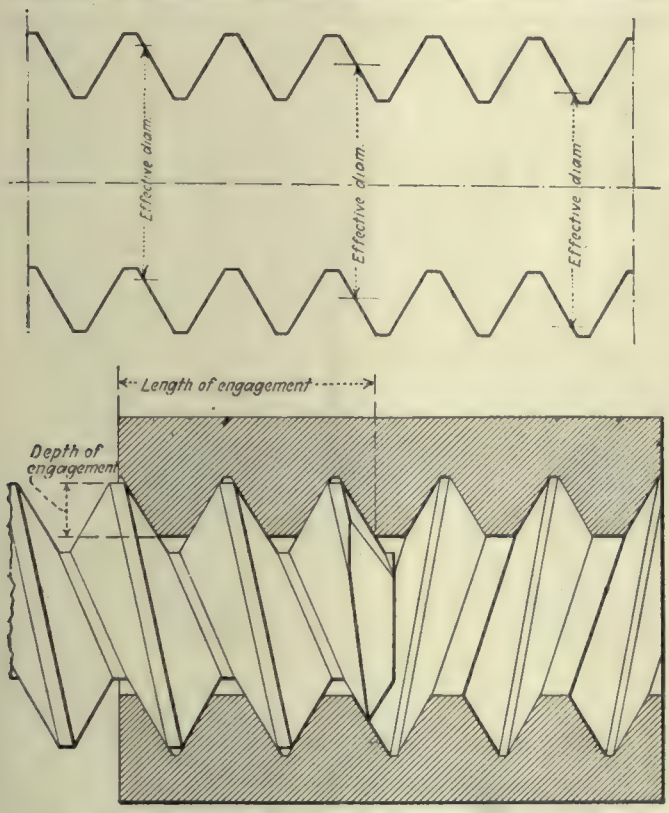
Figs. 1 and 2 illustrate the application of the terms used in this report as previously defined.

This first section relating to definitions will at first glance appear unimportant, but nothing could be further from the fact. The practical mechanic is urged to read it with great care, and to accustom himself to use the terms here given, with the meanings here applied to them. Any one who has been connected with the manufacture or sale of threading tools, gages, etc., as well as threaded products, knows the great waste of energy, time and money that results from the prevalent carelessness in the use of screw thread terms. It is

most important that these terms be standardized and strictly adhered to by all parties concerned.

A number of novelties will be noted at once, particularly the terms "major diameter" and "minor diameter." The great advantage of these expressions is that they cannot be mistaken, and that they are equally plain whether applied to the screw or the tapped hole. As much cannot be said for the terms which they displace. For instance "outside diameter" is self-evident as applied to the screw, but unsatisfactory as applied to the nut. The part of the thread in a nut lying on the *outside* diameter is the part further *inside*, to the view of any one peering into the hole. The same criticism, reversed, applies to the old term "inside diameter," as applied to a nut or tapped hole. "Root diameter" is ambiguous in the case of the tapped hole because the accepted definition of the word "root" as applied to the thread of a nut locates it on the major diameter as shown in Fig. 2 instead of on the minor diameter.

The term "pitch diameter" has been retained as being firmly established and not ambiguous in practice;



FIGS. 3 AND 4—ENGLISH EQUIVALENT OF PITCH DIAMETER AND DIAGRAM SHOWING LENGTH AND DEPTH OF ENGAGEMENT

the corresponding English term is "effective diameter." The English definition reads, "The 'effective diameter' of a screw having a single thread is the length of a line drawn through the axis and at right angles to it, measured between the points where the line cuts the slopes of the thread." The English method of measurement, shown in Fig. 3, amounts to the same thing as our own in the long run.

Two Extremely Important Definitions

There are two of these definitions which should be read and re-read and implicitly followed, those for "Pitch" and "Lead." It is important to emphasize this, because one of the largest manufacturers of screw threading tools has used these terms carelessly in its printed literature, and added confusion where there was plenty already. It will not be easy to change our practice, and give the pitch of a thread as "⅛." It will not, in fact, be necessary. "Sixteen threads per inch" is a reasonable answer to the question of "What pitch?", if we remember that the corresponding answer to the question "What lead?" is "16 *turns* per inch." It would, indeed, have been well to add to the definition of "lead" the formula:

$$\text{The lead} = \frac{1}{\text{Number of turns per inch}}$$

to correspond with the formula given for the pitch.

To make sure that the definitions are understood, it should be remembered that a screw having 16 threads per inch, double, has a lead of ⅛ in.; a screw of 12 threads per inch, triple, has a lead of ¼ in.; a screw of 20 threads per inch, single, has a lead of 1/20 in., etc.

In connection with the terms "crest" and "root," it should be carefully noted, as shown in Fig. 2, that the crest of the thread in a nut is located on the minor diameter, while that of a screw is located on the major diameter—and *vice versa* for the root.

Fig. 4 is here provided to illustrate the terms "length of engagement" and "depth of engagement."

Among the terms relating to classification and tolerances, the importance of the definitions for "Allowance" and "Tolerance" should be noted. There is still a tendency to use these terms interchangeably, when in fact they have distinct meanings. If the maximum screw made to given tolerances is basic, and if the minimum tapped hole made to given tolerances is also basic, that tolerance system has a *zero allowance*; if the maximum screw is smaller than basic, and the minimum tapped hole remains basic, there is a *positive allowance* equal to the difference between the two; if the maximum screw is larger than basic and the minimum tapped hole remains basic, there is a *negative allowance* or *interference* equal to the difference between the two.

Dimensional and Identification Symbols

The "dimensional symbols" given are commended to the attention of all writers of articles, preparers of formulas and tables, and authors of text books everywhere. If these are strictly adhered to, the reader of technical literature will learn to attach their proper meanings to them and have his work much simplified in consequence.

The "identification symbols" are of still greater importance. It is confidently believed that the tolerances proposed in this standard (which will be published in later installments of this series) will so commend themselves to practical men that there will be an insistent demand for taps, dies, gages and other stock tools for their cheap and accurate production. When that time comes a uniform method of identifying these tools for the various sizes and fits will be found necessary. Hence the standardization of these symbols. These tools will be satisfactory to the customer who still thinks in terms of "U.S.S." and "S.A.E.," which standards are not thereby superseded but are incorporated instead. An explanatory printed note might well be wrapped about the tool by the manufacturer whenever an "N.C." tap, for instance, is sent to fill a "U.S.S." order, or when an "N.F." gage is sent on an "S.A.E." order.

The next installment will deal with the important question of thread form.

World Trade in Metal Working Machinery—Exports

Prepared by Industrial Machinery Division, Bureau of Foreign and Domestic Commerce

Switzerland, 1922

Now shown as "Werkzeugmaschinen"—Formerly, "Werkzeugmaschinen zur Bearbeitung von Metallen, Holz, Stein, Etc."

Supplement to table published on pages 958-9, Vol. 57.

Country	Quantity q.n.	Value Francs
Germany	1,060	532,000
Austria-Hungary	150	30,000
France	14,803	5,207,000
Italy	444	189,000
Belgium	2,586	699,000
Netherlands	115	52,000
Great Britain	1,188	633,000
Russia	.....	.....
Sweden	811	257,000
Norway	263	185,000
Denmark	.....	.....
Portugal	.....	.....
Spain	388	136,000
Greece	.....	.....
Bulgaria	.....	.....
Roumania	612	278,000
European Turkey	.....	.....
Serbia	.....	.....
Czecho-slovakia	266	200,000
Yugo-slovakia	.....	.....
Egypt	77	24,000
Algeria and Tunis	.....	.....
South Africa	.....	.....
West Africa	.....	.....
East Africa	.....	.....
Other Africa	.....	.....
Asiatic Turkey	.....	.....
British East Indies	.....	.....
French Indo-China	50	19,000
Dutch East Indies	.....	.....
China	64	45,000
Japan	459	317,000
Australia and New Zealand	89	51,000
Philippine Islands	.....	.....
Canada	.....	.....
United States of America	113	104,000
Mexico	.....	.....
Central America	.....	.....
Brazil	65	37,000
Colombia	.....	.....
Argentine	142	67,000
Chile	.....	.....
Other Countries	485	97,000
Total	24,230	9,159,000

Value of franc at parity is 19.30c. q.n. = metric quintals or 100 kilograms = 220.46 lb.

Sweden, 1920

Supplement to table published on pages 876-6, Vol. 57.

Country	Kg.	Kroner
Norway	259,925	1,099,907
Finland	70,134	288,140
Russia in Europe	.....	.....
Denmark	171,709	318,324
Germany	.....	.....
Netherlands	31,976	118,745
Belgium	100,869	318,272
Britain	312,027	939,131
France	164,201	584,545
Spain	419,626	1,505,552
Portugal	71,581	202,265
Italy	.....	.....
Switzerland	.....	.....
Austria	.....	.....
Hungary	.....	.....
Roumania	.....	.....
Bulgaria	.....	.....
Iceland	.....	.....
Egypt	.....	.....
British S. Africa	.....	.....
China	.....	.....
Japan	18,877	64,600
Other Asia	.....	.....
Australia	81,409	252,056
British North America	.....	.....
United States of America	.....	.....
Brazil	11,192	48,277
Argentina	.....	.....
Other Countries	437,276	1,383,825
Br. East Indies	23,779	79,337
Morocco	11,458	42,410
TOTAL	2,186,039	7,245,286

Par value of krona = 26.80 c.

Germany, 1921

Supplement to table published on page 840, Vol. 57.

Country	Quantity 100 kgs.	Value 1000 Marks
Belgium	79,413	
Bulgaria	.....	
Denmark	13,063	
France	79,795	
Greece	.....	
Great Britain	.....	
Italy	52,945	
Netherlands	46,305	
Norway	.....	
Austria-Hungary (Austria only since 1920)	48,015	
Portugal	.....	
Roumania	11,628	
European Russia	.....	
Asiatic Russia	.....	
Finland	.....	
Sweden	12,620	
Switzerland	17,477	
Serbia	.....	
Spain	23,178	
Turkey in Europe	.....	
Turkey in Asia	.....	
Egypt	.....	
British South Africa	.....	
German Southwest Africa	.....	
German East Africa	.....	
Tunis	.....	
British India	.....	
China	.....	
Japan	.....	
Dutch East Indies	.....	
Siam	.....	
Argentina	15,921	
Brazil	12,882	
Canada	.....	
Chile	.....	
Mexico	.....	
Uruguay	.....	
United States of America	.....	
Australia	.....	
Saar Basin	14,805	
Alsace-Lorraine	2,528	
Czecho-slovakia	21,604	
Netherlands E. Indies	7,286	
Other Countries	137,785	
TOTAL	597,250	11,542,627

Total number of pieces 125,963

Japan, 1921

Country	Yen
China	184,000
Kwantung Province	114,000
Hong Kong	66,000
British India	7,000
Straits Settlements	2,000
Great Britain	13,000
Total	386,000

1 yen = 49.85c.

Machining Steel Cylinder Sleeves of the Wright Aviation Engine

By FRED H. COLVIN
Editor, *American Machinist*

First part of the second article—Turning, boring and threading long, thin sleeves with interlocking flanges — Special tools, fixtures and gages for securing heat radiating contacts

THE cylinder sleeve for the Wright Aeronautical engine is a steel forging which is shown in detail in Fig. 12 and being rough turned in Fig. 13. The forging is first heat treated and then tested for hardness by the Brinell method. The desired hardness is 170, although the tolerance runs up to 190. Sleeves which cannot be brought within this range are held out and run through separately as a single lot. The sleeve is first chucked on the outside diameter and the flange rough faced and turned. Rough boring to 5.442 in. comes next, the tolerance being 0.005 in. The total inside length is 12.143 in. with a plus or minus tolerance of 0.005 inch.

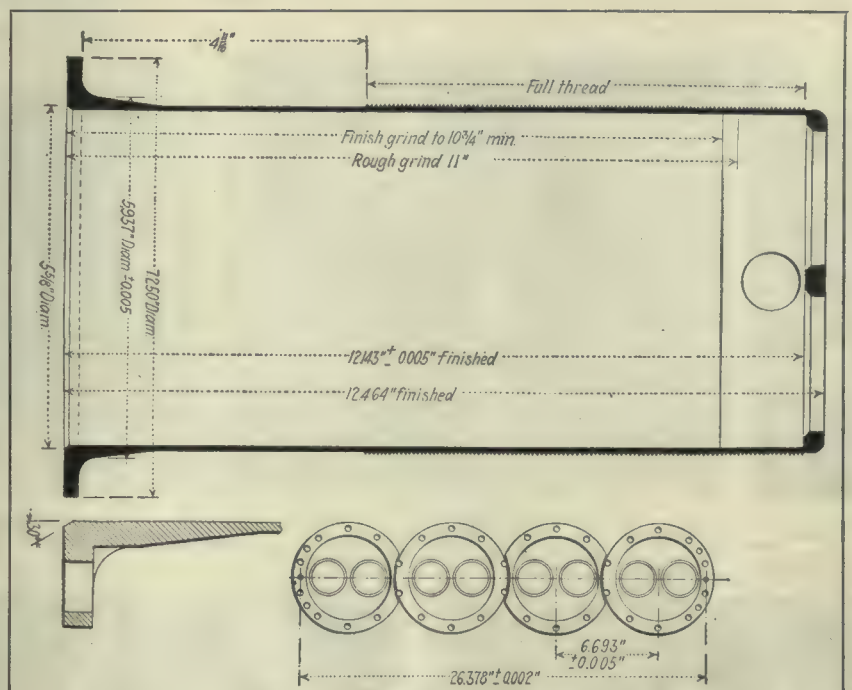


FIG. 12—DETAILS OF SLEEVE

SEQUENCE OF OPERATIONS

Heat treatment	Finish bore	Bore valve seat holes
Brinell test	Finish turn outside	Finish mill top of block
Rough turn flange	Cut thread on outside	Finish grind flange
Rough bore	Grind solid end of sleeve	Lap top of block
Face back of flange	Assemble in block	Grind bore of sleeve
Rough turn outside	Cut segments from flange	Inspection

The sleeve is then held on an expansion arbor, and the back end of the flange at the outer end of the sleeve faced to bring the total length to 12⅜ in. The outside diameter is then rough turned to 5.824 in. except for the taper near the flange, as shown in Fig. 12. This leaves the wall approximately 0.19 in. thick for the future operations, which materially reduce this thickness.

The sleeve is then chucked by the outside diameter in special jaws, and the inside finish bored to 5.492 in. the tolerance now being reduced to 0.002 in. The flange is faced and turned and the end of the bore beveled to a 30 deg. angle, as shown in Fig. 12.

Going again to an expansion arbor, the sleeve is held for finish turning on the outside to 5.744 in. with no plus tolerance and a minus tolerance of 0.003 in. The taper at the flange end is now finished and preparations made for starting the thread at the front end.

The sleeve is now thoroughly washed in soda water and the thread cut with a Modern self-opening diehead arranged on a lathe fixture, as shown in Fig. 14. The thread is 146 mm. or 5.748 in. in diameter and 1.5 mm. pitch, or approximately 18 threads per in., of the U. S. form. The thread is approximately 7⅛ in. long on a wall 0.128 in. thick, while the thickness of the remainder of the sleeve between the threaded portion and the flange is 0.078 in. thick.

The job of thread cutting is an unusually difficult one, both on account of the large diameter of the work and the length of the thread, as well as the necessity of having the thread as smooth as possible so as to make an intimate contact with the cylinder block, in order to secure the maximum transmission of heat. For this reason, it is interesting to examine the method of holding the diehead on the lathe carriage, as it is necessary that it be supported centrally and firmly while cutting the thread.

Ample lubrication is supplied to the chasers through the pipe at the right, the small globe valve controlling

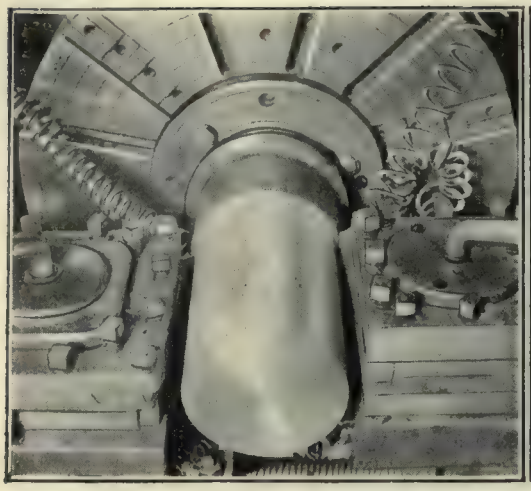
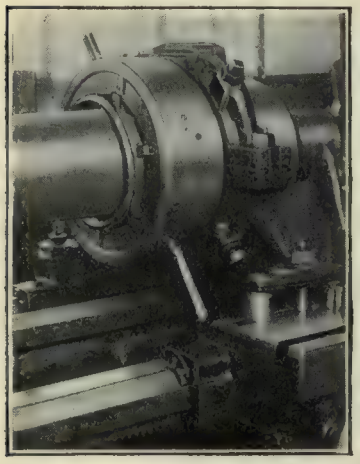
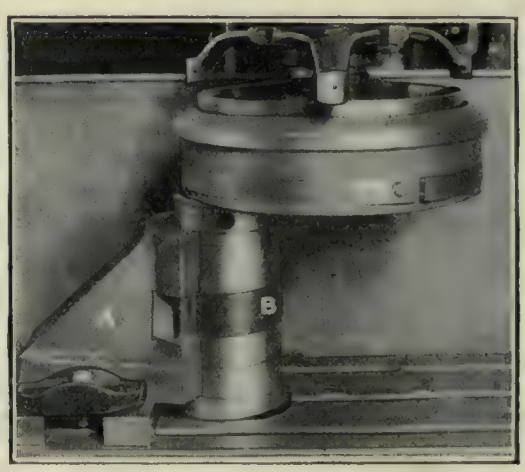




FIG. 13—ROUGH TURNING SLEEVE. FIG 14—CUTTING THREAD ON SLEEVE





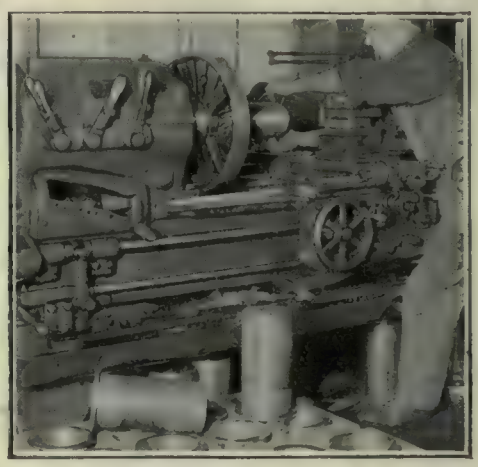
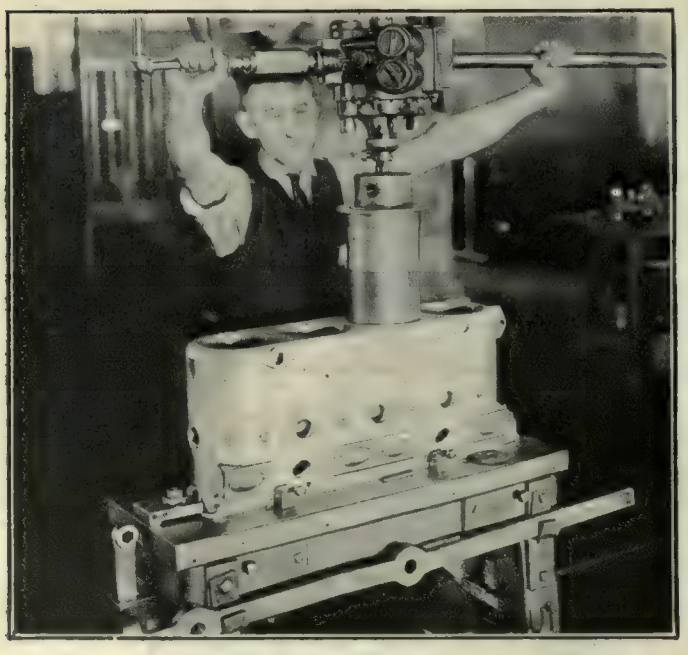


FIG. 15—DETAILS OF DIE AND HOLDER. FIG. 16—GRINDING TOP OF SLEEVE
FIG. 17—FINISH TURNING END OF SLEEVE



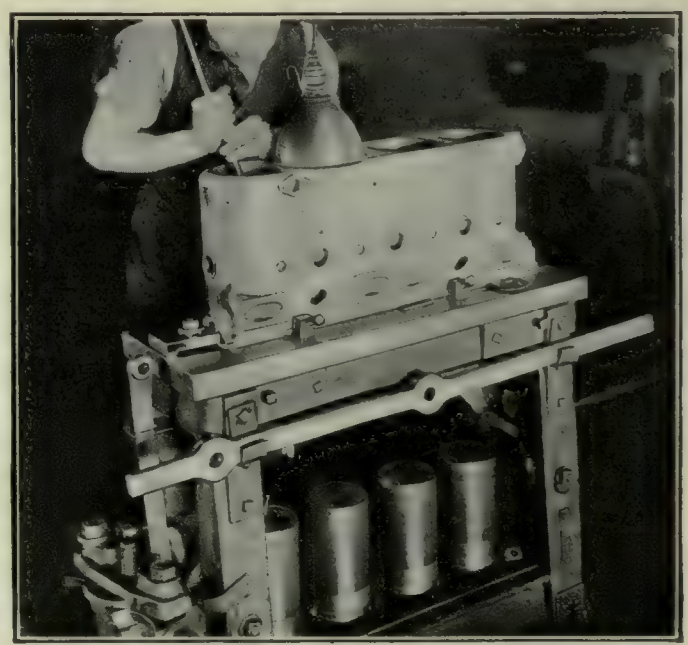


FIG. 18—SCREWING SLEEVE IN BLOCK. FIG. 19—SCRAPING INSIDE SURFACE OF BLOCK

the flow as desired. Each sleeve is inspected as it comes off the lathe, as can be seen at the left, where a thread micrometer is being used to measure the pitch diameter. A ring gage is also used in inspecting the thread. Some idea of the careful way in which the threaded sleeves are handled can be had from noting the rack at the left, on which the sleeve being inspected rests. The box or framework shown protects the whole outside diam-

eter of the sleeves from dirt and injury between operations. Another view of the sleeve being threaded is shown in Fig. 15, which gives a better view of the die and the screws by which it is centered. It also shows the pipe ring which supplies lubrication directly to the chasers as the die advances over the sleeve.

The top of the sleeve is then finish ground on a Pratt & Whitney vertical grinding machine, being held in the fixture shown in Fig. 16. This fixture consists of a substantial angle casting *A*, bored to fit the outside of the sleeve and having a sheet metal band *B* by which the sleeve is held firmly against the casting. A suitable height gage is used for inspection.

The sleeve then goes to the Lodge & Shipley lathe shown in Fig. 17, where the front end is turned to a diameter of 5.665 in. and the end finished to a ⅛-in. radius, as it is very important that perfect contact be secured between the end of the cylinder sleeve and the head of the cylinder casting, in order to secure the greatest possible radiation of the heat. The end or face of the sleeve is then polished with a parallel bar covered with No. 0 abrasive cloth lubricated with oil. After a thorough inspection, the sleeves are delivered to finished stock. Assembling of the sleeves to the cylinder block now begins, to form a single unit.

Having completed both the cylinder blocks and the sleeves to the point of putting them together for future operation, it will be well to refer to Fig. 12 and note the way in which they fit together, as shown at the right. It will be seen that the flanges of Nos. 1 and 3 sleeves remain intact, but that both sides of sleeve No. 2 and one side of sleeve No. 4 are cut away to allow sleeves Nos. 1 and 3 to be screwed into place. Before this is done, however, each sleeve is screwed in, and taken out as in Fig. 18, both to be sure of the fit of the thread and also of the end of the sleeve against the crown of the cylinder block. The method of screwing the sleeves in place by means of the air motor is clearly shown as well as the method of holding the cylinder block in position on the assembly table.

After removing the cylinder sleeve, the bearing on the end is carefully inspected and any high spots on the crown of the cylinder bore are removed by scraping, as shown in Fig. 19. The location of the segments which are to be cut from the flanges of sleeves Nos. 2 and 4 is also determined after these two sleeves have been finally bedded into their positions in the cylinder block. In all future assembling, sleeves Nos. 2 and 4 must be screwed into place before Nos. 1 and 3, the reverse being necessary in removing them for any cause.

Endurance of Properties of Steel

One of the papers presented at the 26th annual meeting of the American Society for Testing Materials, held at Atlantic City, June 25 to 29, 1923, was by D. J. McAdam, Jr. on the endurance properties of steel. This paper gives the results of endurance tests at the U. S. Naval Engineering Experiment Station, on carbon and alloy steels. Static tension, torsion and impact tests were made on these types of steel. Rotating-cantilever and alternating-torsion tests were made on specimens of various forms having various types of surface finish.

Repeated impact tests were made on a special machine and as a result, the relationship of repeated impact to single impact and to endurance properties was shown.

In discussing the results of the tests, the following subjects were given consideration: Relationship of endurance properties to static tension and torsion properties; relationship of endurance properties to impact properties; influence of chemical composition and heat treatment; influence of non-metallic inclusions; influence of form and surface finish of a machinery part, and types of steel best adapted for various kinds of service.

This endurance value of steel is of particular moment to machine designers and the following extracts from the paper should prove of value to them.

When a machinery part subject to repeated or alternating stress is to be made as light as possible, the proper design of the part involves not only intelligent attention to form and dimensions but also intelligent selection of material. In the proper selection of material, use can be made of the information presented, in regard to the relationship of endurance limit to other physical properties.

For fatigue resistance, the endurance limit should be made as high as possible. This involves making the tensile strength as high as is possible consistent with the use to which the material is to be put. Too much stress has in many cases been laid on ductility. In many machinery parts, in which an "elongation" of 16 per cent would be ample, it has frequently been the practice to aim at an elongation of 30 or 35 per cent so as to get material with high Charpy value supposedly indicating "shock-resistance" qualities. For machinery parts such as bolts, which even though threaded should be able to withstand slight deformation without fracture, ductility is of much importance and the Charpy test is of some value. To minimize the disastrous effects of collisions or other accidents, it may be desirable that certain machinery parts have enough ductility to bend somewhat without fracture. Even in such parts, however, the quality of first importance is resistance to fatigue failure, which is always a fracture in which the most ductile material behaves as if it were brittle. The value of quenching and tempering in raising not only the tensile strength but the endurance ratio has already been emphasized. The higher combination of "endurance ratio" with ductility obtainable with alloy steels justifies their use in machinery in which a high endurance limit is of importance.

When a forging cannot be quenched and tempered or when the effect of heat treatment is greatly limited, as in the case of large forgings, chemical composition becomes of even greater importance. The effect of an alloying constituent such as nickel in raising the endurance ratio is worthy of consideration. The use of higher carbon percentages in large forgings in order to raise the tensile strength at the expense of the frequently excessive ductility would in many cases give material more suitable for its purpose.

When the stresses in service are to be repeated rather than alternating it is desirable, in order to secure the necessary high elastic ratio, that quenched-and-tempered steel be used. For the same reason, as well as on account of its high endurance ratio, the use of alloy steel is especially desirable. For large forgings or whenever an effective quenching treatment cannot be given, nickel steel, for the same reason, is especially useful.

There is no doubt that the information obtained within the last few years on the endurance properties of steel will lead to many changes in selection of material on the principles above outlined.

Book Reviews

The Blast Furnace and the Manufacture of Pig Iron. Third edition, by Robert Forsythe, revised by Carl A. Meissner and J. A. Mohr. Cloth boards, 371 pages, 6x9 in., and 74 illustrations. Published by the United Publishers Corp., 239 West 39th St., New York, N. Y. Price $4.

This volume is not offered as an exhaustive treatment of the subject, but is designed primarily for the use of metallurgical students, foundrymen and blast furnace operators as a guide in grasping the general fundamental principle of blast furnace practice. The most recent and most practical information on this subject is given in such a clear and concise manner that every detail should be quickly mastered.

In addition to the main text on blast furnace practice, a supplement has been added that is devoted entirely to the manufacture of pig iron. Furthermore, a brief review of the principles of chemistry and physics is included, which is intended for non-technical readers.

All the materials that make up the charge of the blast furnace, namely, ores, fuels and fluxes are discussed in detail in the main text. The various iron ores available, their place of occurrence and the methods of preparing them for charging, calcination, roasting, concentration and agglomeration, are given. Then the three types of fuels, charcoal, raw coal and coke are taken up, showing how they are obtained and their relative values. And lastly the various fluxes are described with the purpose of relating how their use facilitates the flow of the metal and cleans out impurities.

With the materials going into the manufacture of pig iron described, the text then goes into a detailed study of the plant layout such as furnace design and equipment, the operation, burdening and action within the furnace, and furnace irregularities. It shows the general methods of constructing the various parts of the furnace such as bosh walls and plates, inwalls, lining, tapping and cinder holes, tuyeres and the top arrangement, gives the types of stoves needed to heat the blast and the other equipment essential in blast furnace operation such as pyrometers for measuring temperature, cast houses, boiler and blowing plants.

Then the operation of the furnace from the time of charging till the metal is poured into pig-beds or ladles and the methods by which the furnace temperature and slag composition are controlled, are described in detail. In addition, the problem of burdening the furnace is presented in two distinct phases, namely the theoretical, when dealing with new problems such as unfamiliar materials or when using familiar materials in unfamiliar proportions, and the empirical phase, when a furnace is operating with fixed sources of supply. And lastly, the action within the furnace due to the descending current of solids and the ascending current of gases is explained together with the forms of irregularities likely to occur due to a variety of causes such as leaky tuyeres, destruction of lining, obstructions and a chilled hearth.

The supplementary chapter on pig iron manufacture gives the classification of pig irons and the methods of converting pig iron into wrought iron and steel.

Among the subjects analyzed in the last chapter, which is devoted to some principles of chemistry and physics, are chemical and physical changes in matter, nature of matter, oxidation and reduction, description of the elements entering the furnace, phases and states of matter, laws of gases, heat and fuel. These subjects are reviewed with the purpose of explaining the changes in the composition of the materials that enter the blast furnace.

Applied Personnel Procedure. By Frank E. Weakly. One hundred eighty-seven pages, 5½x8½ in., cloth boards. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York City. Price $2.

Written with a foundation, on the part of the author, of experience in manual work, personnel department and a general executive position, this volume partakes of the case method of presenting certain personnel problems and their solutions. It is not intended as an exhaustive treatise on personnel administration, an advantage in that it gets down at once to definite conclusions and practicalities, that may be applied in organizations of any size.

The first chapter asks and answers the question, "Why a Personnel Department?" The place of human relations in industry is recognized and clearly stated. There follow chapters on sources of help supply; interview, selection and placement; attendance and punctuality; promotions and transfers; job analysis and job specification; employee training plans; employee representation; profit sharing and savings; and other subjects.

A very fair conception of the rights of employer and employee is shown. Mr. Weakly appears to lean niether way, but to have analyzed without prejudice the dependence of the success of any industrial undertaking upon harmonious personnel relations. The reader with an average understanding of the many problems of human relations will find that he can agree with most of the statements in the book and that he has been furnished with a guide for the application of methods that are not complicated.

Engineering Index for 1922. 675 pages, 6¼ x 9¼ in. Published by the American Society of Mechanical Engineers, 29 West 39th St., New York City.

This is the fourth volume of the index to be published since it was taken over by the A. S. M. E., and the twenty-first volume since its inception. The Index reviews over 1,300 periodicals, reports and other publications, and the articles selected for extract represent over 600 of these. About 20 per cent of the articles reviewed are printed in Great Britain or her possessions, while 30 per cent are from representative publications in Belgium, France, Germany, Spain, Italy, South America, etc. The remaining 50 per cent are from American publications.

As in any case where extracts are made, there is always the problem of the personal equation in the selection of the article and the extract made from it. Here the editor is the czar, and there is no getting behind his decision. This of course, means that the articles cited by no means represent all that have been published on any given subject, and the reader must be content with such references as, in the judgment of the editor, cover the subject. Such a point is always open to discussion, and the user of any book of this kind must bear in mind that his information on any given subject can usually be largely supplemented by reference to the leading periodicals in his particular field.

Industrial Cost Accounting for Executives

By PAUL M. ATKINS

The eighteenth article—Interest as an element of cost—The fundamental issue—Theoretical and practical problems—The influence of the attitude of the executive

THERE IS probably no subject in the whole cost-accounting field which has been the source of so much controversy as the question of whether or not interest shall be included as an element of cost. While undoubtedly the topic is an important one, the space devoted to its discussion has been all out of proportion to its real importance to cost-accounting. Its effect on the final cost figures is likely to be so small as not to be worth all the time and energy given to deciding whether or not it shall be included. It seems undesirable, however, to pass the subject by entirely and so this article will be given over to a brief consideration of the more outstanding phases of the question.

Of course, the fundamental issue is whether it is correct to include interest, but the question of principle is intimately related to problems of method and questions of expediency. One of the reasons why this topic has been so confused in the minds of many who have discussed it is undoubtedly due to the fact that certain terms have been used by different groups of individuals in discussing the topic, terms to which rather different meanings have been given. There can be no real objection to the economist's using the term interest in one way if he finds it convenient and useful to do so, but there should be no objection to the business man's employing it in a somewhat different sense if he finds it satisfactory to do so.

Whatever the meaning of the word may be to the economist, to the average business man the word interest means a division of the net income of the business. Part of the net income goes in the form of interest on money borrowed at the bank, part of it in interest on bonds, and part in the form of dividends on capital stock while the remainder is retained in the business. If this conception of interest is held, then it is evident that it would be incorrect to include interest as an element of cost of production for it is rather a part of the distribution of profits.

If the other point of view is taken that interest is a cost of the use of capital just as wages is the cost of the services of labor then it is easy to see how interest may be thought of as a cost of production. In this case, however, to be strictly logical it would be necessary to include that portion of the dividend rate which would represent a fair interest rate on the part of the capital represented by the capital stock. From the economist's point of view this concept of interest is very useful in aiding him in his development of economic principles, but that is no reason why the business man should be compelled to adopt the meaning for his use when some other meaning is more satisfactory.

One of the reasons why the divergence of ideas exists is because the economist in thinking of interest is concerned with business in the large and not with the problems of individual concerns. The appearance of the problem from the broadly social-economic standpoint is radically different from that of the business manager who is chiefly concerned with the successful operation of his business.

Bearing in mind the difference in the uses of the word, let us turn our attention to a brief consideration of some of the principal arguments for and against its inclusion as an element of manufacturing costs. One of the most striking of the reasons advanced in favor of its inclusion is in connection with comparative costs of various methods and kinds of equipment. The examples often cited are those of the ageing of wine or the tanning of leather, processes where it is necessary for the product to remain for relatively long periods in casks or vats and where, it is said, the cost of the process depends very largely on the interest which accrues during the period on the capital invested.

On the face of it, the argument seems impregnable, but a little analysis will show that such is not the case. If a proper burden application rate has been developed, the amount of burden actually charged to the goods going through the process will vary as the time taken. Hence, in comparing the burden charge for the two processes under consideration the time element will receive its proper weight. To include interest in both cases would increase the burden charge in both cases, but it would not affect the ratio between them to any considerable extent because under most circumstances interest, if it is included, forms only a small part of

THE KEEPING of a record of the amount of interest charged to the cost of production involves an expensive amount of bookkeeping, hence unless some adequate gain results from the process it should not be included as an element of cost.

Under the most satisfactory of conditions it will be found that cost records for interest are not accurate and cannot be made absolutely so.

Interest should be included if the executive is of the optimistic kind who is inclined to accept excessive risk, in order that costs may appear high.

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the burden rate. Of course, it would be quite impossible to use a percentage on direct labor hours or charge as a means of allocating the earned burden to the product; it would be essential that a process rate be worked out for the purpose. All of the methods are described in subsequent articles.

At the same time, if it is felt to be essential in any particular case to include interest in the comparison, it is not at all necessary to make it a part of the burden rate and so incorporate it in the cost accounts. It is quite possible to add interest as an estimated figure to the actual cost of the present method and as the cost of the proposed method can only be estimated in any case, the interest contained therein can only be estimated.

The Attitude of Bankers and Courts

While the opinions of those who are neither accountants nor manufacturers may be held to be of little weight in the discussion, it must be recognized that we are living in a practical world and must consider the opinions of those who are in a position to influence the outcome of the question. The courts and bankers are almost unanimous in their condemnation of the inclusion of interest, and since business executives must borrow money from the banks and have disputes among themselves settled by the courts, it is essential that their opinions be given due consideration.

The reason for the banker's attitude is due in large measure to his feeling that the inclusion of interest means an inclusion of a part of the profits or net income of the business as a cost of production, and that as a result, the inventory at cost price is improperly inflated. If interest represents a distribution of profits, their attitude is perfectly correct and understandable, but in any case, they are in a position to make their opinion prevail. Hence, if interest is included as a cost it is necessary to set aside a reserve to cover it till the goods are sold. The reserve to cover interest charged to cost is, of course, a credit balance and, when combined with the inventory accounts should give the correct value of the goods actually on hand.

The necessity of such records raises a practical problem of tremendous importance. To keep a record of the amount of interest charged to cost of production involves an expensive amount of bookkeeping, of which the net results are substantially nil since the accounts are all put into the same position that they would have been in if interest had not been included as a cost element. To those who have not had any experience in handling such a problem it may well appear relatively easy, but in actual practice it is one of the most difficult bookkeeping tasks which is likely to be met. Hence, unless some adequate gain results from the process the weight of evidence is against the inclusion of interest.

Perhaps, also, a better idea is obtained of the importance of the whole matter if one considers the difference in unit costs which result from the inclusion or exclusion of interest. In most cases, it will be found to affect the unit cost singularly little, a result which helps to dwarf the importance of the whole question. It also makes it evident that it is not worth expending large sums in order to apportion interest in cost, and then to take it out again because of the necessity of meeting the requirements of bankers.

The whole question of the use to which a cost account and record is to be put is raised here. If the value of the cost system depends on the accuracy with which it apportions every cent of expenditure for the benefit of the factory to some account, then, if interest is to be considered a cost of production, it is essential that the distribution be made no matter what it may cost to do so. If, however, the cost accounts are considered to be primarily an instrument of control, then it certainly is not worth expending large sums for a series of bookkeeping entries which do not enhance the accuracy of the control but do materially increase its cost.

Under the best and most satisfactory of conditions it will be found that the cost records are not accurate and cannot be made absolutely so. They are simply approximations to the statement of the real facts, and as long as this fact is borne in mind their value is not vitiated. No records are ever a substitute for intelligence and good judgment. The business executive must follow the example of the artist and mix his cost records with brains if he expects to find them really useful.

The anticipation of profits by the inclusion of interest as a cost of production needs further consideration before being left entirely. To some it may appear as quite illogical to insist that interest must not be charged as a cost of production, and hence, as a part of the inventory value of the goods until they are actually sold and shipped, and yet to permit the crediting of interest at that time as a gain. Is there any essential difference between assets in the form of an inventory of goods in the stock room and assets in the form of accounts receivable? It might even seem as though the inventory in the plant of the company were even a better asset than an account with another company for the company may use the goods and never be able to pay for them.

It must not be forgotten, however, that in many respects the account receivable is a better asset than the inventory. The goods are sold and accepted, and a legally enforceable claim is established thereby on the customer. The claim is not simply against the goods but against all the assets of the customer against which a prior lien has not already been set up. If customers are selected with reasonable care and an adequate reserve is arranged to provide for the occasional bad debts, the losses after the goods have been delivered and accepted are likely to be exceedingly small and are provided for by means of the reserve. Hence, it is logical to use accounts receivable as a basis of calculating profits while it may not be proper to include interest as a part of the inventory as long as they remain unsold. What was said about the insignificance of the variation of the costs when interest is included or excluded should be remembered in this connection, however.

Association Cost Accounting

It is often advanced by those who advocate the inclusion of interest and who are interested in association cost-accounting that such a step is necessary if costs are to be obtained which are comparable among the several members of the association. They bring out the proposition that if rent is to be treated as a cost by those who must rent their buildings, then it is essential that those who own their own buildings should include interest on the capital costs of their buildings if building costs and hence costs of production are to be comparable among the members of the association.

The argument seems to overlook the fact that even if interest were included the costs still would not be comparable unless we are to assume that the proprietor of the building would be content to receive profits equal

only to the rate of interest. Such an arrangement is sometimes made, it is true, when the lease provides that the tenant is to pay all maintenance costs, and the rent is substantially the depreciation on the building plus interest on its agreed value. Such cases are relatively rare, however, for the owner ordinarily expects to obtain a profit from his building over and above what might be considered as interest.

It would be more appropriate for the concern which is actually paying rent to charge as building costs only such items as it would charge if it owned the building. The difference between the total of such items and the amount actually paid for rent could then be carried directly to the profit and loss account as a distribution of profits.

On What Is Interest to be Charged?

There are two very practical questions to answer if the decision has been made to include interest as an element of cost. The first of them is: On what is interest to be charged? Is it to be interest on the net capital investment as is advocated by some, or interest on the fixed assets? If the latter, is the present net worth to be taken as the basis or is the original cost to be chosen. If interest is to be charged on fixed assets, is it not also proper to charge it on inventories of material-stores, worked material, merchandise, and if on these why not also on goods in process? If the answer is in the affirmative, how is the value to be determined since it is fluctuating day by day? Shall the value of each be used as a basis for the calculation of the interest, or the value on hand at the end of the month or the average value of each kind of inventory during the period in question? If interest is to be charged on liquid assets in this form, why should it not be charged on prepaid insurance and other prepaid expenses, and also on accounts receivable? Of course, interest actually paid out to bankers should be charged as a cost though an issue is raised at once in case the money is used for some other purpose than to aid production.

Other similar problems must be faced when one tries to decide on what interest is to be charged. To be strictly logical, it would be necessary to say that interest on everything should be charged, and when the attempt is made to put this into practice, many difficulties are encountered. It should not be inferred from what has been stated that it is impossible to ascertain a basis for the calculation of interest, but enough has been said to indicate that such an operation is attended with both theoretical and practical problems.

The second question referred to in the preceding paragraph is in respect to the rate of interest which is used in the calculation. Is it to be the rate paid by the savings banks in the community, or is it to be the rate paid when borrowing money at the bank, or is it to be some other rate considered fair and just for the business in question, and if the latter method is selected, how is its justness to be determined? Is the rate to fluctuate as the general interest rate changes with the general business conditions, or is it to be altered as often as the current market rate of interest oscillates, or is it to remain fixed for an indefinite length of time when once determined?

If the amount decided upon in the solution to the preceding is large, a relatively small variation in the rate of interest will cause a substantial difference in the amount of interest to be charged to cost, even though that amount is very small per unit of product turned out. As in the case above, the question is not unanswerable, but to work out a satisfactory solution is no easy task. The questions raise the same query about the desirability of including interest when looked at from the wholly practical point of view—is it worth the cost?

It is only worth the cost if it renders services of greater value than the cost. To a very considerable degree it depends on the character of the executive who is to use the cost accounts and records. If it will aid him in the control of his business sufficiently to make the gain more than the cost, then it is appropriate to include interest in spite of the attendant expense. If the manager is of the sanguine, optimistic kind who is inclined to accept excessive risk, then it may be well to include interest so that the costs may appear to be high, and his rashness may be checked, thereby. If, on the other hand, he belongs to the contrary class and is over cautious then it is certainly wise to omit interest and show the actual costs at the lowest consistent figure. It must always be remembered that interest can be added as a supplementary figure if it is ever required for control purposes, and so, any benefits to be derived from the calculation may be obtained without increasing the regular routine work of the cost department.

The whole question is not one involving moral turpitude. It is no reason for rejecting the services of a man because he believes one way or the other in respect to the question unless he becomes intolerant. It is almost wholly a matter of expediency, and it should be treated as a matter of expediency. Very rarely will it rise to any great practical importance among the cost-accounting problems which exist to be solved.

What Is a Screw Machine?

By John R. Godfrey

"Say, Johnson, what is a screw machine?" I asked the old man the other day.

"Damfino, Godfrey, and I don't believe you do either. It used to mean a small hand turret lathe for making machine screws. Now it seems to mean anything from an automatic for making small parts for watches up to a large turret lathe. Nobody knows what it means so far as I can find out.

"The screw machine, even the automatic, doesn't always make screws by a long shot. Of course it can, but so can a bolt cutter, an engine lathe, a milling machine, a thread miller, and so on.

"Of course, if we really wanted to be logical, we'd drop the name 'lathe' altogether, and call it a turning machine, or turner. But that's asking a lot, especially of us older chaps. There isn't any sense in the word 'engine' either, but we've been pretty firmly inoculated with the germ and its likely to stick.

"Any horizontal machine whose chief function is to 'turn,' can be called a lathe, with a handle in front of the name to tell what type of lathe it is. There's engine-lathe, turret-lathe, forming-lathe, low-swing lathe, flat-turret lathe, semi-automatic and automatic lathes, fox-turret lathe, etc. Screw machine doesn't seem to have any logical place in the list unless its chief function is to make screws. And even then, 'automatic screw cutting lathe' will fit the case just as well.

"It's about time we got some sort of a language most of us could understand."

Trigonometry Problems from the Drafting Room—Discussion

By Fred Stevins

THE following solutions are submitted to the problems that Mr. Thompson presented on page 652, Vol. 58 of *American Machinist*. The first problem, the conditions of which are shown in the accompanying illustration, can be treated as follows:

$$\frac{x}{4} = \frac{x+6}{\sqrt{225-(x+6)^2}}$$

Or, $x^4 + 12x^3 - 173x^2 + 192x + 576 = 0$

Whence,

$$a = 3 \qquad c = 48$$
$$b = -\frac{173}{6} \qquad d = 576$$

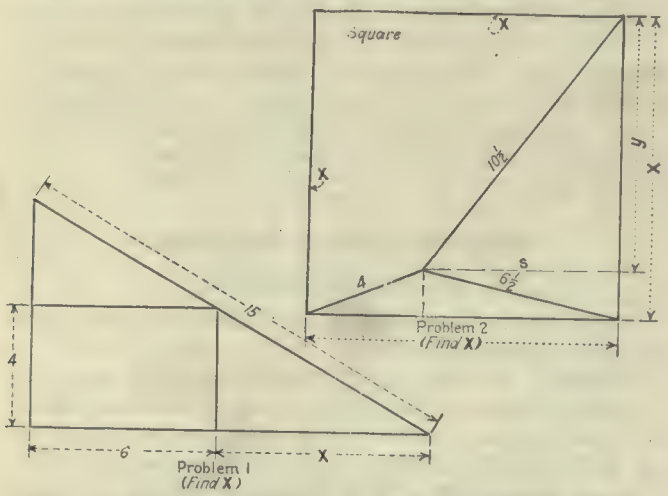
Solution by the method of Euler and Lagrange: Put,

$$g = a^2 - b = \frac{227}{6}$$

$$h = b^3 + c^2 - 2abc + dg = \frac{1{,}820{,}683}{216}$$

$$k = \frac{4}{3}ac - b^2 - \frac{1}{3}d = -\frac{29{,}929}{36}$$

Then, since $\sqrt{h^2 + k^3}$ is negative, the solution must



TWO PROBLEMS ARISING IN THE DRAFTING ROOM

be made by the use of trigonometric tables.

Put $$r = \sqrt{-k} = \frac{173}{6}$$

and $$\sin 3\theta = -\frac{h}{r^3} = -0.351638.$$

Whence from the table of sines,

$$3\theta = 20°35'15'' + 180° = 200°35'15''$$
$$\theta = 66°51'45''$$

Then,

$$l = r \sin \theta$$
$$l_1 = r \sin (120° + \theta)$$
$$l_2 = r \sin (240° + \theta)$$

Of these values $l = r \sin \theta$ is the only one to make all the radicals of the root equations positive. Using this value of $l = r \sin \theta = 26.51398$,

$$u = g + l = 64.34732$$
$$v = 2g - l = 49.15268$$
$$w = 4u^3 + 3k - 12gl = 2{,}030.87667$$

$$\sqrt{u} = 8.02152 \qquad \sqrt{w} = 45.065249$$
$$\sqrt{v} + \sqrt{w} = 9.70659 \qquad \sqrt{v} - \sqrt{w} = 2.02174$$

Then,

$$x_1 = -a - \sqrt{u} - \sqrt{v} + \sqrt{w} = -20.72811$$
$$x_2 = -a - \sqrt{u} + \sqrt{v} + \sqrt{w} = -1.31493$$
$$x_3 = -a + \sqrt{u} - \sqrt{v} - \sqrt{w} = +2.99978 \text{ or } +3$$
$$x_4 = -a + \sqrt{u} + \sqrt{v} - \sqrt{w} = +7.04326$$

The positive roots, particularly the last, satisfy the given conditions for the value of x.

A method of solving Problem 2 is given in the following work, the significance of the letters being shown in the accompanying illustration.

$$s^2 = (10\tfrac{1}{2})^2 - y^2 = (6\tfrac{1}{2})^2 - (x-y)^2$$

Whence,

$$x^2 - 2xy + 68 = 0$$
$$2xy = x^2 + 68 \qquad (1)$$
$$y = \frac{x^2 + 68}{2x}$$
$$y^2 = \frac{x^4 + 136x^2 + 4624}{4x^2} \qquad (2)$$

$$16 - x^2 + 2x\sqrt{\left(\frac{21}{2}\right)^2 - y^2} - \left(\frac{21}{2}\right)^2 + y^2 = x^2 - 2xy + y^2$$

$$2x^2 - 2xy + \frac{377}{4} = 2x\sqrt{\frac{441}{4} - y^2}$$

Substituting values for $2xy$ and y^2 from (1) and (2),

$$x^2 + \frac{105}{4} = \sqrt{-x^4 + 305x^2 - 4624}$$

Squaring to remove the radical,

$$x^4 - \frac{505}{4}x^2 + \frac{85{,}009}{32} = 0$$

$$x^2 = \frac{505}{8} \pm \frac{1}{8}\sqrt{85{,}009}$$

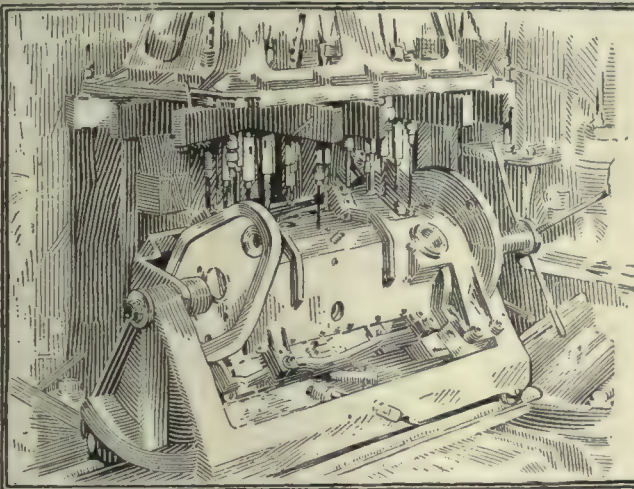
$$x = \pm\sqrt{\frac{505}{8} \pm \frac{1}{8}\sqrt{85{,}009}}$$

$$x_1 = +\tfrac{1}{2}\sqrt{398.2798} = +9.9784$$
$$x_2 = -\tfrac{1}{2}\sqrt{398.2798} = -9.9784$$
$$x_3 = +\tfrac{1}{2}\sqrt{106.7202} = +5.1652$$
$$x_4 = -\tfrac{1}{2}\sqrt{106.7202} = -5.1652$$

The first root, or 9.9784 for the side of the square, satisfies the conditions. The other positive root 5.1652 is for use when the point of intersection of the three known lines lies outside the square.

A Sculptor Mechanic

Those who read the article on page 825, Vol. 58, of the *American Machinist*, will be interested to learn that the sculptor, Douglas Tilden, is a deaf mute. They will also be disheartened to know that, in spite of having produced a number of notable pieces, he has been unable to earn a living in this way and has for several years been working as a mechanic in the shop of the Johnson Gear Co. of San Francisco. It is certainly a pity that in this country of ours a man who can produce work of this kind should not be able to find enough to keep him busy, while others who produce nothing, artistic or otherwise, have no such difficulty. It is to be hoped that he may again have the opportunity of producing other and equally pleasing work along sculptural lines.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Inspection gages continued—Principles involved in automotive gages—Inspecting connecting rods—Gage for camshafts—Value of indicating gages

IT IS essential that the tool designer who undertakes to design gages should be very familiar with the requirements and functions of any piece of work which he intends to gage. The fundamental points which require careful consideration in any gaging problem have been treated to some extent in a previous article, but there are many special matters which are dependent upon the shape of the part and the manner of its functioning, which cannot be treated in the form of general notes.

In the first place, the designer should know or find out positively just how the part which is to be gaged functions in the completed mechanism. If he is able to do this and if he can analyze the importance of various fits and the location and importance of holes and surfaces, he has made a long step in the right direction. If unable to do this, he must depend entirely upon the drawing of the part for which he is making gages and must be guided by the limits given. There are many cases, however, when alignment of various holes, concentricity of diameters and angularity of surfaces or holes are of the greatest importance, and yet the drawings for the parts would not always specify limits on these points.

Aligning Holes in Connecting Rods

In order that any two or more parts may function properly, the alignment of holes and concentricity of diameters are of great importance, but often the only mention which is made on a drawing of the part which will give the designer any information is the limits on the size of the hole or the location of the surface. To a man who is unfamiliar with the general design of a machine, the problems which he encounters in gaging the various components of that machine are difficult of solution. In our opinion it is very necessary to make a study of the mechanism, and if there are certain troubles which are likely to be encountered due to a lack of alignment or eccentricity of holes, these points should be very carefully determined before any attempt is made to design gages.

In automobile work the gasoline motor presents to the designer a number of problems in gaging. He may know from his own experience that a piston in which the wristpin is out of alignment will cause the piston to scrape along the walls of the cylinder, yet he will find no mention of the importance of this matter on the drawing of the piston. So also, in many other parts of an automobile the alignment of holes and positions of surfaces must be very carefully studied. Let us take

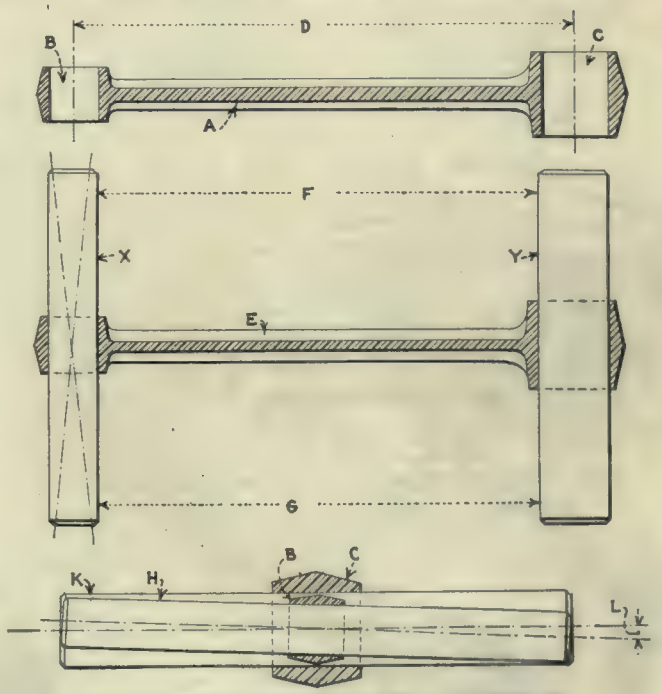


FIG. 551—IMPORTANT GAGING POINTS ON CONNECTING ROD

a few examples of various kinds in which the importance of the different dimensions is not apparent on the blueprint of the part.

Almost any connecting rod in a rapidly moving mechanism, whether it is an automobile motor, air pump or any other similar mechanism, is a good example to use in order to bring out the importance of alignment of holes. Fig. 551 shows a simple form of drop-forged connecting rod *A*, on the drawing of which the dimensions *B*, *C* and *D* are carefully specified with limits. To the designer who does not realize the way in which the connecting rod works, there would be little cause

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to worry about the gages needed for this part; and he would in all probability design limit plug gages for *B* and *C* and test the dimension *D* by means of plugs in the holes *B* and *C*, a measurment being taken across the plug. He would then apparently have fulfilled the gaging requirements for the piece.

If he were familiar with the mechanism and the functioning of the connecting rod, however, he would realize that the alignment of the two holes *B* and *C* is of extreme importance, and he would provide for testing

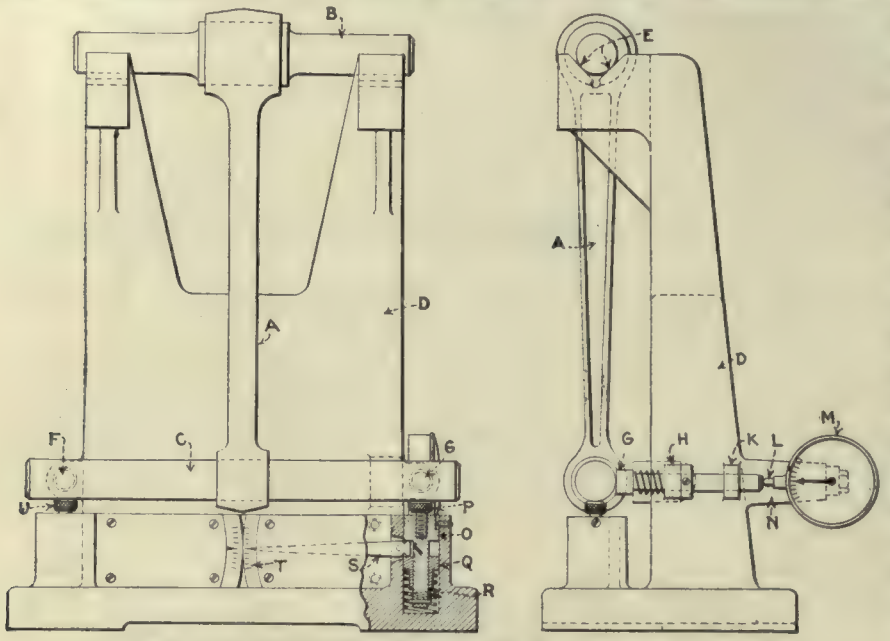


FIG. 552—INDICATING GAGE FOR CONNECTING ROD

these portions by means of well designed indicating gages. A lack of parallelism between the two holes would cause friction in the inside of the cylinder, the motor would heat up and wear badly, and the general results would be very unsatisfactory. It is important, therefore, that these holes should be as nearly parallel as possible, and as both of them are short in comparison to their diameters a small error is not easily determined.

By referring to the diagram *E* the use of long pins *X* and *Y* in the two ends of the connecting rod will permit errors to be readily found at *F* and *G*; and if the holes are not parallel, these two dimensions will be different and must be corrected before the connecting rod can be considered ready to pass inspection. There is another point of importance which is illustrated in the diagram below. The twist of the connecting rod may also be a source of a great deal of trouble. The pins *K* and *H* in the holes *B* and *C* can be out of alignment in this direction, as shown in exaggerated form at *L*. This condition can be easily found when testing in a suitable fixture.

The designer will appreciate the importance of these things more fully if he has practical knowledge of the working of a given mechanism. The shop man who is assembling the testing machines from day to day knows from experience the damage which can be caused by errors of this kind. The drafting room, therefore, is to some extent dependent upon the information received from the shop, unless the engineers realize the importance of analysis and treat the gaging problem from a scientific standpoint.

There are two types of gages used in testing connecting rods. In one of these types the rod is tested for alignment and provision is made for straightening it *in the fixture*. The other type simply tests the work, which *is removed* for straightening and then retested after corrections have been made. There is a difference of opinion as to the advisability of using an accurate testing fixture for straightening and correcting errors. The writers do not believe that it is generally good practice to do this, as there is a likelihood of springing or otherwise distorting the fixture when the straightening operation takes place. However, it is possible to design the testing fixture in such a way that it will withstand these strains, and it is largely a matter of personal preference as to which method is used.

In the example shown in Fig. 552 the connecting rod *A* is to be tested to make sure that the holes at each end are in alignment and that there is no twist in the rod. The type of fixture shown here has been found successful in showing small variations, and the work can be tested very rapidly and with precision. We have shown in the previous illustration by means of diagrams, the importance of alignment of the two holes in the ends of the connecting rod. In analyzing the gaging operations necessary for this work, we must first remember that a multiplication of the errors in order to make them more clearly apparent is very desirable.

In the design shown here the pin *B* is pressed into the large end of the connecting rod, while one at *C* is placed in the small end. Both these pins are several times longer than the holes in which they enter, in order to obtain a multiplication of any errors which are found. The upper pin B rests in V-blocks *E* which are a part of the fixture *D*. The other pin *C* is held down by the operator's fingers and pressed back against a fixed stud *F* on one side of the fixture. In the same position but on the other side of the fixture the spring pin *G* is so arranged that it passes through the lugs *H* and *K* and bears against the end of the pin *L*, which is a part of the indicator *M*. This indicator is supported by a lug *N* at the rear of the fixture. By setting the indicator point so that it reads zero when the pin *C* is in perfect alignment with pin *B*, any variations from the true position will be readily shown by the fluctuations of the needle on the indicator. This dial takes care of any twists in the pin, but there is also another matter to be considered, and that is the possibility of an angularity of the holes in the other direction.

Indicating Gage for Connecting Rod

The plug *O* extends down through the sleeve *Q* and has a spring *R* at its lower end to assist in preventing lost motion. The sleeve *Q* is spring supported. The upper part of the plug *O* has in it a knurled screw *P*, which may be provided with a check nut if desired. This screw makes it possible to adjust the pin to the correct height as determined by a master plug or block. The pointer *S* operates on a graduated dial *T* so as to show a multiplication of the errors in alignment. The other side of the gage has another adjustable stud *U* arranged in an exactly similar manner.

It will be seen that any variations from the true alignment will cause fluctuations of the indicator point along the graduated scale. If the two pointers are opposite each other, no matter whether they are on the zero line or not, it will be an indication that the pin *C* is perfectly true. If there is a slight angularity to the pin *C*, one of the pointers will be up and the other one down. This type of gage is very rapid in use; and while it may require the operator to use a small amount of pressure in holding the bar *B* down in the V-block, in the majority of cases the springs can be so proportioned as not to require this to be done. The operator must, however, push the lower end of the connecting rod back until it is in contact with the plugs *F* and *G*. Various other gaging problems which have to do with alignment of holes can be solved by the use of devices similar to the one just described. In different cases the methods of locating and operating might be radically different on account of the construction of the work, although many of the principles involved would be identically the same.

There is considerable difference in the methods employed for testing the throw of cams on a camshaft, due to the different constructions used by various manufacturers. In some cases the gears which operate the camshaft are located on the end of the shaft by a key. Occasionally the end of the shaft is tapered, while at other times it may be squared up or provided with other means of locating, so that the proper relation between the gear teeth and the cams will always be maintained.

When the tool designer attempts to make a testing gage for determining the accuracy of a camshaft, he must first be sure that he understands the points of importance which must be gaged. It is oftentimes advisable to reproduce to some extent the actual working operation of the camshaft in making a gaging fixture.

In Fig. 553 is shown a testing fixture for a two-throw camshaft *A* having cams directly opposite each other at *B* and *C*. This particular type of shaft has a flange *D* at one end which locates in a recess in the gear that operates the shaft. Dowel and screw holes are also provided to insure accurate location. The testing fixture used for this example consists of a base *E* having a lug *F* at one end which is cut out in V-block form at *G*. This *V* is used to locate one end of the camshaft, which is lightly clamped in place by means of the strap and thumbnut *H*. The other end of the shaft locates in a recess in the locating or indexing plate *K*. This plate has four pins in it corresponding in their locations to the dowel holes in the flange. The index plate is keyed to a shaft *L*, on the end of which there is a knurled knob *M*. A hardened liner bushing *N* is provided to avoid excess wear. The index plate *K* is furnished with bushings at *O* for indexing purposes, and the plunger *P* is spring controlled and operated by a movement of the finger lever *Q*.

The inspector places the camshaft in position as mentioned and indexes it by means of the index plate *K* into the various positions required for testing the cam. It is assumed that diameters and lengths have previously been gaged, as this fixture does not test these dimensions. The important parts of a cam are the "throw," the small diameter and the contour. These points, therefore, must be taken into consideration when gaging. It will be seen that the surface of the fixture *R* is finished accurately to provide a testing surface which bears a certain relation to the center line of the camshaft.

In order to determine the throw of the cam, the sliding gage *S* is moved along over the surface *R* until it strikes over the point *T*. If the work has been done within the required limits one portion of the gage *U* will go over the cam, while the other will not. The low part of the cam is gaged by a similar piece *V*, which either goes or does not go across the portion of the cam *W*. An indicator with a suitable set-block is sometimes used instead of the "go" and no-go limit gage shown, and it will produce equally good results. There is always a possibility, however, of the operator disturbing the setting of the indicator gage and thus causing trouble. With the type of gage we have just shown, errors can be caused only by wear in the gage or by extreme carelessness on the part of the workman.

A knife-edged gage *X* is mounted on a block *Y* for testing the shape of the cam. The plate which is used for gaging is carefully formed to the angle of the sides of the cam, and it is pushed up in place so that the operator can look through against the light and see if there are any variations in the form *Z*. This gage is in the nature of a receiver type gage, and there are some manufacturers who recommend the use of go and no-go templets. In either case, however, the eyesight of the operator is called into use to some extent. For testing the diameters of the camshaft and the relation between cams other gages are generally used, but these points can easily be tested by the use of snap gages.

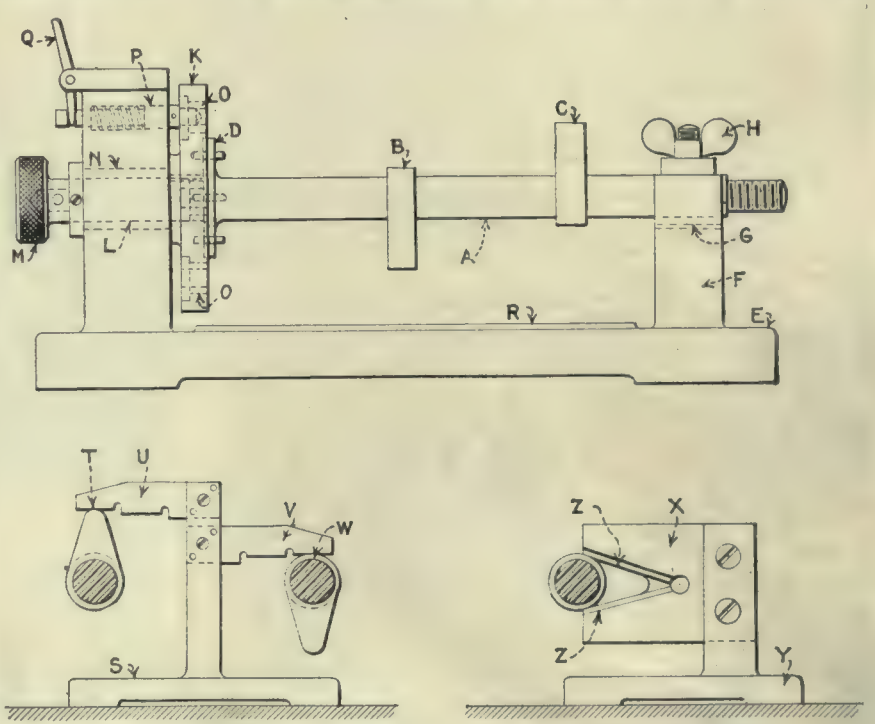


FIG. 553—TESTING FIXTURE FOR CAMSHAFT

Machinery which was dug up with old King Tut was good enough, perhaps, when he was living, but—

It Pays to Replace

By Adele L. De Leeuw

The Jones Works built its first machine in 1886.
It proudly claims to be "an old concern."
And just in time it found that, though old dogs can't learn new tricks,
If shops desire to live, they have to learn.

The sales were good enough, it seems, until deliveries fell
So far behind that customers grew cross,
And salesmen muttered, "Can't you even make what we can sell?"
And profits quickly melted into loss.

Then Jones began to feel that things were looking rather grim,
So fearfully and desperately he said,
"I'll get an expert in and put the whole thing up to him—
He can't do worse than say that we are dead."

The expert spent three days in finding out just what was wrong
And then he went to Jones and hands in jeans,
Delivered this extremely short and bitter little song,
"You'll have to chuck out all your old machines."

"Chuck out the old machines!" J. cried—in fact, he nearly wept—
"Why, man, you must be crazy! We would be
Completely done!" The other said, "I wish that I had kept
A list of those who've said such things to me.

"You seem to think that you should treat machines as you treat men:
If they have served you from their youth, you hold
That, though they are a bit uncertain now and then,
It is but just to keep them when they're old.

"Well, true enough. Besides, a man, though shaky in his hands,
Has stored up knowledge and a deal of skill.
From long association there are things he understands;
He can be very helpful if you will.

"But when machines begin to creak and halt and groan and sigh
And wobble, mutter, chatter, cough, and rap,
You are not stony-hearted when you bid them swift good-bye
And send them out, unpensioned, labelled 'scrap.'

"Then, too, there is another thing: you can't afford to make
An operator act as semi-nurse;
You handicap yourself and him—and merely for the sake
Of keeping something bad from getting worse.

"As long as your machines require the minimum of care,
Just so long should they stay inside your shop.
But once they start to fail you, mark my word, Jones, and beware—
Chuck out the old, and buy a nice new crop."

He left Jones sitting at his desk, with deeply knitted brow,
As if the lesson still were sinking in.
But sink it did, for there are two additions building now—
And Mr. Jones has work up to his chin.

Miss De Leeuw is the daughter of A. L. De Leeuw, Consulting Editor of *American Machinist*. She frequently contributes to the New York dailies. The article was not a contribution to the prize contest.

Milling Forty Driving-Box Wedges in Eight Hours

By FRED H. COLVIN
Editor, American Machinist

Special fixtures and methods at the Burnham Shops of the D. & R. G. Railroad which reduce locomotive repair cost—Lapping the piston rod in the crosshead

ALTHOUGH the Burnham shops of the Denver & Rio Grande Railroad lack many modern facilities, such as cranes, they are using many interesting methods in getting out work as economically as circumstances permit and are utilizing manufacturing practices wherever there is sufficient standardization, or the parts to be made can be handled in sufficient quantities. An example of this is shown in the method

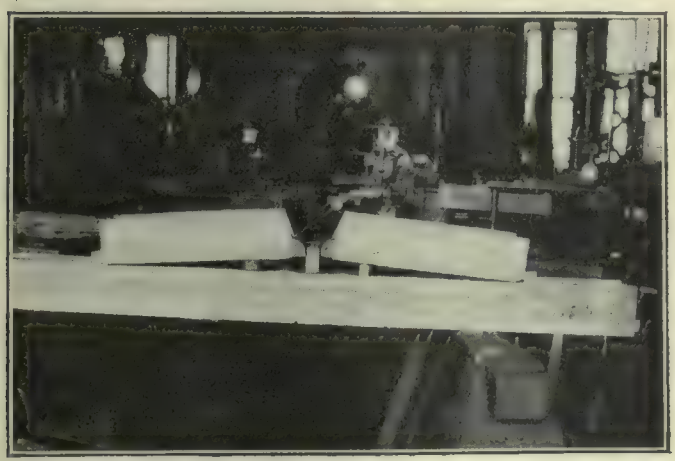


FIG. 1—HOLDING DRIVING-BOX WEDGES FOR MILLING

of machining driving-box wedges and shoes by string milling on an Ingersoll milling machine.

Two of the wedges are shown in place on the fixture in Fig. 1, although the fixture was not mounted on the milling machine when this picture was taken. The construction of the fixture can be seen in the sketch in Fig. 2. The fixture itself consists of a long channel which holds from six to eight wedges according to size. Grooves at the sides near the top, as shown at *A* and *B*, receive and guide the ears of sliding jaws, two of which are shown at *C* and *D*.

It will be noted that these sliding jaws have serrations or teeth on each side, cut at such an angle as will tend to force the work down onto the top of the fixture and hold it firmly. One double-faced jaw is placed between each of the wedges and in each jaw is a hole through which a long threaded rod passes. Nuts on this rod draw the end jaws together and in so doing clamp all the wedges between them.

The jaw shown between the wedges in Fig. 1 is made specially high in order to grip the ends which are tilted up to secure the proper taper on the inside. The jaws at the outer ends of the wedges are of the standard height. It will be noted that the angle of the wedges is secured by the location of the small square bars placed under the thin end. With six or eight wedges strung along the fixture in this manner it will readily be seen that they can be milled at a fast rate. In fact, where eight wedges can be put on the fixture at one time, the machine handles forty of them in an eight-hour day.

When machining shoes, which have no taper, the regular low jaws are used and only project a sufficient distance above the fixture to grip the shoes firmly, allowing the milling cutter to pass from one shoe to the next with due clearance for the jaws. Both the shoes and wedges are of brass.

Fixture for Milling Crosshead Shoes

Another job for which this fixture is used is the milling of crosshead shoes, which are also of brass. The blocks, as shown at *A*, Fig. 3, are made to fit the top of the fixture, the upper sides being of the proper

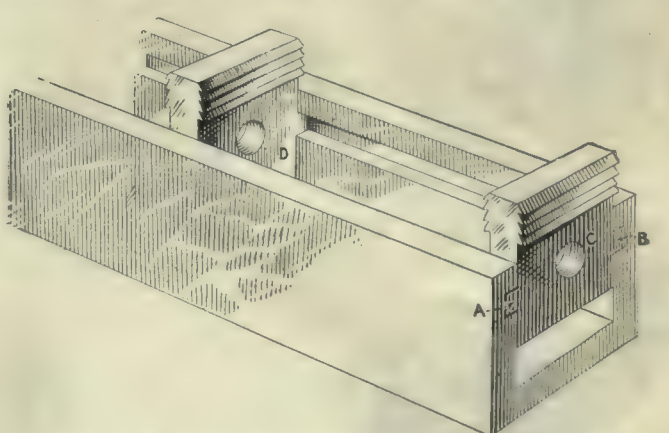


FIG. 2—A SECTION OF THE MILLING FIXTURE

size and shape to carry the bearing portion of the crosshead shoe when turned upside down as shown at *B*. Crosshead shoes are also held by toothed jaws, and the surfaces shown in heavy outline are milled at one pass of the cutters to fit the crosshead. The shoes are then placed in the crosshead and held in position by straps and bolts as shown in Fig. 4, when the bolt holes are drilled and the shoes fastened in place.

The crosshead is now ready to be fitted to the guides in the usual manner, which is to mount it on a mandrel

representing the piston rod, the mandrel being held level in V-blocks on the planer table. The shoes are then planed to the proper size and the uniform distance on each side of the piston rod is secured by turning

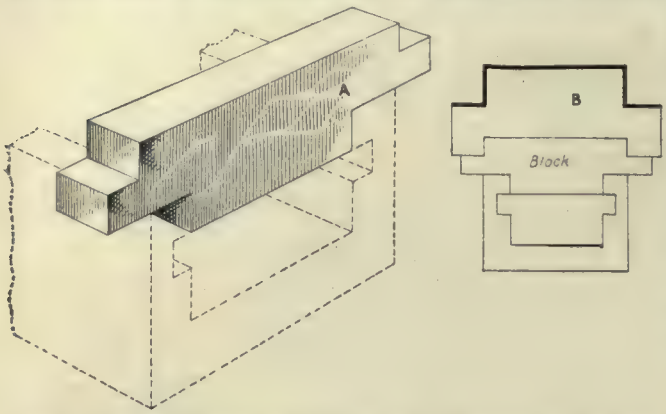


FIG. 3—BLOCK USED FOR HOLDING CROSSHEAD SHOES

the mandrel a half revolution in the V-blocks so that the second shoe can be planed to the same center distance as the first.

The shoes have diagonal wearing strips of babbitt cast in place as shown in Fig. 5. When the shoes become worn the entire bearing surfaces are babbitted, there being no difficulty in securing perfect adhesion between the brass and the babbitt lining. This is one of the reasons for using a brass shoe instead of one of either cast iron or cast steel. The shoes are manufactured to standard sizes on shop orders and are held in stock, partly finished, until they are needed to be fitted to the crossheads. In order to insure a good fit of the crosshead on the piston rod taper, the two are ground together as shown in Fig. 6. The piston rod is clamped to the end of a work bench and the crosshead lifted up over it by a chain block suspended from a small jib. The crosshead is lowered until

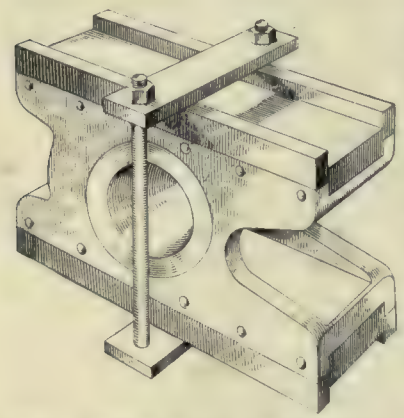


FIG. 4—HOLDING A CROSSHEAD SHOE FOR DRILLING

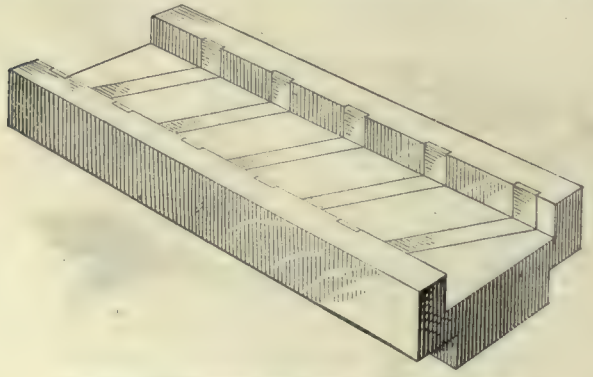


FIG. 5—BABBITT STRIPS IN BRASS SHOE

it makes contact with the taper fit on the rod, fine carborundum being introduced as an abrasive. The crosshead is then turned by hand around the rod and the joint ground, or lapped, until a perfect fit is secured. The chain hoist makes it easy to lift the crosshead off the rod for examining the bearing or for cleaning off the abrasive. The writer is indebted to shop superintendent Stevens, general foreman Strong and machine-shop foreman Frye, for the opportunity of illustrating these methods. The examples are typical of those to be found in railroad shops that are attempting to better their methods of operation.

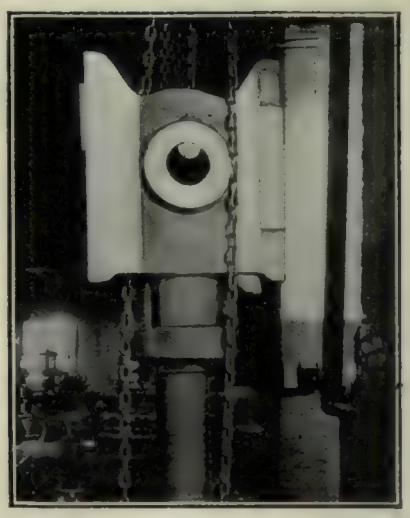


FIG. 6—LAPPING THE PISTON ROD FIT IN CROSSHEAD

Watching the Efficiency Engineer

BY JOHN R. GODFREY

The Black Motor Co. is undergoing the throes of being systematized by an efficiency engineer. Guess they need it all right but it's almost as bad as an operation for appendicitis was in the old days, about one out of ten survived the operation. It happened in this wise.

The old manager, Ed Hughes, was a peach in handling men and did wonders with the plant during the war when nearly everyone else was having all kinds of trouble with labor turnover. But a little while ago the bankers got the notion that the plant wasn't quite scientific enough and turned it over to an alleged expert.

I guess there is plenty of work to be done as Hughes was much better on handling men than on methods and machinery and there's a great opportunity for some one to make a good showing, if he doesn't disrupt the whole works while he's about it. The new man comes in, sees plenty of room for improvement, and goes dippy with the idea that he must change everything from the errand boy to the way the shipping labels are made out.

The worst case I know of is when they turned the old Price-Abbott Motor inside out, redesigned the whole motor and put out a new car under the old name. Then things began to happen.

The new motor didn't always mote, frames began to break and the good "rep" of the old company began to fade away into nothingness. In two years they had swapped a bank balance for a heavy deficit and their friends were few and far between.

Finally the bankers woke up and scurried around till they got back some of the old men who knew how to build cars even if they didn't know all the latest blank forms for finding out how much money you lost last year. And the old Price-Abbott is coming back, but it's an uphill fight.

It's quite likely that the experts did some good things, which will stick. But it's a risky game turning your plant over to a set of men who have everything to gain and nothing to lose, and who know little if anything about the motor game. I'm hoping the Black Motor Co. won't have this experience.

Our Immigration Needs

BY JAMES A. EMERY
General Counsel, National Association of Manufacturers

Flexibility of quantity and selective composition desirable—Shortcomings of existing law—Unbalance between wages and commodities caused by labor conditions—Constructive policy necessary

THE subject of immigration is at once of great importance and delicacy. I know of no other issue upon which prejudice may be more easily excited or which so vitally touches our economic and social life or in which the position of industry is so generally misrepresented and misunderstood.

Industry opposes extreme efforts to prohibit immigration under the guise of restriction, and is said, therefore, to favor unrestricted immigration. I know of no industrial executive or association that does not believe unrestricted immigration injurious, and at the same time, does not believe in a constructive policy of selective immigration.

The alien is easily represented as threatening us with economic injury through lower standards of living, and as a menace to our political institutions by subversive ideas and exciting disorder and crime. The gates should be closed against the diseased, the defective, the criminal, the potential public charges, those incapable of citizenship or belonging to races of demonstrated unassimilability, and all who undertake to accomplish political changes by violence.

The United States has developed in continuing reliance upon immigration to supplement its native labor supply. Since the Civil War this has been especially true in carrying forward the rough work of expansion. In a century we have received more than 30 million aliens, but 80 per cent of our present blood is of the six fundamental Revolutionary stocks.

As the development of the Nordic countries lessened their immigration stimulus, the proportion of immigrants from eastern and southern Europe has increased. These newcomers have colonized in the cities and are less assimilable but the national government has made no substantial effort for naturalization. The present law offers no aid in meeting the situation of those already here and simply lessens the number that may come in.

Construction Labor Problems

Due to war conditions, we had practically six years without immigration, followed by a year in which the flow so excited our fears that we passed the present law. Our yearly immigration quota is now substantially 357,000 and the House Committee on Immigration proposes to further limit the number to about 187,000 per year. Considering the sex and age of the immigrants, the gain in our adult male producing population has been very slight under the new law.

We are now facing the largest construction requirements in our history and construction in every form presents permanent overhead charges upon national life. Production, distribution and commerce are carried on in structures whose costs of construction and maintenance are a direct tax upon every service or commodity available in the structure. The farmer in the remote West is thus keenly interested in the cost of building in the East where business affecting him is transacted.

When construction charges pass an unendurable level, they react upon themselves, and so the whole construction problem of the nation has been systematically diminished during the past few months. Our laborers migrate from South to North and from East to West in response to uneconomic competitive bidding for the inadequate supply, and this unsettled condition means a lift in all costs and an increase in the unbalance between the buying power of agricultural products and the cost of industrial services and commodities. Nor does the industrial laborer benefit. He gains in nominal wages; he loses in real wages.

A Suggested Policy

A decent consideration of national interest suggests that we shall oppose prohibition of immigration under the guise of restriction. Secondly, we should provide for administrative flexibility in the present law to meet our demonstrated economic need and, thirdly, we must at once begin work on a permanent constructive policy of selective immigration. We should not only pick racially and by occupation, but so far as practicable, determine admissibility before embarkation and accumulate, by co-operation between the States and the nation, reliable data on immigration needs and opportunities, which will give rational guidance to distribution.

The United States should assume the obligation of instructing and preparing for naturalization the alien who truly desires to incorporate himself into our society; but to this end, it should assert the right to register him during the period of his alienage, induct him into citizenship through appropriate ceremonial which emphasizes the privilege, and simplify the procedure of deportation so that the alien of pronounced criminal tendencies or the violent subverter of our institutions may be expelled.

The short-sighted effort to deny the adequate reinforcement of our native labor supply threatens to permanently impress upon us a continually increasing cost of living that threatens our natural living standards. It also excites a continuing discontent by denying to the average citizen the opportunity to fairly participate in abundant production, efficiently performed at reasonable cost.

Abstract of address to the directors of the National Lumber Manufacturers' Association, San Francisco, July 25, 1923.

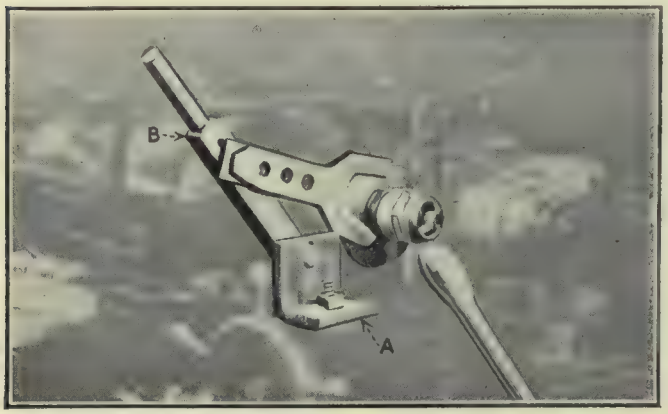
Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

An Ever-Ready Wrench

By Henry M. Clary

In machining foot-valve parts for underground oil tanks, at the plant of S. F. Bowser & Co., Fort Wayne, Ind., the wrench shown in the illustration is used for



AN EVER-READY WRENCH

screwing them on and off the adapter on the machine spindle.

To avoid having to lay the wrench down and pick it up again each time the work was changed, the operator attached the wrench to the machine as shown. The angle plate *A* was fastened to the carriage of the machine and the lever *B* attached to the angle plate. The wrench was bolted to the lever *B* in such position that by moving the lever forward, the wrench engaged the work and held it for screwing on or off, according to the direction the spindle was running.

A Handle for Flat Filing

By E. V. Allen

We have considerable flat filing to do in our shop and using files with the ordinary wooden handles on the tang on work of this kind is rather difficult. After some experimenting we had a number of handles made as shown in the illustration. The handles were cast from scrap brass. The two lugs shown at the front are stationary. The clamping jaw is placed on the opposite side and about half way between the two lugs. The clamping jaw is little more than a small block of brass tightened by a screw run through the body of the handle. The handles require no machining other than to drill and tap the screw holes. The clamping screw used is a fillister-head machine screw with a cross pin run through the head for a finger hold.



A HANDLE FOR FLAT FILING

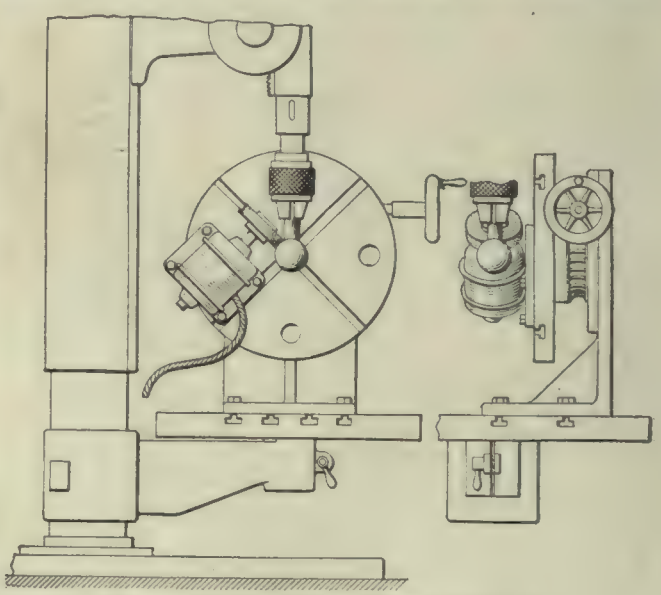
The handles are clamped to a flat file just back of the middle and the file is used like a plane. It is surprising how much easier it is to file flat work with this device.

Spherical Grinding on a Drilling Machine

By Geo. A. Luers

Machining the ball ends of ball and socket connections with shaping tools is readily accomplished on the lathe. A concave tool can be used and if it is properly shaped, a finished ball can be obtained.

Hardened steel however is not readily made spherical, inasmuch as the grinding is generally done with a flat-faced wheel. Compound movement of the work, cutting wheel and feed is required to grind the ball end. Such



SPHERICAL GRINDING ATTACHMENT

work is readily accomplished with the set-up indicated in the attached sketch. The only equipment required is a drill press, a portable electric grinder and a work-holding chuck taken from a milling machine, shaper or similar machine and fitted with a screw for circular feed.

As shown in the accompanying sketch the ball-ended work is held and rotated in the chuck of the drilling machine. On an angle plate attached to the machine table is mounted a circular attachment carrying a portable electric grinder. The center of the circular attachment is set at the center of the work to be ground. With the work rotating slowly in the machine, the circular attachment is used to guide the grinding wheel about the ball.

Insuring Proper Hardening

By Donald A. Hampson

In shops where the hardening of carbon steel parts is only an occasional job, the loss connected with hardening is considerable. A piece that represents some hardening difficulties is the T-slotting cutter shown in Fig. 1. Granted that the cutter part may readily be hardened all over, there is a risk in the region where the shank joins, and the all-too-familiar condition on withdrawing it from the quenching bath is in two pieces. If the cutter is successfully hardened, there follows the slow job of drawing the temper and the even chance of getting the teeth too soft in some spots and leaving them too hard in others, besides the natural tendency to draw the teeth and leave the center so snappy that the cutter breaks off when taking a full cut.

While experienced men know of these difficulties, they have to be reminded of them from time to time. In specialty plants, ways of hardening have been perfected that put heat treatment on the same production basis as metal cutting, but these ways are of little use to the workman whose only equipment is a forge or a small furnace, a pair of tongs and a container for the quenching bath. Yet with no more equipment than the above, it is possible to harden T-slotting cutters and similar pieces at an overall cost that compares favorably with production methods.

The arrangement of the bath for hardening and drawing is shown in Fig. 2, both operations being done at the one setting. The hardening bath is just clear cold water. The container may be a pail, pan or tub capable of holding such a volume of water as will not be made hot by the quenching. The cutter or other work to be hardened is laid on a piece of metal placed in the tank to keep it off the bottom. Water is poured in until it submerges part of the stem of the cutter shown—from ¼ to ½ in. of submergence will do.

When the cutter has been brought to the proper heat, it is plunged into the water and left there, resting on the metal piece in the bottom of the tank. The cutter will cool off gradually except on the thinner teeth which are in contact with the water and which will chill first anyway. The cutter will be prevented from cooling so

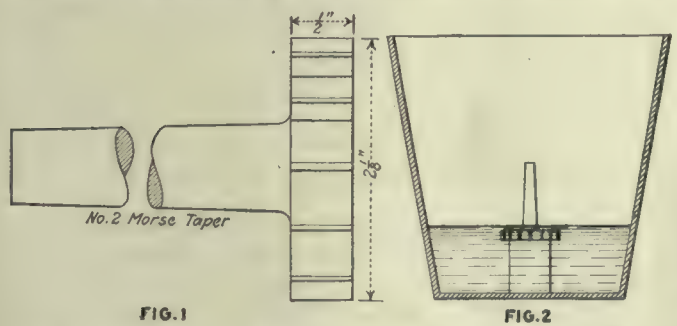


FIG. 1—CUTTER TO BE HARDENED. FIG. 2—ARRANGEMENT OF QUENCHING BATH

fast as to be hard all over by the heat in the stem, which will be carried down into the cutter, drawing the temper of the center but not being great enough to draw the teeth, as they are surrounded on all three sides by water.

With this method there is practically no risk, the familiar water crack is avoided, the cutting edges are hard, and the entire piece is drawn so as to insure strength and wearing qualities. The prerequisites are to have the piece heated slowly, thoroughly and away from the direct air blast in the fire.

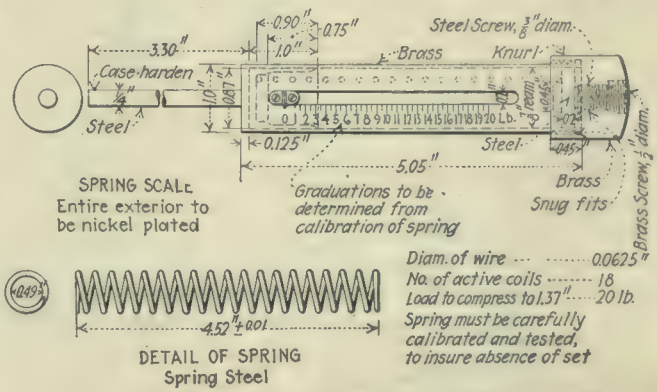
In heating the cutter, the entire stem or only a portion of the stem may be brought up to the same heat. This will provide the heat for drawing the end and avoid that dangerous line of demarcation in heating, where a thin section joins a heavy one. There is no danger of hardening the part of the stem that is submerged for it is so near the surface of the water that the water heats up and is kept hot by heat fed down from above.

The method is so simple that one doubts its worth until it is tried. The work is put in the water and left until cool enough to handle—that's all there is to it.

Compression-Spring Balance

By G. W. Nusbaum

In the shop or laboratory there is often occasion to weigh some force that is required or produced in some mechanism, and this is difficult to do with an ordinary tension-spring balance without considerable rigging, as



COMPRESSION-SPRING BALANCE

would be the case with inclosed levers, hydraulic and pneumatic pistons, etc. To be able to weigh these forces the writer designed the compression-spring balance shown in the accompanying sketch.

It will be noted that an adjustment is provided in the handle for changing the assembled length of the spring by removing the outer plug and moving the inner screw in the desired direction. This obviates the necessity for making the spring with extreme accuracy.

A Suggestion to Draftsmen

By Elmer C. Hiebsch

In designing machines, it often happens that levers, rods, special bolts and other parts, the same as used on machines built previously, can be profitably utilized in the new machines.

As it is difficult to keep in mind all such parts that have been made for other machines and to avoid duplicating any or all of them, the following method is suggested:

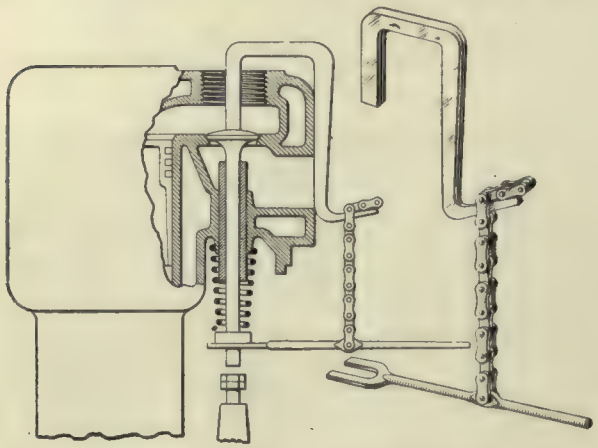
Make duplicate blueprints of the separate parts of all machine designed and file them alphabetically under their respective names. Then if a rod lever or other part is needed for the machine being designed, look over the drawings of like parts to see if any of them can be used.

Simple Valve Lifter Made from Scrap Parts

By Edward Johnson
Cheshire, England

The accompanying sketches show a simple type of valve-spring lifter which, besides being cheap to make, is, so far as my experience goes, the only one that will effectively hold the valve down without trouble while the cotter pin is being removed.

The tool consists of three parts. The upper portion



SIMPLE TYPE OF VALVE LIFTER

is of square steel bar of $\frac{3}{8}$ in. section. It is bent as shown in the sketch, so that one end will bear on the valve, while the other end is flattened so that it will enter any link of an ordinary cycle chain. A piece of the latter about 12 in. long is the second part of the tool, while the fork, which is naturally made to suit the type of valve in use, is forged from a piece of $\frac{3}{8}$-in. round steel bar. One end of this bar is forked, and near to the fork it is flattened so that it will pass between the links of the chain. Through the flattened part a hole is drilled to accommodate the ordinary joint bolt of the chain.

Stock Gage for a High-Speed Press

By S. A. McDonald

A large variety of stock gages are used on punch press work, the most familiar being the stationary gage located in the die as shown in Fig. 1. The simplicity of its construction is its strongest point of advantage. However if the press is to be run at high speed and continuously, the operator may find it impossible to lift the stock over the gage and relocate it properly before the punch comes down.

The gage shown in Fig. 2 was designed to use on combination dies for making boxes for shoe polish of varying sizes, which were punched at the rate of 135 per minute.

It is constructed as follows: The bracket *A* is bolted to the side of the press and contains the sleeve *B*, held in place by a shoulder and the nut *C*. The large end of the sleeve is split and has the clamp bolt *D* which clamps the adjusting rod *E* in position. The gage stop *F* is adjustable in the adjusting rod and is clamped in position by the screw *G*. The spring *H*, connecting the pin *I* in the bracket with the pin *J* in the sleeve, keeps the gage on the die under tension. The stud *K* in the sleeve *B* is bent parallel to the sleeve and has the connecting rod *L* located on it by the two collars *M*. The upper end of the rod *N* has a slotted

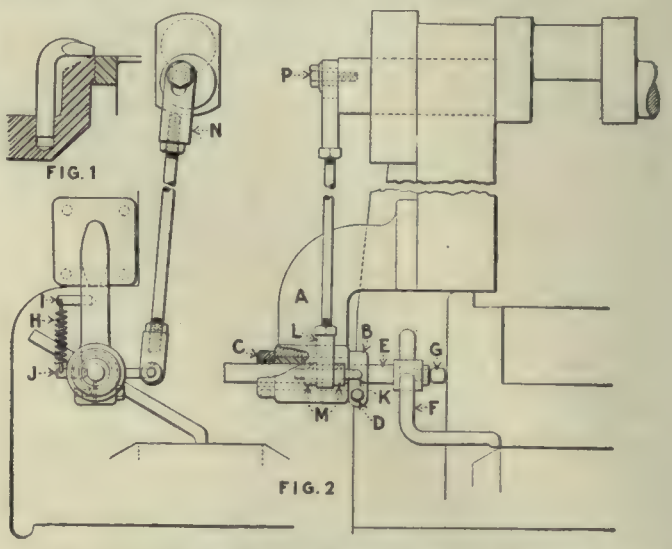


FIG. 1—STATIONARY STOCK GAGE. FIG. 2—STOCK GAGE FOR HIGH-SPEED PRESS

hole through which it is attached to the crank shaft by the bolt *P*. The bolt hole is so located that as soon as the punch leaves the die the gage is lifted up and before the punch reaches the top of its stroke the gage is down on the die again. By means of adjusting nuts, the amount of lift of the gage is reduced to a minimum so that the stock can be fed just past the gage before it comes down again, leaving the maximum time for relocating the stock. This gage is used on a number of dies whose diameter and height vary, and it can be set accurately for lithographed tin.

Moving Gas-Engine Flywheels—Discussion

By J. T. Towlson
London, England

Upon reading the article under the above title by E. V. Allen, published on page 559, Vol. 58, of the *American Machinist*, describing his method of transporting the flywheels of gas engines, I am reminded of a similar procedure applied with respect to the moving of steam-engine flywheels of much greater diameter and weight. These wheels were 12 ft. in diameter and weighed about 8 tons each, being built-up wheels consisting of six segments with corresponding spokes and a hub, or boss.

The wheels were built in a small shop which, though possessing a good and heavy flywheel lathe, could not boast of much in the way of tackle equal to the task of lifting the heavy weights. The wheels were built up, segment by segment, in the lathe, and when the turning was completed they were dismantled in the same manner and reassembled for transportation to the distant engine room in which they were to be erected.

The assembled wheels were raised upright (upon their rims) and a turned log of wood 9 in. in diameter was passed through the bores of the two wheels. Wood battens, nailed to the log between the hubs, spaced the wheels about 12 ft. apart and similar battens outside the hubs kept them from working off the log.

To pull the wheels along, a light road engine was pressed into service, being attached by means of chains of considerable length to the outer ends of the log while a strut about 13 ft. long held the two leads of the chain apart so that they were clear of the wheel rims and could not rub them.

The distance the wheels were to be moved was about 4 miles, but as the road was fairly hard and level no difficulty was experienced in getting them to their destination.

Laying Out Work for Drilling

By G. W. Nusbaum

A die blank from which it is desired to cut a square is shown in Fig. 1. The usual method is to lay out the square to be cut, select the size drill which is to be used, set the dividers to the diameter of the drill and then lay out the centers of the holes to be drilled. This is a satisfactory method if time and tedious work are not factors to be considered. There is also another method frequently used, which is to employ a spacing device on a center punch, but by the use of a few easily made tools most of this lay-out work may be avoided.

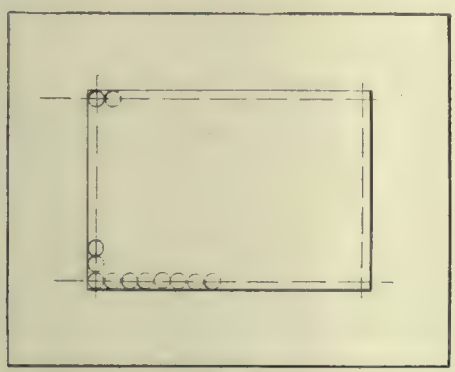


FIG. 1



FIG. 2

FIGS. 1 AND 2—LAYOUT TOOL AND METHOD OF USING IT

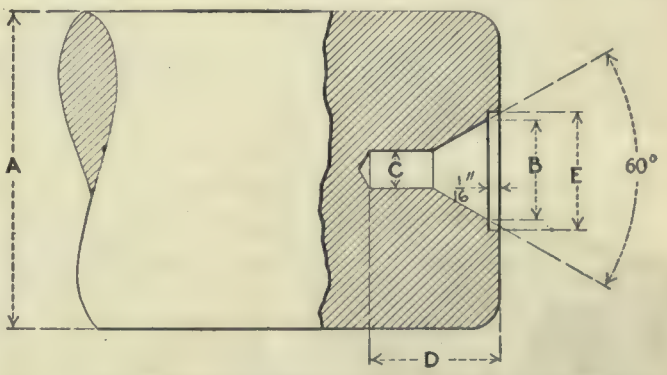
With a set of tools, as shown in Fig. 2, starting with a $\frac{1}{8}$-in. circle, each tool increasing by $\frac{1}{8}$ in. on the diameter, a complete chain of centers with the proper circle circumscribed about each one can be marked on the work with unusual rapidity. In addition to the speed of layout attained, much tedious work is eliminated, for it is only necessary to match the edge of the tool against a circle and a line previously made on the work, and then to give the tool a light blow with a hammer.

A parallel strip may be clamped to the work to guide the tool parallel to the layout and thus further reduce the tedium of the work.

Dimensions of Reamed Centers

By Clarence D. Scrom

Herewith is a table giving dimensions of centers for boring bars, reamers, arbors, etc. The table has gone a little farther than ordinary tables of the kind by providing for a counterbored recess to prevent the centers from getting burred up in use. The column giving the decimal sizes of the drills enables the workmen to use such drills in place of those designated by letters or numbers. The table was made for use in our toolroom.



Dia. of Work A	Largest Dia. of Center B	No. of Drill C	Dec. of Drill	Depth of Hole D	Counter Bore E
1/4	1/8	55	0.0520	7/32	3/16
5/16	5/32	52	0.0635	1/4	9/32
3/8	3/16	48	0.0760	9/32	5/16
7/16	7/32	43	0.0890	5/16	11/32
1/2	1/4	39	0.0995	3/8	3/8
9/16	9/32	33	0.1130	13/32	13/32
5/8	5/16	30	0.1285	7/16	7/16
11/16	11/32	29	0.1360	15/32	15/32
3/4	3/8	25	0.1495	1/2	1/2
13/16	13/32	20	0.1610	9/16	17/32
7/8	7/16	17	0.1730	19/32	9/16
15/16	15/32	12	0.1890	5/8	19/32
1	1/2	8	0.1990	21/32	5/8
1 1/8	23/64	5	0.2055	11/16	41/64
1 1/4	17/32	3	0.2130	23/32	21/32
1 3/8	25/64	2	0.2210	23/32	43/64
1 1/2	9/16	1	0.2280	3/4	11/16
.....	....	Letter	.....	....	....
1 5/8	27/64	A	0.234	25/32	45/64
1 3/4	7/32	B	0.238	25/32	23/32
1 7/8	29/64	C	0.242	13/16	47/64
2	15/32	E	0.250	13/16	3/4
2 1/8	31/64	F	0.257	27/32	49/64

Dia. of Work A	Largest Dia. of Center B	Letter of Drill C	Dec. of Drill	Depth of Hole D	Counter Bore E
2 1/4	33/64	G	0.261	7/8	25/32
2 3/8	17/32	H	0.266	29/32	51/64
2 1/2	11/16	J	0.277	29/32	13/16
2 5/8	35/64	K	0.281	1 1/8	53/64
2 3/4	23/32	L	0.290	31/32	27/32
2 7/8	37/64	M	0.295	31/32	55/64
3	3/4	N	0.302	1	7/8
3 1/8	39/64	N	0.302	1 1/32	57/64
3 1/4	25/32	O	0.316	1 1/32	29/32
3 3/8	51/64	O	0.316	1 1/16	59/64
3 1/2	13/16	P	0.323	1 1/16	15/16
3 5/8	53/64	Q	0.332	1 1/8	61/64
3 3/4	27/32	R	0.339	1 1/8	31/32
3 7/8	55/64	R	0.339	1 1/8	63/64
4	7/8	S	0.348	1 3/16	1
4 1/8	57/64	T	0.358	1 3/16	1 1/64
4 1/4	29/32	T	0.358	1 3/16	1 1/32
4 3/8	59/64	U	0.368	1 1/4	1 3/64
4 1/2	15/16	V	0.377	1 1/4	1 1/16
4 5/8	61/64	V	0.377	1 1/4	1 5/64
4 3/4	31/32	W	0.386	1 5/16	1 3/32
4 7/8	63/64	X	0.397	1 5/16	1 7/64
5	1	X	0.397	1 5/16	1 1/8

TABLE OF REAMED CENTER DIMENSIONS

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors
August 2, 1923

Unserviceable Locomotives Become Fewer

THE report of operating statistics of Class I railroads to the Interstate Commerce Commission for June shows a steady decrease in the number of unserviceable locomotives, both passenger and freight. Considering this achievement in view of the record movements of freight cars during the last few weeks we must agree that the railroads have done a remarkable job.

If we also consider the handicaps in the way of poor tools and inadequate equipment with which the mechanical departments have to struggle, the fact that unserviceable freight locomotives have dropped from 26.1 to 22.9 per cent, and passenger from 24.4 to 21.3 per cent is much more remarkable.

The shop executives and the men under them deserve a lot of credit for what they have accomplished but can we say the same for those responsible for the poor shop equipment with which the mechanical department has to work?

Thoughts on Reading the Entries For the Equipment Replacement Contest

WE HAD rather expected it would be an arduous task to wade through all the entries to the "It Pays to Replace" contest. Strange to relate it turned out to be quite the reverse. Not only were many of the stories good reading in themselves but the wide variety of subjects covered drove away any tendency toward boredom.

It was quite clear that the mechanical men who wrote of changes for the better made under their direction or at their suggestion, realized that appreciable savings can be made by the use of the most modern small tools and handling equipment as well as by the installation of first class up-to-date machine tools. The suggestions ran from oxyacetylene cutting and welding to the replacement of an ancient railroad transfer platform by a traveling crane.

In size the tools mentioned ranged from wire-forming machines to big station-type automatics. The product was anything from a small part of a hand numbering machine to iron disks that would just go on a big boring mill.

All in all, the quality and number of entries exceeded expectations and the only regret is that every entrant could not win a prize.

We could not help but be struck by one thought that ran through many of the stories, the difficulty of persuading the man who held the pursestrings to loosen up. Entrant after entrant told of his long struggle with the boss to get him to retire some worn-out, obsolete piece of junk and replace it with a real tool that would earn its cost in a few months.

Conservatism is well enough in its place but it can be overdone, particularly when it means the needless expenditure of time and money in making things with inadequate equipment. The American manufacturer has the reputation of having the nerve and business acumen to scrap old equipment when better tools for his purpose appear. Undoubtedly some of our leading manufacturers have earned this reputation but there are certainly many today who do not merit it in the least.

If they would only listen to the pleas of their foremen, superintendents and managers how much more prosperous they would be and how the industry as a whole would forge ahead. As one contributor pointed out, sentiment in the treatment of men who have put in a lifetime of faithful service is one thing, but something quite different where a worn-out machine is concerned.

The Weakest Link— The Milling Cutter

EVERYONE knows the old truism about the chain being no stronger than its weakest link. The trouble, however, is that most of us think of it only in connection with chains.

Perhaps the milling machine is as good an opportunity as any to apply the weakest link in theory, but how many do so? We buy a big husky milling machine, in our judgment the very best made, and boast about its cost. But when it comes to cutters for this same machine, it is too often a different story.

When it comes to weak links, the milling cutter is a good example and this includes design, material and sharpening. It is practically safe to say that a majority of the heavy duty milling machines of today are not doing all they should, because of the lack of knowledge concerning milling cutters.

"Cutters is cutters" in too many cases, and price alone controls their purchase. And so we find many fine machines, nibbling away at work instead of pulling out the chips as they should. The owner is disappointed at not getting the production he expected while the milling machine builder frequently knows nothing at all about it.

This is not a criticism of quality of milling cutters so much as of their not being adapted to their work. In these days of heavy duty milling, each job frequently presents a real engineering problem of cutter design and construction. A milling cutter which is to absorb the pull of a 15 or even 25 hp. motor is a very different proposition from the milling cutter of ten years ago. The day of ordering cutters from a catalog doesn't fit this kind of work.

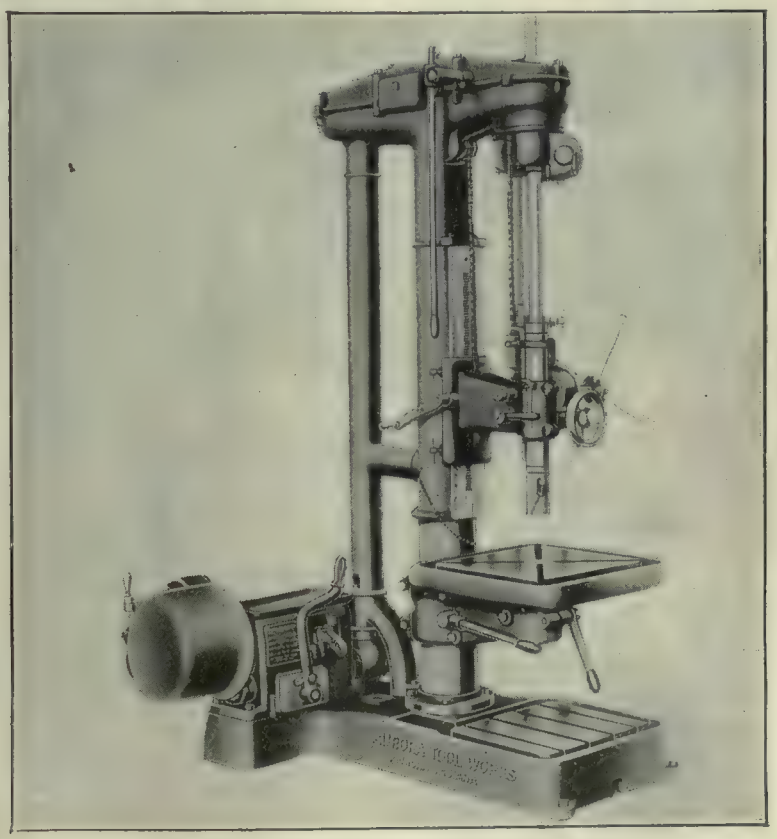
The milling cutter makers who are getting best results are those who study the work in hand. They send cutter engineers instead of the small tool salesman of the older type, and buyers who are wise have to forget the first cost and count on the work done per dollar of investment. But there are still many shops where the fine, high-powered milling machine is doing about half the work it should because the manager hasn't applied the "weakest link" story.

Shop Equipment News

Aurora Ball-Bearing Upright Drill

A ball-bearing upright drill, designated as the "Super 28 in.," is just being introduced by the Aurora Tool Works, Aurora, Ind. The main feature of the machine is its built-in construction, in which all moving parts, with exception of spindle and feed rod, are inclosed.

The main column, 8⅛ in. in diam., is bolted to the base which has a stationary work table at the front and carries the speed box and belt pulleys at the rear. The speed box speed is 450 r.p.m. and the tight belt pulley is 12 in. in diameter with a 4¼ in. face. When equipped for motor drive, the motor is mounted on the speed box. The loose pulley is fitted with an oilless bearing and is smaller than the tight pulley to slacken the belt when idling.



AURORA BALL-BEARING UPRIGHT DRILL

All speeds and feeds are plainly designated and may be obtained without stopping the mechanism. The helical spur gears are made from nickel alloy steel with 20-deg. stub teeth. Two sets of back gears are built in and, in combination with these, the speed box will furnish 16 spindle speeds ranging from 37 to 500 r.p.m. Six feeds are available from 0.007 to 0.046 in. per revolution of spindle. The vertical drive shaft passes up through the tubular back brace.

The spindle is forged from high-carbon steel, is double-splined and fitted with ball thrust bearings. Its diameter in the sleeve is 1⅛ in. and the hole fits No. 4 Morse taper. The drilling head slides on ways attached to the main column through a total movement of 24 in. and provides a maximum distance of 49 in. from spindle to base.

The table of the drill is carried on the main column and is raised and lowered by a hand-operated rack and pinion. The maximum distance from spindle to table is 33¼ in. and the table may be swung out of the way to allow work to be placed on the base. The diameter of the plain round table is 25 in. and a square table, 27x27 in., is furnished.

All bearing and gears are arranged to run in oil and glass gages are fitted to show the oil level in the reservoirs. Ball bearings are used throughout the machine except in the quill.

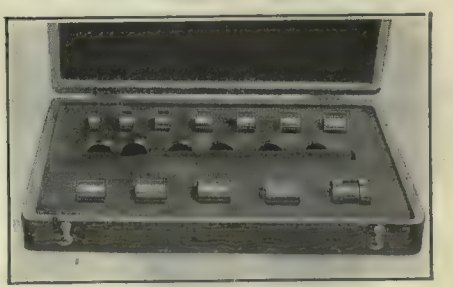
Controls, including table clamping handles, are so arranged that they may be operated from the front of the machine. Protection of vital parts from foreign matter and increased safety for the operator are among the advantages claimed for the built-in construction of the machine.

A friction tapping attachment can be furnished, and the height with this attachment in place is 9 ft. 3 in. The extreme height with spindle extended is 11 ft. The machine weighs 3,410 lb. and requires 62½x40¼ in. floor space.

Van Keuren Fractional Reference Gage Set

An addition to the line of reference gages manufactured by the Van Keuren Co., 362 Cambridge St., Allston, Boston, Mass., is a set of fractional reference gages which is now being marketed.

This set includes the fractional inch or common shop sizes. It consists of eighteen gages varying in sixteenths from $\frac{1}{16}$ to 1 in. and including the $\frac{33}{32}$ and $\frac{65}{64}$ in. sizes.



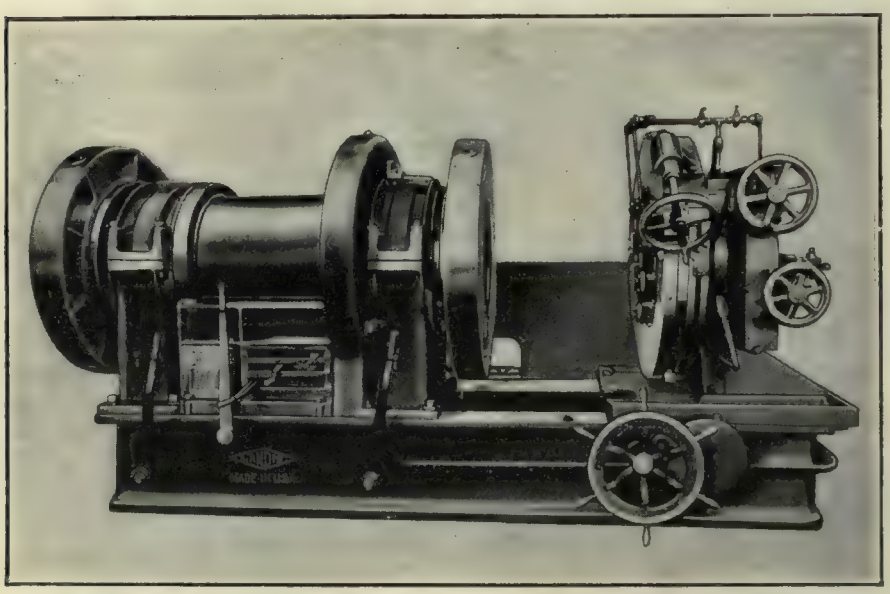
VAN KEUREN FRACTIONAL REFERENCE GAGE SET

The gages are particularly useful as a reference standard for measuring steel balls and other products where the standard sizes are fractional inch dimensions.

A Bureau of Standards certificate of accuracy is furnished with the set.

Landis 18-Inch Pipe Threading and Cutting Machine

The Landis Machine Co., Waynesboro, Pa., has added to its line of pipe threading and cutting machines an 18-in. size. The range of this machine is from 8 to 18 in. and this entire range is covered by one diehead and one set of chasers. The design is similar to that of the 12-in. size, illustrated and described on p. 349, Vol. 56 of *American Machinist*.



LANDIS 18-INCH PIPE THREADING AND CUTTING MACHINE

The length of the machine is 12 ft. 6 in. and the height is 6 ft. The extreme width of the belt driven machine over the belt pulley is 5 ft. 10 in., while the extreme width of the motor driven machine over the motor plate, is 6 ft. 8 in. It weighs 22,000 pounds.

The machine has a single pulley drive and the variations in speeds, which are eight in number, are obtained by means of a speed box located beneath the main spindle. A friction clutch is mounted on the main drive shaft with the pulley or, if driven by an electric motor, a chain sprocket will be substituted for the pulley. The operating cone of the clutch is moved by two levers which are located at the ends of the headstock within easy reach of the operator. The forward lever is used when threading pipe, and the lever at the rear end of the machine is used for starting and stopping when making up flanges. The lever in the middle is for reversing and is placed convenient to the operator.

All gears are fully enclosed and, with the exception of the main driving gear and its pinion, they run in an oil bath. The main bearings of the hollow spindle are lubricated by flat link chains which run in oil contained in large reservoirs in the base. The driving pinion shaft, as well as the reverse shafts, is lubricated by sight feed oilers.

At each end of the hollow spindle there is a 3-jaw independent chuck for holding the pipe. The rear chuck is equipped with flange grips for fitting flanges. The jaws are geared, have universal adjustment and are self-centering on the pipe.

The carriage which supports the diehead, the cutting-off tool, and the reaming tool is traversed either by power or by hand. The power traverse is both forward and backward, and is controlled by a lever located on the operating side of the carriage. To advance the carriage toward the chuck, the lever is pulled and held until the threading position for the die is reached. To reverse the movement of the carriage, at any point within its travel, the lever is pushed and held. Releasing the lever instantly stops the carriage at any point.

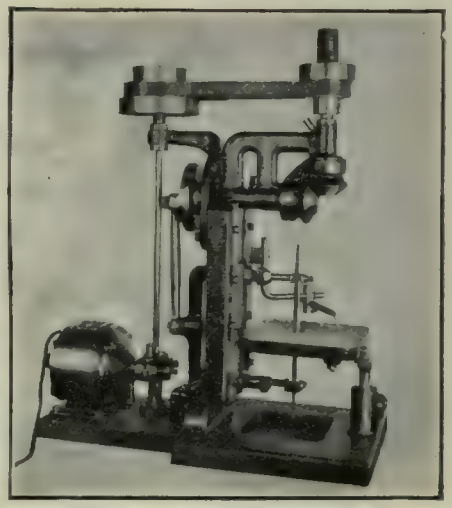
Automatic stops prevent the diehead from coming in contact with the chuck in the forward movement, and the carriage from running off the guides of the machine in the backward movement. The reaming tool is quickly set to position and locked with a lever. It is fed to the pipe by rotating the cutting-off feed handwheel in a counter-clockwise direction.

The machine is converted to motor drive by replacing the pulley with a sprocket and mounting the motor on a base over the gear box. A silent chain is employed to drive from the motor to the sprocket. This machine employs the Landis long life tangential chaser.

Flint Filing Machine

A filing machine which presents some interesting features is now being introduced by the Flint Manufacturing Co., 1016 Merrill St., Flint, Mich. The general design of the machine will be evident from the accompanying illustration.

Various sizes and shapes of standard files may be clamped on projections from a crosshead which slides in suitable guides on the frame. The crosshead is given a reciprocating movement by a crank on a horizontal shaft above the work table. This shaft is driven by means of bevel gears from a short vertical shaft which is, in turn, belt-driven from the vertical shaft geared to the motor. Ball bearings are used and a feature of the machine is that the bearings are above the work and away from the file dust. Three-step cone pulleys are provided for changing the speed.



FLINT FILING MACHINE

The stroke of the file is adjustable to all distances up to 5 in. and the work table is adjustable about two axes. A universally adjustable work clamp is provided.

In addition to the motor-driven machine shown, a belt-driven machine and one adapted to be placed on a drill press table and operated by the spindle, are manufactured.

Cochrane-Bly Metal Sawing Machine

The Cochrane-Bly Co., St. James St., Rochester, N. Y., has recently placed on the market a cold sawing machine having sufficient capacity for cutting 13-in. round, 12-in. square, or 10 x 15-in. rectangular sections.

As shown in the accompanying illustration, the bed of the machine is set in a deep pan which catches the oil and chips and drains into a reservoir from which a geared pump recirculates the oil. The saw carriage is carefully fitted to the bed and carries the hardened and ground saw arbor in a solid bearing.

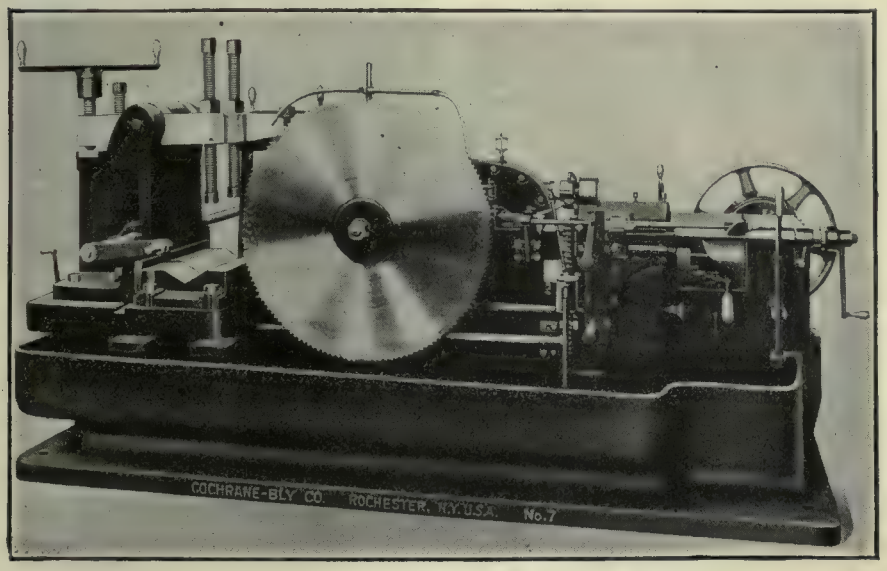
The feed screw is directly in line with the center of the saw arbor and as close to the line of the saw as possible. The feed-screw nut is split and adjustable in an endwise direction to remove lost motion from the screw. Between the screw and gear box, the lost motion is taken up by hardened steel nuts. The screw is driven through a combination of worm and spur gears which allow eleven changes of feed. The feed may be started, stopped or reversed by suitable levers at front and back of machine. The carriage can also be adjusted to or from the work by cranks at either end of the machine.

The friction clutch pulley which drives the machine is 24 in. in diameter with 9-in. face and is mounted on the drive shaft which runs in ring-oiling bearings. This clutch is also controlled through levers at front and back of machine.

Three cutting speeds, 30, 40 and 50 ft. per min., are available and changes are made through a gear box operated by a lever on the box. All gears except the worm gears are of steel and run in oil. The worm is hardened steel and is furnished with a ball thrust bearing.

The regular vise shown has two hand-operated clamping screws, but a vise operated by compressed air can be furnished. A crank-operated feeding mechanism is installed, and through suitable gearing the operator can, it is said, easily adjust a 12- by 12-in. billet in the vise.

The diameter of the saw is 37 in. and its thickness 9/32 in. The speed of the drive shaft required is 300 r.p.m. and a 20 hp. motor should be used. The floor space for belt drive is 71 x 129 in., and for motor drive, 89 x 129 in. The net weight of the machine is 12,600 pounds.



COCHRANE-BLY METAL SAWING MACHINE

John-Sons Gage Vise and Fixture

For use in connection with the John-Sons adjustable thread snap gages, the John-Sons Gage Works, 67 Blue Hills Ave., Hartford, Conn., has recently developed a gage vise and fixture which are shown in the accompanying illustrations.

The vise is illustrated in Fig. 1 and can be used with any size or style of John-Sons thread snap gage. The structure is rigid and the gage is clamped in position by a collar-head screw.

The fixture is used with any John-Sons thread gage for work larger than 2 in. in diameter and is shown in Fig. 2. The finished portion of the base upon which the work slides is a hardened steel plate, ground after being fastened to the base. An arrangement of springs in the stem leaves the gage free to float up and down above the plate, and the position of the gage above the plate is regulated by an adjusting bolt projecting through a hole in the handle. The stem also projects through the threaded bushing and handle and guides the gage so that it always remains parallel to the base.



FIG. 1—JOHN-SONS GAGE VISE

This arrangement eliminates the tendency to cross threading, and the freedom of movement vertically permits alignment between gaging rolls and the thread to be gaged. By giving the work a quarter turn and regaging it, an out-of-round thread is detected, and a tapered thread is shown by raising or depressing the gage. When released, the gage returns to its normal position.



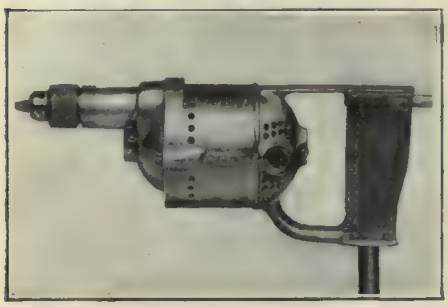
FIG. 2—JOHN-SONS GAGE FIXTURE

It is stated that the practicability of this fixture has been proven under actual working tests and that its use leads to speedier and more accurate work.

U. S. Automatic ¼-Inch Electric Drill

A recent addition to the line of electrically driven tools, manufactured by the United States Electrical Tool Co., Cincinnati, Ohio, is an electric drill designated as the "U. S. Automatic" type and designed for drill sizes up to ¼ inch.

The handle is cast integral with the aluminum body and, at its upper end, the switch is located as shown



U. S. AUTOMATIC ¼-INCH ELECTRIC DRILL

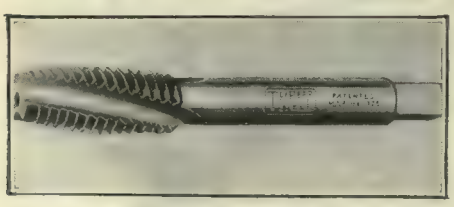
in the illustration. A 3-jaw, screw-back chuck is fitted to the spindle, which is geared to a motor of a type which will operate on d.c. or a.c. circuits. S.K.F. ball bearings are used and the gears are of hardened chrome nickel steel running in grease.

This drill may be made to serve as a grinder, a bench drill or a bracket drill, by the use of other U. S. attachments. The tool weighs 5¾ lb. and its overall dimensions are 10x4 inches.

Wells Spiral Flute Tap

A spiral flute tap has been recently placed on the market by the Wells Corp., Greenfield, Mass.

The spiral flute is the main feature of this tap and many advantages are claimed for it. The action of the right hand spiral curls the chip and cleans it out of the hole. This is an advantage in machine tapping since the tap need not be backed out to loosen the chips. The cutting action of the teeth is improved by the flute as it gives more shearing action at the cutting edge. It is also stated that this design makes the tap especially useful in tapping blind holes on account of its chip-clearing action.



WELLS SPIRAL FLUTE TAP

The ends of the tap are given a double chamfer for easier working, and the edges of the chamfered teeth are rounded over to insure easy starting qualities. The taps will be furnished with threads ground to a tolerance of 0.0005 in. on both lead and diameter if desired.

Hand taps and tapper taps with various shanks are available in standard sizes and threads up to 1 in. in diameter.

Waterbury Farrel Automatic Screw Slotter

The accompanying illustrations show an automatic screw slotter, recently designed and now introduced by the Waterbury Farrel Foundry & Machine Co., Waterbury, Conn. Three sizes of this machine are built, which are adapted to slot screws with maximum shank diameters, respectively, of 5/16, 7/16 and 1½ in. The maximum lengths of screws corresponding are 1½, 2½ and 4 inches.

The drive shaft of the machine carries a 4-step cone pulley at the back and a handwheel at the front. It is geared to a cam shaft and belted to the shaft which operates the hopper slide. The hopper slide reciprocates through the blanks in the hopper and loads them into a chute, down which they slide to the indexing dial. Mechanism to insure proper location of blanks in the chute is provided in the hopper.

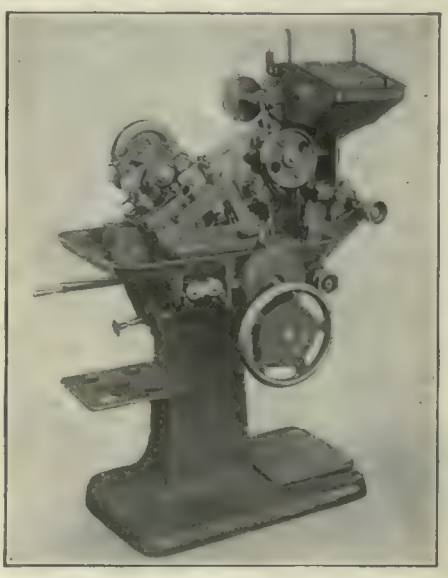


FIG. 1—WATERBURY FARREL AUTOMATIC SCREW SLOTTER

The dial is shown in Fig. 2, the saw frame having been swung upward so that the dial mechanism may be seen. The blanks are fed to the dial one at a time, and are clamped at the slotting position by a clamping disk which binds against the shank. The dial indexing and locking mechanism is located at the lower end of the dial shaft. A burr-remover, which is a form tool conforming to the shape of the head of the screw, operates to clear off the burr produced in sawing the slot.

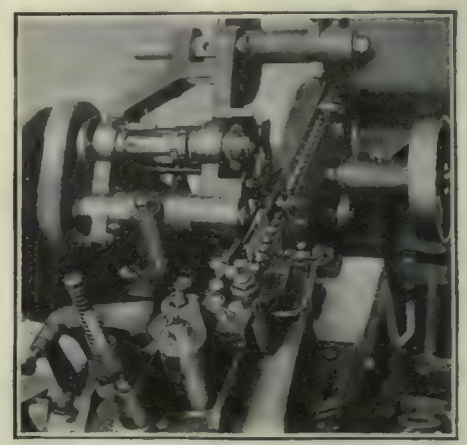


FIG. 2—WATERBURY FARREL SLOTTER FEED MECHANISM

The dial, clamp, saw frame and burr remover are operated from the cam shaft mentioned above.

The saw frame is hinged for convenience in changing saws. Two speeds are available to accommodate high speed or carbon steel saws, and speeds are changed by interchanging the spur gears on the hinge stud and cutter arbor. The depth of cut is adjustable to suit the screw, and a spring buffer under the saw frame is provided to reduce chatter. In the two smaller size machines the saw is belt-driven, and in the largest it is driven through a chain.

Facility of adjusting and setting up and low operating cost are among the advantages claimed for the machine. A pump, tank and suitable piping for cutting compound are provided. Motor drive will be furnished at an additional charge, if desired, in which case the motor is mounted on the finished pad on the base and drives the machine through a sprocket chain to the drive shaft. For the largest size a 1½-hp. motor is required. This size machine weighs 2,200 lb. and requires a floor space approximately 55 in. square. For the smaller machines ¾ and 1-hp. motors are required and their weights are 900 lb. and 1,550 lb., respectively.

Sundstrand 15-Inch Portable Geared Head Lathe

The 15-in. portable geared head lathe just placed on the market by the Rockford Tool Co., 2402 Eleventh St., Rockford, Ill., will be of interest to railroad shops, shipyards or other shops using such portable equipment. This lathe is patterned after the Sundstrand 14-in. toolroom lathe, a description of which was published on page 315, Vol. 56, of *American Machinist.*

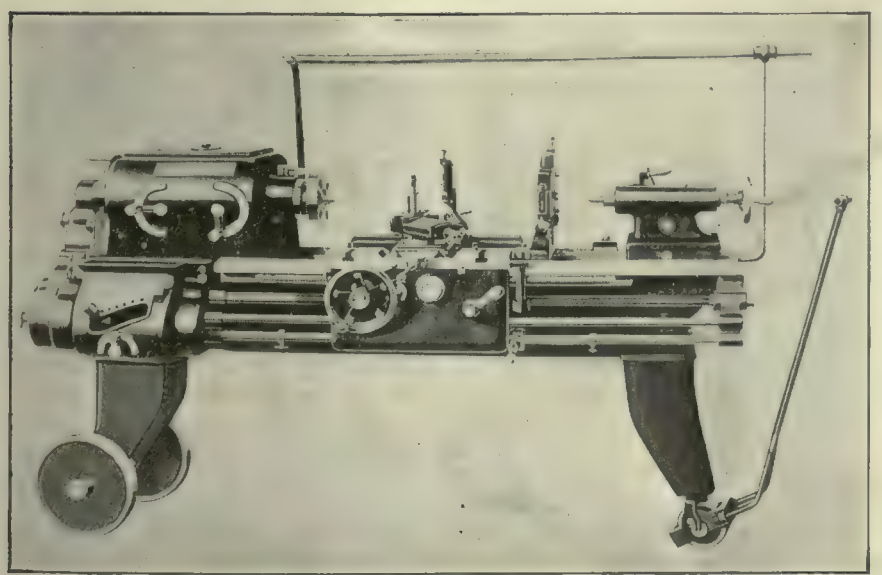
The wheels which provide the portable feature of this lathe are attached to heavy box-section legs at either end of the bed. The headstock end is supported on two wheels through trunnions, and at the other end a single wheel with a suitable fork and steering handle is provided.

The geared headstock is fully inclosed and sliding gears are used. When motor drive is used the motor is mounted directly on the headstock. Speed changes can be made with the machine in motion.

The apron is of double-wall construction and provides sufficient bearings for gears and studs. The threading nut and the longitudinal feed cannot be engaged at the same time. The carriage is provided with felt wipers for cleaning and oiling the ways.

The lead screw has ball thrust bearings at the tailstock end and a threading dial is furnished to facilitate location of previous cuts. The gear box has a tumbler and a cone of eight gears, and 48 thread and feed changes from 1½ to 92 are possible.

This lathe will swing 15 in. over the bed and 8¾ in. over the carriage, and the distance between centers, with 6-ft. bed and tailstock flush with end of bed, is 32 in. For motor drive a 2-hp. motor is required. The usual equipment is provided. The approximate net weight is 2,250 pounds.

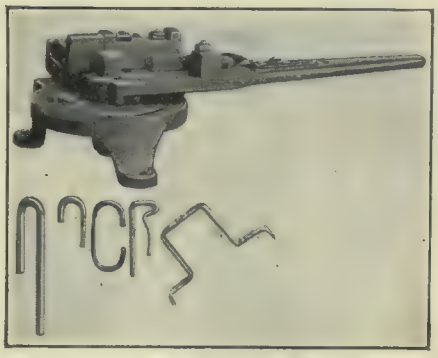


SUNDSTRAND 15-IN. PORTABLE LATHE

Hinman Angle and U Bender

D. A. Hinman & Co., Sandwich, Ill., have recently added an angle and U bender to their line of hand-operated bending equipment. The apparatus, together with samples of bending work accomplished, is shown in the illustration.

The bender is operated by hand and, with regular equipment, is designed to bend round and flat stock to any angle. It will also handle angle iron when one flange is properly cut out at the bending point. With special U-blocks, hooks and Us of various forms can be bent. U-blocks in widths up to 6 in. can be furnished, and also special equipment for U-bends up to 12 in. in width.

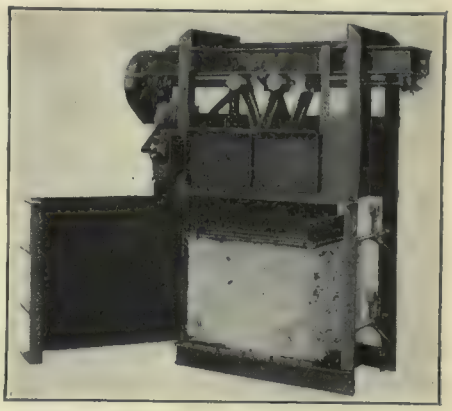


HINMAN ANGLE AND U BENDER

For hot bending the machine will handle flat stock up to 2x2½ in., and for edgewise hot bending, flat stock up to 1½x⅜ in. The maximum capacity for cold stock is 2x½-in. flats, and ⅞-in. rounds and squares. The weight is about 60 pounds.

Galland-Henning Motor-Driven Toggle Baler

A self-contained motor-driven baling press is now being marketed by the Galland-Henning Mfg. Co., Railway Exchange Bldg., Milwaukee, Wis. The machine is built in two sizes, with corresponding capacities.



GALLAND-HENNING MOTOR-DRIVEN TOGGLE BALER

The principal feature of the pressing apparatus consists of a toggle mechanism, the links of which are operated by two heavy nuts threaded on a large horizontal screw at the top of the machine. The screw is rotated by the motor, which drives it through gearing. There are four toggle levers, mounted in such a way on the nuts and pressing head as to decrease tendency of binding and to keep the parts in proper alignment.

The frame of the machine is constructed of structural steel throughout. The sides of the box are hinged to provide easy access to the finished bale. The frame joints are reinforced with steel castings and forgings and the bearings are fitted with bronze bushings.

The baler will handle paper, rags, leather, rubber and similar materials. The smaller size is shown in the accompanying illustration and will press a bale 36 x 24 x 26 in. The larger size produces a bale 50 x 24 x 26 in. The weights of the machines are 2,500 and 5,500 lb., respectively.

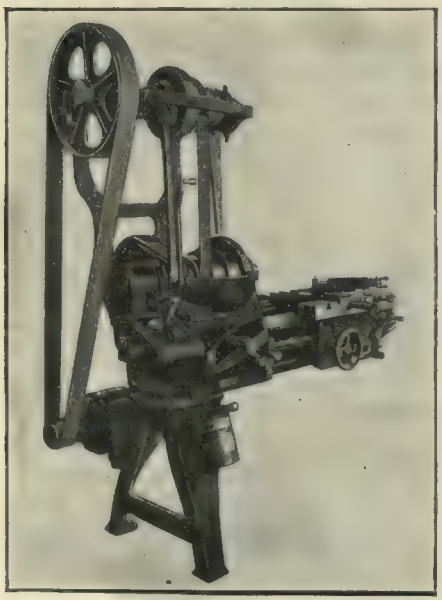
Motor Drive for Carroll & Jamieson Lathes

The Carroll & Jamieson Machine Tool Co., Batavia, Ohio, has recently brought out a motor drive arrangement for use on the line of lathes which it manufactures.

As will be noted from the illustration, a heavy, rigid, vertical bracket is bolted to the back of the lathe bed, and carries at its upper end a hinged frame which supports the countershaft. The countershaft is raised or lowered by a vertical member, which is actuated by an eccentric lever, and swings the frame on its hinge.. This vertical movement of the countershaft is to loosen the belt when changing speeds. Adjustments are provided for regulating belt tension and belts can be used until worn out without shortening.

The motor is mounted on the back of the lathe leg by means of a special bracket, and is belted to the countershaft drive pulley by a 2½-in. belt. The upper cone pulley is fitted with a friction clutch which is operated by a convenient lever, and by which the lathe can be started and stopped independently of the motor.

By attaching this drive to a cone head lathe the advantages of a self-contained machine are claimed without excessive first cost. The apparatus is furnished as shown with the



MOTOR DRIVE FOR CARROLL & JAMIESON LATHES

exception of motor and switch. A 1½-hp. constant speed motor of about 1,200 r.p.m. is required and can be furnished. It is said that the drive operates with little vibration and causes no misalignment of the lathe.

Hisey Motor-Driven Combination Grinder and Buffer

A recent addition to the line of machines manufactured by the Hisey-Wolf Machine Co., Cincinnati, Ohio, is the Hisey motor-driven combination grinder and buffer.

The general design of this machine varies somewhat from previous Hisey machines but the detail construction is patterned after the standard line of grinders and buffers. It is adapted for work requiring the use of a grinding wheel, buffing wheel, wire brush wheel or rotary wire rasp wheel.

The motor is direct connected and is bolted to the top of the floor stand. A suitable base for bench mounting can also be furnished on order. The spindle extension is a separate unit



HISEY MOTOR-DRIVEN COMBINATION GRINDER AND BUFFER

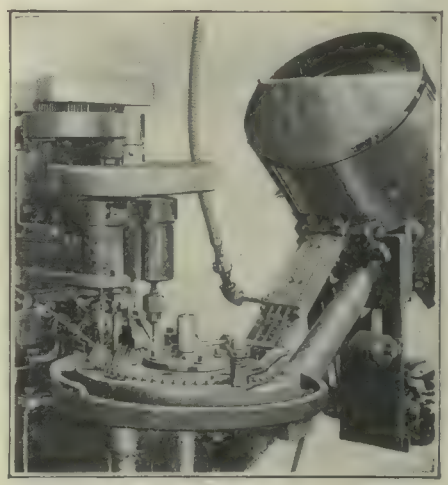
and is connected to the motor armature shaft through a suitable clutch. Each shaft unit is supported on two ball bearings which, it is stated, makes the entire spindle and general construction exceptionally rigid.

The motor speed under no load is 3,500 r.p.m. and the motor is rated at 1 hp. Machines for either alternating or direct current are available for various voltages. The standard a.c. machine is built for 60 cycles but 25- and 40-cycle motors to run at 1,500 and 2,400 r.p.m., respectively, will be furnished on order.

The size of wheel required is 8 in. in diameter, 1½-in. face, and has a ¾-in. hole. The net weight of the machine is 390 lb. Suitable connector cable and switch, two wheel guards and one grinding wheel are standard equipment. Other wheels will be furnished on order.

Hopper Feed for Anderson Dial Tapping Machine

The Anderson Die Machine Co., Iranistan Ave., Bridgeport, Conn., has recently placed on the market a hopper feed for its No. 40 dial tapping machine which was previously



HOPPER FEED FOR ANDERSON DIAL TAPPING MACHINE

described on page 155, Vol. 56, of the *American Machinist*. This arrangement was developed for feeding knurled battery nuts to the machine, and is mounted on a bracket fastened to the under side of the dial pan. It is independently driven by a motor, the independent drive being installed so that the chutes leading from the hopper may be filled before the machine is started.

The arrangement of the various parts is indicated in the accompanying illustration. There are three chutes leading from the hopper and a mechanism in the hopper insures proper feeding of the pieces to the chutes. The pieces slide down the chutes by force of gravity, and at the lower end are fed into the dial when it is stationary, for tapping. A stop at the end of the chutes is automatically closed when the dial is stepped, so that there can be no possible obstruction to the dial movement.

The dial ratchet has 18 teeth and for each tooth there are 3 openings in the dial. Three pieces are therefore fed to the dial at each movement of the ratchet and, by using all three of the machine spindles, three are tapped at the same time. A positive ejector is provided to force the finished pieces out of the dial. This ejector will be seen at the left of the dial in the illustration, and consists of three fingers on a bracket which moves up and down with the spindles.

When the machine is timed for 40 strokes per min., the theoretical production is 7,200 pieces per hr. It is stated that three machines, running on a 20 hr. schedule, have tapped up to a maximum of 421,000 pieces per day, which is 97½ per cent of the theoretical production.

Falk-Bibby Flexible Coupling

A flexible coupling for use in all kinds of power transmission equipwhere a coupling is used has been placed on the American market by the Falk Company, Milwaukee, Wis.



FALK-BIBBY FLEXIBLE COUPLING ASSEMBLED AND DISASSEMBLED

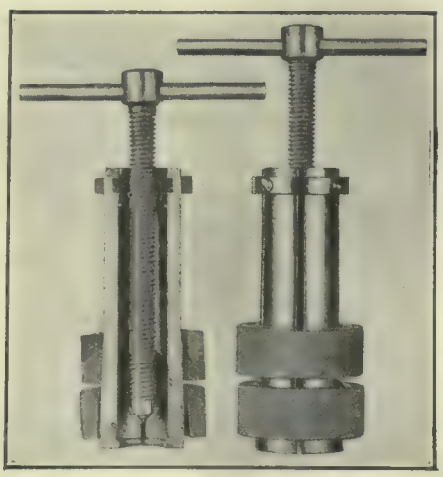
The coupling is known as the Falk-Bibby flexible coupling and is of a type already in extensive use in England, where it is manufactured by the Wellman-Bibby Co., Ltd.

The coupling consists of two flanged steel disks, one to be keyed to each shaft, a tempered steel spring bent into the form of a continuous cylindrical grid, and a steel shell. Pitched cross grooves are cut in the peripheries of the disks, into which the spring is placed. The shell is slipped over the spring to hold it in place and protect it from dirt and injury, and also serves as a container for lubricant. When the shell is in place, end plates are slipped into it and the whole mechanism is locked together by means of clamping rings, which are sprung into grooves in the shell.

The distinctive features of the Falk-Bibby coupling are the form of the spring and the shape of the slots in which it is held. In both flanges the slots widen inwards, so that each section of the spring fits closely only at the outer end of the slot. The sides of the slots are formed to circular arcs of carefully designed radius. Under light and normal load there is a long free span between the points of contact on the springs, but under overloads the spring sections become supported along the curved sides of the grooves, which shortens the span and results in a progressive increase of stiffness with increase of load, while the stress on the spring segments remains constant. The form of construction used allows both torsional and lateral elasticity, which allows for a reasonable amount of misalignment of the shafts. The load is distributed over a large number of spring segments with the result that the pressure on each segment is comparatively light. Other advantages claimed for the coupling are those of convenience in assembling and disassembling, durability and compactness.

Campbell Bearing Puller

The illustration shows an outside view and section of a bearing puller now being marketed by the Campbell Auto Works, 232 N. El Dorado St., Stockton, Calif. This puller is designed for use in removing the inner cones of ball bearings of the open type used on magneto armature shafts and similar electrical equipment.



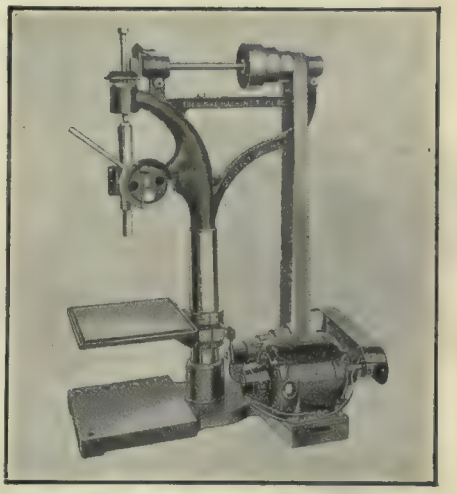
CAMPBELL BEARING PULLER

The tool is made in two sizes and each size is adjustable for different size bearings, without the use of other tools. The adjustment is accomplished by the two taper rings, each of which will adjust for two sizes by reversing it on the jaws. The larger size tool will handle Nos. 14, 15, 16 and 17 bearings, and the smaller size Nos. 8, 10, 12 and 13. The construction and method of operation will be evident from the illustration.

Burke Motor-Driven Heavy Duty Bench Drill Press

The Burke Machine Tool Co., Conneaut, Ohio, has recently added a motor drive to its No. 2 heavy duty bench drill press. The belt-driven machine was previously noted and illustrated on page 499, Vol. 58, of the *American Machinist*.

The construction details and general features of the motor-driven unit are exactly similar to those of the belt-driven machine. The base has been enlarged to provide a pad for attaching the ½-hp. motor which is placed beside the countershaft. The motor drives the countershaft through a Morse silent chain, and a suitable guard for chain and sprockets is provided. Machines with motor drive can be furnished to operate on either direct or alternating current.



BURKE MOTOR-DRIVEN BENCH DRILL PRESS

As previously stated, this machine will drill up to ⅞ in. in diameter at the center of a 12-in. circle. The maximum distance between spindle and table is 10¾ in. and between spindle and base is 18½ in. The motor-driven machine weighs 240 lb., the height is 39 in. and a space 32x12 in. is required.

News Section

Most Railroads Show Gain in June

The general trend of the railroad reports for June made public last week showed an increase, both in comparison with the same month last year and with May. There were exceptions, though, notable among them being the St. Louis-San Francisco.

The report of the Pennsylvania R.R. showed net operating income of $7,938,580, an increase of $2,266,098 in comparison with a year ago. The largest increase was in freight revenues, which totaled $45,636,211, or $11,302,684 more than last year. Compared to an increase of $13,508,043 in the gross operating revenues, the railway operating expenses increased $1,706,294 for June over the same month last year. The greatest increase in expense was registered in the railway operations, where an additional $5,234,840 was spent this year, while maintenance of equipment was second, with an increase of $3,742,646. In June $1,434,099 more was spent on maintenance of structures and ways than in the same month last year.

While June was a favorable month for the Pennsylvania R.R., the net operating income for the first six months was $41,486,060, or a decrease of $279,071 in comparison with the corresponding period last year. Total railway operating revenue for the six-month period was $356,130,371, which is $59,082,728 more than in 1922.

The St. Louis-San Francisco R.R. for June reports a net operating income of $1,506,585, which is $338,401 less than for the same month last year. The decrease is due principally to a falling off in total revenue which was $7,052,830, or $783,495 less than last year. The figures for the half-year period are more favorable, showing a net income of $9,144,231, or $879,747 more than in the same period last year.

The Chicago, Milwaukee & St. Paul R.R. reported net operating income of $1,311,981 for June, compared with $1,215,104 for the same month last year. This brought the net income for the first half of this year up to $6,669,014, compared with $1,617,154 last year, an increase of $5,051,859.

Net income of the Central Railroad of New Jersey was $587,970, compared to a deficit of $112.158 for the same month last year. This brings the net income for the first six months up to $2,516,568, against $1,681,722 in the same period of last year.

Considering Twelve-Hour Day Elimination

Elbert H. Gary, chairman of directors of the United States Steel Corp., reported that progress was being made in evolving a plan calling for the elimination of the twelve-hour day in the steel industry. Several conferences of subsidiary company presidents were held in the office of Judge Gary last week, and the directors of the American Iron and Steel Institute discussed the matter at a meeting held in the Metropolitan Club on Friday. Following a recent meeting of steel corporation executives, Judge Gary said that both meeting have been postponed until next Aug. 2.

When asked to comment on the situation, Judge Gary said:

"Both meetings have adjourned to meet again in New York on Aug. 2. We are making a very careful study of the whole subject concerning the elimination of the twelve-hour day. I should say we are making very satisfactory progress, but have not proceeded far enough to express any opinion as to the final conclusion. I suppose when the consultations are finished I may make some statement."

June Exports of Metal-Working Machinery

Exports of metal-working machinery during June, 1923, with revised comparative figures for June, 1922, as compiled from the returns to the Department of Commerce, were as follows:

	1922 Value	1923 Value
Lathes	$82,198	$96,385
Boring and drilling machines	68,580	44,710
Planers, shapers and slotters	52,220	26,855
Bending and power presses	31,531	10,703
Gear cutters	15,937	9,971
Milling machines	51,622	34,830
Thread cutting and screw machines	17,290	36,384
Punching and shearing machines	20,685	14,890
Power hammers	31,162	7,158
Rolling machines	585	485
Sharpening and grinding machines	69,297	72,034
Chucks (centering, lathe, drill and other)	11,605	24,344
Reamers, cutters, drills and other parts for machine tools	110,007	182,433
Pneumatic portable tools	30,687	64,896
Foundry and molding machinery	53,447	28,246
Other metal-working machinery and parts of	821,953	370,627
Total metal-working machinery	$1,444,806	$1,026,951

Similar figures covering motor car exports follow:

	1922 Value	1923 Value
Automobiles and chassis (total)	$6,652,519	$10,130,183
Motor trucks and busses (except electric)	.....	.....
Passenger cars, except electric	5,807,426	8,971,827

Will Improve Terminal at Madison

The Chicago & Northwestern R.R. is completing plans for terminal improvements at Madison, Wis., and has planned to start construction by the first of October. The plans call for a general machine shop 75x120 ft; a steam generating plant; a 100-ft. cinder pit with electric hoist; a 24-stall roundhouse; a 200-ton coal house; and a turntable. This road has also prepared plans for the construction of a new coal hopper at Milwaukee.

Engineers Studying Coal Problems

Definite organization of engineering committees throughout the country for the purpose of guarding against a shortage of coal this Winter, which threatens to become acute, was announced recently by the President of the F.A.E.S. Dean Mortimer E. Cooley of the University of Michigan. The engineers, probably 200,000 of them, are working in conjunction with the United States Coal Commission and the Department of Commerce.

One hundred and seven committees now are actively pursuing the study of how to solve the Nation's fuel problem, Dean Cooley said.

As was done during the war under the direction of Herbert Hoover, industries are being classed as preferential and desirable; these to get first call on the coal in hand. Among the former are electric railways, light and power, gas, steam railways, steel mills, smelters, autos and accessories, electrical equipment, railway equipment, cotton ginning, textile, paper and pulp, packing houses, flour mills, sugar, glucose and starch, office buildings, hotels, publicly owned buildings, schools and hospitals, dock and pier storage, coal dealers and navy and merchant marine.

Instructing Employees in New Way

A strong plea for the education of industrial employees in the fundamentals of business economics and in the details of the businesses in which they are employed is made by Carl F. Dietz, president of the Bridgeport Brass Co., Bridgeport, Conn., in a pamphlet recently issued by the Fabricated Production Department of the Chamber of Commerce of the United States.

The methods employed by Mr. Dietz's company are unique. Employees are educated through lectures and by means of simple visual illustrations. In the place of charts and graphs blocks of colored wood are used.

Workers who perform certain operations on materials before they have reached an advanced stage towards completion often show little interest in their work because they never see the start and finish of the job on which they are employed. There is manifest at all times, declares Mr. Dietz, a real desire on the worker's part to know more about the business in which he is employed. Far seeing managers, he adds, are seeking the best methods of imparting such information constructively, and especially information regarding the relation of production to wages and the distribution of the dollar received for the product of the plant.

Copies of the booklet may be obtained by addressing the Chamber of Commerce of the United States, Washington, D. C.

Chicago Workers Busy on Unfilled Orders

Machine tool dealers in the Chicago district report business as quiet, but attribute the lack of business to be due principally to the vacation period. There has been no new activity in the railroad situation this week, and industrial buying continues to be slow.

The Pennsylvania R.R. has made inquiry for a 36-in. punch, a 36-in. shear, a 5-ft. radial drill and a 4-ft. radial drill. The Virginian R.R. is in the market for a 32-in. shaper, a pipe machine, a sensitive drill press, a 32-in. crank planer, and 21-in. and 25-in. lathes. The Seaboard Air Line R.R. has entered the market for a 36-in. and 60-in. punch, and a 36-in. and a 60-in. shear. The Atlantic Coast Line R.R. has issued an inquiry for a 300-ton hydraulic bulldozer.

The last week has brought no developments indicating the trend of the machine tool industry over the next few months. There is a fair degree of optimism in the trade, but this is coupled with the fact that there is also a great deal of uncertainty in every one's mind as to just which way the market will drift in the next few months.

The general weakness in the steel market continued with slight change for the better last week. Railroad buying of cars and locomotives which figured largely during the early part of the year, has fallen to a low point, with the future course depending upon price fluctuations. Car builders in the Chicago district have work on hand for the next three or four months.

Production keeps up at a high rate for this time of the year and shipments are going forward to contract consumers without let-up. There are virtually no requests of importance for suspension of shipments, while some consumers, particularly the railroads, are pressing for deliveries to complete work on hand.

Freight Car Performance at Record Peak

The railroads of the United States on July 14 had 84,210 surplus freight cars in good repair and immediately available for service if transportation conditions warranted, despite the fact that for the week which ended on that day a total of 1,019,667 freight cars were loaded with revenue freight, the second largest number for any one week in the history of the country. The previous record loading was established during the week which ended on June 30 when the total was 1,021,770 cars, and on which date there were 63,636 surplus freight cars. When the previous freight loading record was made during the week of Oct. 14, 1920, the total for which was 1,018,539 cars, there were only 2,188 surplus freight cars, while there was a shortage of 69,517 freight cars.

The total number of surplus freight cars on July 14 was an increase of 20,143 cars over the number on July 8. Surplus box cars in good repair numbered 64,692, an increase within a week of 21,771, while surplus coal cars numbered 4,865, an increase of 245 within the same period. Surplus refrigerator cars totaled 8,074, an increase of 70 over the total number on July 8, but there was a decrease of 1,949 in the number of surplus stock cars which brought the total on July 14 to 5,702 cars.

The reported shortage in freight cars on July 14 totaled only 5,574. This was an actual decrease since July 7 of 1,314 cars despite the record loading of revenue freight. Shortage in box cars on July 14 was only 1,047, a decrease of 214 within a week, while the shortage in coal cars were 2,700, a decrease of 1,167 within the same period.

Ford Automobile Plant for Philadelphia

Construction of a new assembling plant by the Ford Motor Co., in Philadelphia, appeared to be assured this week. Engineering representatives of the company came from Detroit to look over a 70-acre tract of land at 63rd St. and the Schuylkill River, on which the company has an option at a purchase price reported to be about $6,000 an acre.

The proposed new plant would replace the existing assembling facilities at Broad St. and Lehigh Ave. Increased output is said to have rendered this property inadequate, and limited space at that site makes expansion impossible.

The contemplated plant in Philadelphia is understood to be a part of the Ford company's program for building in various parts of the East on which several million dollars will be spent.

Big Rail Consolidation Planned for Midwest

A consolidation of the Chesapeake & Ohio R.R. with the recently combined Nickel Plate System, is the next railroad move contemplated by the Van Sweringen interests of Cleveland, it was reported. Such a consolidation, provided it were approved by the Interstate Commerce Commission, would give the Cleveland financiers a unified system of more than 4,000 miles, touching such important centers as Chicago, Cleveland, Detroit, Cincinnati and Toledo.

Representatives of the Cleveland interests are now in practical control of the two lines, so that all that would be required would be a plan for a consolidation, it is said, and the permission of the Interstate Commerce Commission.

Would Combine Civic Societies

Plans are being discussed by the leading trade and civic organizations of Baltimore, Md., for the consolidation of all these bodies for the purpose of bringing about greater commercial and industrial growth of the city. The Board of Trade, the Merchants and Manufacturers' Association, and the Export and Import Board of Trade are included. At the same time there is a general feeling on the part of those interested that no matter what is done, steps should be taken to extend the work done by the Industrial Bureau of the Board of Trade. This bureau has been responsible for bringing numerous industries to Baltimore and its work has been decidedly effective ever since it was organized.

Australia Buying Many Motor Cars

Australia is today as it has been in the past, America's leading export market for motor cars, says Trade Commissioner J. W. Sanger in a report to the Department of Commerce. It imported from the United States in 1922, $23,000,000 worth of automobiles and parts and is now buying about 60 per cent of its motor chassis, bodies, equipment and spare parts from the United States. Aside from this, its imports of chassis from the Canadian factories of American manufacturers represent approximately 20 per cent of its total purchases. Roughly speaking, one out of every three makes of American cars are represented in Australia, in one way or another.

American cars usually rank in popularity in about the same order as they do in the United States. The leading eight American cars in this market represent upward of 40 per cent of Australia's total purchases of motor vehicles of all kinds from all sources.

Why They Like American Cars

At the present time with the pound sterling at $4.60, American motor cars with American motors or American built bodies, sell for slightly less than double their American price. Broadly speaking, the features of American cars that recommend them strongly to the Australian buyer and which have enabled them to so completely outdistance the English, Italian, and French cars, are high power, clearance and strong springing, and the many refinements and conveniences included in the equipment of moderate priced cars.

The distributor's chief difficulty today, is not the delay in receiving shipments from overseas, so much as obtaining the locally built bodies for the imported chassis. Very few cars selling in the class of $1,000 or under, f.o.b. American factory, are imported complete, but only as stripped chassis, the bodies being built in Australia. In the $1,500 class a larger number of cars are imported from the United States complete. Despite the fact that a considerable industry of body building has been built up in the Commonwealth, it is yet unable to meet the increasing demand. Recently efforts to get twelve motor bus bodies built in Victoria were met with a direct refusal, makers stating that they were too busy to take further orders, and New South Wales builders on being approached would only agree to fulfill half of the order. Many distributors, impatient of this delay, have been importing a much larger number of bodies than previously.

Will Hold Convention in Chicago

The eleventh annual convention of the Supply Association of the American Railway Tool Foreman's Association will be held Aug. 29, 30 and 31 at the Hotel Sherman, Chicago, Ill., according to an announcement that has been sent out by Herbert S. White, secretary and treasurer of the association. Due to the fact that no convention was held during the past two years, a delay in the announcement was occasioned, and due also to the same reason, it is expected that the attendance this year will be greater than ever before in the history of the association.

Milwaukee Factories Are Well Employed

Midsummer characteristics govern current machinery business and prospective customers are slow to act upon responses to their inquiries. These, too, are light, but it is significant that they are running heavier than a year ago, which builds up stronger hopes that Fall trade will be active. In the local trade, developments since the beginning of June have been gratifying and justify the expectancy of continued good business.

Manufacturers of machine tools are operating at about the same capacity as the average for the year, with orders on the books which insure a continuance of this rate until early Fall. Complaint is still heard concerning a shortage of competent workmen, although this is not quite so serious a problem as in shops of users of machine tools. The average manufacturer of machinery has been employing considerably more capacity than the makers of metalworking tools and naturally any shortage of labor is felt more seriously.

Oil Field Activity

The Southwestern petroleum area is showing another burst of activity in demand for all descriptions of oil-well equipment and some current machine tool business is traceable directly to the increased production needs of manufacturers of drilling and pumping units. In the coal mining industry activity is spotty, with a single notable contract for machinery reported, this calling for the largest mine-hoist unit ever projected, and to be built by the Nordberg Mfg. Co. of Milwaukee, with electrical equipment by the Westinghouse interests.

Automobile manufacturers are again in the market for tools, although inquiry and orders are confined to a few major producers, who as yet are not doing much beyond replacing worn out or obsolete machines and apparently are not striving to bring about any material increase in capacity. Public garage and repair shop construction is proceeding and furnishes dealers with opportunities to reduce their supplies of the lighter class of floor equipment as well as making the used machinery market fairly active.

Manufacturers of saw mill and woodworking machinery are busy, although new business is running into the customary slack season, from which a revival is expected as Fall enters. Building construction is falling off markedly, limiting prospective lumber manufacturing operations, but automobile body builders are pressing for equipment. A large Wisconsin woodworking machinery interest, namely the D. J. Murray Mfg. Co. of Wausau, Wis., has decided to become an active factor in seeking export business and has recently established for the first time a foreign sales department.

Good Sales Consummated in Pittsburgh

The surcease of business in the iron and steel industry is now being felt by the makers and dealers in machine tools and machinery in Pittsburgh. Apparently the Summer quietness is on in full in all lines. In this respect dealers say they are no worse off than last year at this time when exactly the same conditions were encountered in the machinery equipment business. However, several deals that have been hanging fire for two or three weeks were closed in the past few days, among them the awarding of a contract for twelve or fifteen machine tools by the Pittsburgh Board of Education, while the Westinghouse Electric & Manufacturing Co. has placed additional orders for machinery for the new plant at Sharon, Pa. Makers are awaiting with interest the decision of the Pennsylvania R.R. with regard to its list of machine tools for Columbus, Ohio.

Inquiry among the dealers here shows that numerous sales have been made in the past week, one being that of a 20-in. shaper to a local user and a fair number of small tools such as floor grinding machines, drilling machines, and hacksaws.

Inquiries continue to come in for single installations. It has been noticed that buyers are particular in having their specifications lived up to without the slightest deviation, even in the case of used machinery, as well as in new orders.

From the South there came an order for a wheel turning lathe, and the same interest was this week inspecting a bed lathe.

One feature of the sales market this week was that of a horizontal post milling, drilling and boring machine that had been used. It was shipped in two cars to a Central Ohio user, and weighed 52,000 pounds. There is very little activity in the crane market, only one sale having been noted last week, but there were several inquiries that may lead to business in the near future.

New York Market Still Satisfactory

Improvement in sales and inquiries has been noted in the New York district during the past week and dealers report that this condition is surprising considering the time of the year and what was to be expected in the line of business in July and August. Railroads are still good customers and seem to be ordering with more promptitude following their inquiries than has been the custom in the past. Inquiries are also coming in from the roads with regularity and prospects for a good Fall business from this source are anticipated.

Textile mills in New England are buying continually but in small lots, according to New York dealers. It was to be expected from the record of past years that the textile people would be out of the market by now but this is not the case.

Automotive industries around New York have taken the lull in their own production as an opportunity to overhaul and replace their machines and this has added considerably to the market activity. From all indications the automotive business will be lively in the Fall and preparations are being made to see that machines are in the best of condition before that time.

Heavy machinery is moving slowly, merchants in this line state. Used machinery is not as active as it was in the Spring, but compares favorably with the business done last Summer.

Exporters say that there has been a slight improvement in shipments during the past month and that it is anticipated that this will continue for the remainder of the shipping season.

Machine Tool Business Good in the South

A survey of conditions in the Southeast shows the metal trades industries of the district entering the second half of the year in the best condition in three years, and with a majority of the foundries and shops operating near capacity, according to William E. Dunn, Jr., secretary of the Southern Metal Trades Association in Atlanta.

Pig iron production in the Alabama district continues on a stable basis, with the prices still holding around $27 though a downward tendency is noted in some districts. Other plants melting iron in the Southeast also are in full operation.

Export trade out of Southeastern ports in iron and steel products has mounted steadily since the first of the year and in this regard the industry will enjoy one of its best years in the South.

Improvement Shown in St. Louis Business

There has been some improvement in the machine tool situation in St. Louis during the past two weeks, although business has not picked up to the extent hoped for. Inquiry has been much more heavy than for the past two months. The railroads have been showing considerably more interest in the market and indicate that they will buy for their pressing needs. Shops are nearly all running on full schedule.

The vacation season to some degree has retarded new orders and has hurt collections for the reason that responsible officers of firms are out of the city and apparently there is no one vested with the authority to make purchases and disbursements.

After being idle for a number of years, the Granite Mountain mine, at Iron Mountain, Mo., is to be re-opened for the production of ore, in fact it is already producing a few tons per day. If the mine comes up to expectations, St. Louis manufacturers will be able to purchase ore cheaper than heretofore. Some manufacturers in this district have been using ore from the Northern fields and others from the mines of Alabama.

The automotive industry is slackening up a bit, although the production of passenger cars is quite as good as it has been for the past two months, though not so great as early in the Spring.

Long Island R. R. Receives Many New Cars

Thirty-five of the ninety-two new steel passenger cars ordered by the Long Island Railroad for delivery this year have been received and put into service. Twenty of the cars have been assigned to the steam service and fifteen of the trailer type to the electric service. The cars assigned to the electrified divisions were distributed so as to provide two additional cars on four different trains and one extra car on seven other trains operating over the Rockaway Beach and Far Rackaway branches.

Of the fifty-seven cars yet to be delivered, forty will be equipped with motors, five will be trailers, ten will be for steam service and two will be mail cars.

Buffalo Preparing for Fall Business

Conditions in the Buffalo market have followed the usual trend for July, which is ordinarily a light month on account of vacation periods and other Summer drawbacks. Foundry and machine shop operations throughout the district are lighter than at any other time this year. Small machine shops especially find business quiet and operators of both small and large shops find it necessary to solicit business.

Factories making parts used by the automobile industry in the West, especially screw machine products, are facing new conditions. The manufacturers who furnish their principal markets are not buying nearly so heavily as earlier in the year and many of them are asking for reductions in prices quoted which the local manufacturers say they cannot possibly meet on account of the present condition of the labor market in Buffalo.

Regarding the labor outlook, it may be said that there is an evident tendency on the part of many large Buffalo plants to reduce their forces somewhat at this time. There are no indications at the present of a downward tendency of wages and yet the fact that several of the city's largest plants are reducing the size of the payroll by letting a few men go in this department or that may be the forerunner of such a condition. Of course, this is the season of the year when manufacturers usually tighten the lines just a bit to allow for Summer slack and get things shipshape for Fall business.

Some Factories Very Busy

On the other hand, there are a few large industries which cannot seem to catch up in production, generally because the capacity of the plants is not sufficient to take care of the business now on the books. But these are mainly plants that build up their stock during the Summer months and have their slack season later. One such company reports that various conditions have tended to hold back production this year and one of its Buffalo plants is 86,000 pieces behind at the present moment.

While sales of heavy machinery for public work, railroads, oil refinery and the like have let down, companies manufacturing such equipment report that they are experiencing a good business on lighter lines, such as ventilating fans. The tendency in large public building projects seems to be to hold off as long as possible, anticipating price reductions in the Fall. Inasmuch as the prices for machinery are so largely based on steel prices, it cannot be said that there are any present indications of lower prices for Fall.

One feature of the market for machinery for construction work is that equipment which ordinarily does not sell very heavily at any time seems to be moving well now while movement of standard equipment, such as hoisting engines, concrete mixers, wheelbarrows, cranes, steam shovels and the like is very backward. However, the reason for the latter situation is apparent. Last year in western New York there were probably twenty-five large construction jobs getting under way as against four or five at the present moment. At least one dealer in equipment of this kind, however, reported that his business for July this year would total at least 100 per cent better than for the same month last year.

Demand for lathes, milling machines and other equipment of this kind is spotty, and concentrated mostly on the smaller sizes. There is a fairly good and continuous demand for small tools, such as taps, reamers, drills and dies, although the quantities which are being sold are smaller right now than under normal conditions.

Collections Are Being Closely Watched

Another important indication of present tendencies is the fact that collections are steadily getting slower, even with the most responsible firms. Probably 75 per cent of the plant owners of the Niagara frontier are sailing as close as possible, either through over-caution because of the storm warnings which have been hoisted by banks and financial advisers, or because of an actual lessening of demand and curtailment of funds. As one machine seller put it, this is a good time to scrutinize charge accounts very closely and not to buy in larger quantities than necessary for business in sight. Unfortunately this tendency on the part of the distributors of machinery is bound to have an adverse effect on the entire business but it undeniably is the position that many are taking.

A few of the distributors in the Buffalo territory take an optimistic view for the future. One of these said he did not feel that his business was any lighter than should normally be expected at this time of the year and he looked for Fall to bring a brisk demand, although perhaps not for heavier types. However, Buffalo is not an especially good market for heavy machinery. Everything depends, this observer said, on whether or not the majority of manufacturers of the district can find enough business in the next couple of months to keep them going until the annual Fall rush of business starts in.

Willys Shares Bought in Buffalo Court

Federal Judge Knox in Buffalo accepted a bid of $3,500,000 for 739,866 shares of Willys-Overland Corp. common stock, with a clause which protects 600 holders of the first preferred stock. Judge Knox's action was taken at the resumption of the hearing in the suit in equity receivership of the Willys Holding Corp. of Toledo.

The bid of $3,500,000 was presented by Thomas H. Tracy, and was an increase of $500,000 over the bid offered by the same interests previously, on which Judge Knox had reserved decision.

John N. Willys, head of the company, expressed satisfaction with Judge Knox's decision on the bid, according to a company official in Buffalo. It offers, he said, certain advantages to 6,000 Willys Holding Corp. stockholders, who hold Willys-Overland stock valued at $15,000,000. The Tracy interests offered to stand responsible for the liabilities of the Willys Holding Corp. up to $500,000, it is said.

Railroads Authorized to Buy Equipment

The Reading R.R. has been authorized by the Interstate Commerce Commission to assume the obligation of the issuance of $6,000,000 in equipment certificates to be expended in the purchase of new locomotives and cars. The new equipment includes: 25 locomotives at $38,192 each; 500 70-ton steel hopper coal cars at $2,072.45 each; 500 70-ton steel hopper coal cars at $2,135.37 each; 500 60-ton steel hopper coal cars at $2,067.82 each; and 500 70-ton steel hopper coal cars at $2,075.58 each.

The Unadilla Valley Railway Co. has been authorized to issue notes to cover, among other things, a coal storage and locomotive fuel station at New Berlin at which engines are to be loaded by gravity, and ten 50-ton hopper coal cars to cost $2,500 each.

The Interstate Commerce Commission has authorized the Chicago & Northwestern Railway Co. to assume obligation for $4,755,000 of equipment certificates, to be applied on the purchase of the following property: forty Mikado-type freight locomotives at $45,395.06 each; ten Pacific-type passenger locomotives at $43,200 each; 140 milk express cars at $5,804.93 each; 800 50-ton steel ore cars at $1,673.70; 800 50-ton steel underframe gondola cars at $1,919.41 each; 200 50-ton steel underframe flat cars at $1,581.10 each; and 40 10,000-gallon steel tankers at $2,550 each.

The New York, Chicago & St. Louis Railroad Co. has been authorized by the Interstate Commerce Commission to assume liability for $4,275,000 worth of equipment trust certificates to apply on the purchase of the following equipment: 30 light Mikado-type locomotives at $64,000 each; six Pacific-type locomotives at $48,380 each; 1,000 55-ton steel underframe, composite copper cars at $2,010 each; and 500 55-ton steel underframe, composite gondola cars at $2,250 each.

New Haven Will Electrify New York Division

A contract for $1,250,000 was signed recently between the New York, New Haven & Hartford R.R. and the Westinghouse Electric & Manufacturing Co. for the immediate delivery of twelve heavy passenger electric locomotives.

Clinton L. Bardo, general manager of the New York, New Haven & Hartford R.R., said that seven of the locomotives have already been shipped to the yards of the railroad at New Haven, Conn., and that the remaining five will be delivered within three months. He said that in supplying the road with the additional locomotives, the company is further extending its plan to electrify the entire road.

The locomotives will be used on the New York division and the plan is to eliminate entirely the use of steam passenger locomotives on that division. As yet there are no definite plans to extend the electrification of the road to Hartford or Springfield, but with the New York division fully equipped to handle its passenger traffic with electric locomotives, arrangements will be instituted looking toward the electrification of the entire system, although it is not anticipated that this can be done in the immediate future.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
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THE ONLY sensational happenings of last week were in Germany. There was a riot with some fatalities in Frankfort and a run on the Reichbank at Berlin.

They were both due to the swindle of which the German wage earners are the victims through the depreciation of the paper mark. More than 25 trillion marks had been issued up to July 14 and they have become practically worthless outside of Germany, although they are still being foisted upon the German people in exchange for their labor and goods. They are, however, being rapidly displaced by other currencies. Some German industrial and commercial concerns are printing their own obligations which pass as money, and the American paper dollar is circulating freely although its use as a medium of exchange is nominally unlawful.

But the chaotic conditions in Germany have had no influence upon the American markets, except as they encourage the hope that France will soon see the futility of trying to make a debtor pay by choking her to death. This hope of a Franco-Anglo German agreement is somewhat quickened by cables from London and Paris which seem to indicate that by his gentle firmness and persistence the British Premier is gradually convincing France that her present position is untenable.

An American can never be sure of his way in following the tortuous paths of European diplomacy, but some of the bankers whose advices were alarming a month ago are now quite optimistic in the belief that the foreign crisis which threatened has been averted.

Here in America conditions might be described as static. The stock market has been quiet with a firm undertone, and bonds are tending upward as the undigested issues are being assimilated. The indications are for higher prices when the harvest season is over and the city vacations are ended.

Railroad earnings are excellent. The autumn traffic promises to be enormous. The surplus oil production is being taken care of and the only fly in the ointment is the price of wheat, which continues to fluctuate around a dollar and is, to tell the truth, remarkably steady when the wide advertisement given to the prospective surplus is considered.

But, as against the unsatisfactory price of wheat, there is to be noted the advancing market for corn, which has sold at 87 cents in Chicago. Oats and rye are also higher, and as the wheat crop represents less than a fourth of our grain production, it may be that in the gross the farmers' returns will be less discouraging than it is the fashion to assume.

Discussing this phase of the matter the *Breeder's Gazette* points out that less than 7 per cent of the value of farm crops and live stock last year were represented by the American wheat crop, and it argues that it is only among the one-crop farmers who specialize in wheat that the much talked of decline will cause distress. It declares with truth that "America can never be made safe for the one-crop farmer" and adds that "If the map of agriculture is red or revolutionary in spots in this country, those spots owe their color to the demonstrable unsoundness of the one-crop system."

It concludes that, "So long as mixed farming, with its foundation based upon improved live stock, continues to increase, as it has been rapidly increasing in recent years, American agriculture cannot be 'ruined' by unprofitable prices for wheat."

"The only sensational happenings of last week were in Germany. Here in America conditions might be described as static. Viewing the domestic situation as a whole the salient features are small stocks, a steady consumptive demand for all necessary staples and a feeling of caution among distributors and manufacturers, who still fear that an acceleration of business may be in some way checked by the powers who control the supply of credit, and who are determined to prevent the inflation."

New crop cotton had a sudden drop when it rained in Texas and the premium on July delivery evaporated; but there was a prompt though partial recovery and if the crop turns out as large as some expect, 20 cents a pound will not be an unprofitable price for it.

Sugar, coffee, and the minor commodities have not changed much; but the distant coffee options are well bought whenever they are under 7 cents, at which figure they seem cheap.

There is talk of a rubber shortage in the remote future, and the supply available at or around 27 to 28 cents is being absorbed.

Copper is firm at 14¾ cents but its future depends on Europe.

The steel industry is fully employed, but is no longer abnormally pushed as it was last winter.

In the market for textile fabrics the Spring opening of the American Woolen Co. was the event of the week. Prices averaged about 12 per cent above those of six months ago, and although the sales were large the buying is said to have been deliberate.

In the cotton goods market buyers are waiting for raw cotton to find its level and some more New England mills have gone on short time. But retail sales continue ahead of last year and every one agrees that stocks are small and must be soon replenished.

The market for silk fabrics is also waiting for a stabilization of the raw material, which is somewhat lower. If any one outside of Japan knows what silk is going to do, he will not tell.

Hides and leather are two other commodities which puzzle even the wisest, but an overproduction of leather seems indubitably indicated by the continued sluggishness of the market for it.

Viewing the situation as a whole the salient features are small stocks, a steady consumptive demand for all necessary staples and a feeling of caution among distributors and manufacturers, who still fear that an acceleration of business may be in some way checked by the powers who control the supply of credit, and who are determined to prevent the inflation of which they are so apprehensive.

The result is that most business men are running at a moderate speed. They fear to go faster, as they know that a sudden application of the brakes might damage the train; but it may be that they will soon find themselves behind the customary schedule and that they will be compelled to make better time or be passed by their competitors because they do not have the goods their customers demand.

Domestic conditions are certainly sounder than usual. Of course there are some things that need correction. There always are. But upon the whole the country is in better shape than for many years at this season, and with an abundance of credit and of work for those who want to work, there is no visible reason why we should not have prosperity.

The weekly statement of the Federal Reserve System shows a gain of $14,000,000 in gold. The reserve ratio has risen to 78.2 per cent. This compares with 76.5 per cent for the previous week and assures an abundant supply of credit during the harvest season. The statement is not otherwise significant.

Machinery Tonnage Shows Big Total

Machinery, boilers and castings contributed 1,356,696 tons to the revenue freight carried by the Class 1 railroads during the first quarter of 1923, figures just compiled by the Interstate Commerce Commission show. Of that tonnage, 1,027,549 tons originated in the Eastern District; 9,168 tons in the Pocohontas region; 61,269 tons in the Southern region, 258,710 tons in the Western District.

News of Washington Activities

By Paul Wooton

IF newspaper editorials reflect the opinion of the public, the Coal Commission's report has the approval of the vast majority of the people. The comments favorable to the report greatly exceed the criticisms. It is particularly noticeable that a larger number of these editorials approve what the Commission has recommended and would go even further in the effort to insure a constant supply of coal. It is not only the newspaper that is elated over the election of Magnus Johnson that advocates doing what the Commission recommends and much more, but vigorous editorials to that end have appeared in the conservative papers of the country—publications which are outspoken against the radical tendencies which have flared up in the middle West.

The returns from the clipping services indicate that an unusual amount of newspaper space has been given to this report and to editorials commenting upon it. With few exceptions, they accept the Commission's belief that the mining and the distribution of anthracite are matters which effect the public interest in a legal way and that there is an obligation on the part of mine operators and mine workers to give continuous service.

Some few papers characterize the whole report as unfair and as constituting a dangerous precedent in its proposals which require publicity of accounts and otherwise allow the Federal arm to be thrust into private business. Some editorials take the ground that the Commission has recommended nothing which is likely to be put into effect and as a consequence has wasted $600,000 of public money.

Opinion is very much divided as to whether the President should be empowered to take over the operation of mines during an emergency. The opinion is expressed that the Federal Government would be no more successful in inducing the men to return to work than would be their regular employers. Nearly all editorial writers who touched on that point show skepticism as to the ability of the Government to secure anything like a normal production.

Some of the editorials reflect opposition to the compulsory divulgence of so-called business secrets. Some of the newspapers, not unfriendly to the plan, doubt its feasibility because of the legal difficulties involved in attempting to establish Federal control over mines or even to force publicity of accounts.

In that connection attention was called to the fact that the Supreme Court of Indiana, in passing upon the Fuel Commission law of that state, held that the state has no authority to fix conditions of mining and to set prices on coal since the commodity is likely to be carried in interstate commerce. At about the same time a court in the District of Columbia ruled that the Federal Trade Commission has no right to demand production costs because mining is not an interstate commerce.

In accordance with the plan already announced, the Commission has begun the issuance of some of the material on which its anthracite report was based. The first exhibit is the study of earnings of anthracite miners made by Miss Anne Bezanson. Other exhibits will be forthcoming at frequent intervals in the future.

Nothing to justify the abrupt dismissal of A. P. Davis from his position as director of the Reclamation Service has developed since the Secretary of the Interior took that action. Such justification as has been proffered by Secretary Work and by his assistants seems to have been refuted as the facts became available.

One of the reasons put forward for the summary character of Mr. Davis' dismissal was that the situation of the water users is so desperate as to make necessary drastic action. That the farmers on the reclamation projects are in any such plight as that described at Secretary Work's office, seems to be contradicted by the Secretary of Agriculture who is authority for the statement that "the financial distress among farmers on these projects is no greater than the financial distress of farmers not on reclamation projects throughout the region from the Missouri River west. In that region there are large sections in which I have no doubt agricultural distress is greater than on the reclamation projects."

As the situation is being analyzed more thoroughly, those who are looking into the matter are more convinced than ever that the motive behind the change was an endeavor to secure a partisan political advantage. During the entire time Mr. Davis was at the head of the Reclamation Service, he did all in his power to prevent attempts to dilute the reclamation fund. He feels that there are too many projects as it is, and that successes must be made of those before attempting to take on more. This policy aroused bitter complaint from those who are anxious to have Uncle Sam undertake further development. There is reason to believe that no small part of the influence which resulted in the ousting of Mr. Davis came from those who are anxious to interest the Federal Government in the Columbia Basin project. To this, however, must be added the influence of those who wanted to see Mr. Davis removed from the path along which their various schemes must advance, to say nothing of those concerned with existing projects who would repudiate obligations.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb....	$0.0337	$0.034	$0.0276
Cold finished shafting.....	per lb....	0.0428	0.042	0.0355
Brass rods.....	per lb....	0.1825	0.1850	0.1650
Solder (½ and ½)	per lb....	0.276	0.2862	0.21
Cotton waste...	per lb....	0.1231	0.1231	0.101
Washers, cast iron (½ in.)...	per 100 lb.	4.66	4.66	3.83
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100...	3.08	3.08	3.11
Lard cutting oil	per gal...	0.575	0.608	0.575
Machine oil....	per gal...	0.349	0.349	0.36
Belting, leather, medium.....	off list....	37%	42½%	46⅔%
Machine bolts up to 1x30 in.	off list....	44¼%	44¼%	53⅓%

A. E. S. C. Will Consider Electrical Code

The American Engineering Standards Committee announces the appointment by its Chairman, A. W. Whitney, of a committee to arrange for a thoroughly representative conference to decide whether there shall be formulated, under the auspices and procedure of the A.E.S.C., a combined electrical fire and safety code. The committee will also make a careful study of the general situation with respect to such a code and will outline and propose some form of policy for the consideration of the conference. At present, two separate codes are in force: a "National Electrical Code," which prescribes methods of wiring, fixture, and machine installation with respect to fire hazard; and a "National Electrical Safety Code," that deals primarily with the personal hazards. Since both provide guides for materials and methods of electrical construction, it is clear that either co-ordination or combination of the codes is a desideratum. Which method is best suited to the circumstances of the case is the question now under consideration by the committee.

The proposed formal conference to consider the formulation of the code, will not be called until some time after October, 1923. The members of the committee arranging for the conference are:

David Van Schaack, Aetna Life Insurance Co.; Cyril Ainsworth, Pennsylvania Department of Labor & Industry; F. O. Evertz, Ohio Inspection Bureau; F. M. Feiker, Society for Electrical Development; H. W. Forster, Independent Bureau; and S. J. Williams, National Safety Council.

Turkey Signs Contract for U. S. Machinery

A contract to supply agricultural machinery and to introduce modern agricultural developments in Turkey has been signed by the Turkish government and the Ottoman-American Development Co., owner of the "Chester Concessions," the company announced.

The contract is for six years and is guaranteed by the Turkish government, which insures a minimum annual sale of agricultural implements to Turkish subjects of 400,000 Turkish pounds, about $1,760,000 at normal exchange rates.

Under the contract, there are to be established repair shops, machinery depots and schools of instruction for farmers who, it was explained, are now using wooden plows. One of the instruction shops will be established on a railway car which will travel through the rural districts.

Personals

A. B. DAY and W. E. EVANS, of Knoxville, Tenn., have organized the Day-Evans Iron Works, and plan the establishment of what is said will be the largest plant in the South devoted to the manufacture of mining machinery and equipment.

CAPTAIN F. J. JUDD, well known in the iron and steel industries in the Southern field, has been appointed general superintendent of the plant of the Florida Machine & Engineering Co., Tampa, Fla., according to an announcement made by H. A. Van Borrsum, general manager of the company. Captain Judd has for some time been connected with the Gulf Iron Works in a similar capacity.

G. A. TRUBE, for many years with the Westinghouse Electric & Manufacturing Co. in Europe, and also with the Equitable Trust Co. in Paris, sailed on July 24 on the S. S. *France* for Neuilly, France, where he will have charge of the construction work at the new American hospital.

ALEXANDER I. MCKAY has been appointed superintendent of the Morgan Manufacturing Co., Keene, N. H.

A. H. CANDEE has joined the Gleason Works organization in Rochester, N. Y.

PROF. HAROLD A. THOMAS, for the past 13 years a member of the staff at Rose Polytechnic Institute, Terre Haute, Ind., has been appointed to the faculty at Carnegie Institute of Technology for next year. He will begin his new work in the Fall as professor of Theoretical Hydraulics and of Hydraulic and Sanitary Engineering.

FRED O. HEUSER, founder and president of the Unity Manufacturing Co., Chicago, has resigned and will become associated with the Fort Dearborn Manufacturing Co., as Chicago representative.

LAURENCE CORNELIUS, general manager of the Wolverine Brass Works, Grand Rapids, Mich., has been made secretary of the firm.

Urges Industry to Employ War Veterans

An appeal to business organizations to assist in absorbing into industry the three or four thousand disabled war veterans who are completing government training courses monthly, was made recently by the Chamber of Commerce of the United States. The National Chamber calls attention to the obligation that rests on the business interests of the country to co-operate with the government to the end that all of the men be given employment.

"The men who are being trained," says the National Chamber "are trained in many lines and are prepared to meet adequately the physical and mental demands that their new occupations will place upon them. The government can only rehabilitate and train the men up to the point of employability. From this point the employing interests of the country must carry on."

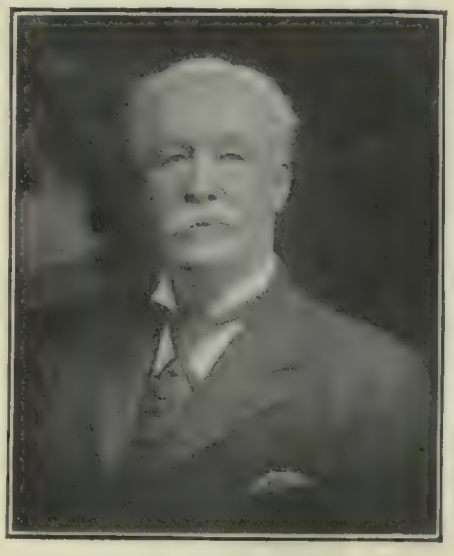
Most of the reports that have come to the central office of the Veterans Bureau in Washington from the employers of the country who have had these men in their employ give favorable reaction as to the satisfactory service of the rehabilitated men.

More than 30,000 of the men have been rehabilitated and have gone into employment within the last two years. Statistics show that they are earning more in their new vocations than they earned before the war.

Salmon W. Putnam Claimed By Death

Salmon W. Putnam, aged 79 years, died recently at his home, Fitchburg, Mass. Mr. Putnam was the founder of the Putnam Machine Works, at Fitchburg which is now operated by Manning, Maxwell & Moore, Inc., and during his lifetime was the inventor of many valuable improvements on lathes and other machine tools.

Mr. Putnam was the first to devise means of placing leadscrews on the



SALMON W. PUTNAM

front of lathes, thereby adding to the convenience of operation. He also invented the self-aligning spindle boxes for lathe spindles and the same principle has since been applied on grinding machines. Another of Mr. Putnam's achievements was the non-conflicting feed mechanism on lathe aprons, whereby the engagement of shear nuts and the leadscrew automatically disengages the rack pinion.

He was generally accredited as being the oldest machine tool man in the country and his death will be mourned by machine men in all parts of the United States.

Obituary

ORIN V. BRANSON, for several years chief engineer of the Atlanta, Ga., branch of the Grinnell Co., Inc., died at his home in Atlanta, recently, at the age of 49 years, following an illness of several months. Mr. Branson had been connected with the Grinnell Co. for about 20 years.

WALTER L. MINGLEDORFF, for many years one of the owners of the plant of the Forest City Machine Co., Savannah, Ga., died recently at his Savannah home at the age of 60 years, following a protracted illness.

Business Items

Private bids for all of the property of the Mitchell Motors Co., in bankruptcy, Racine, Wis., will be received for 30 days from July 23 by Herbert F. Johnson of Racine, trustee, according to the agreement adopted by creditors at a meeting held that day to receive the report of the appraisers. The trustee was instructed not to consider any bids except in bulk. In case no satisfactory private bid is received within the specified period, a public auction will be held, at which piecemeal as well as bulk bids would be entertained. The minimum bulk figure regarded as satisfactory is $1,500,000. The report of the appraisers filed July 23 gives the value of all assets at $1,819,851.87, of which amount $1,013,110.34 represents real estate and buildings; $419,659.18, machinery; and $387,082.35, miscellaneous property. It does not include cash on hand of $145,038 in charge of the trustee, the result of sales of finished automobiles and materials.

The Great Lakes Boat Building Corp., Milwaukee, has increased its authorized capital stock from $200,000 to $750,000, directly as the result of making a contract with the Packard Motor Car Co., Detroit, for the manufacture of a standardized motor yacht which is to be marketed through the Packard dealer organization. The contract will require substantial additions to the plant and equipment of the Great Lakes company, details of which have not been divulged, however. William C. Morehead is president and general manager. It is stated that the motor yacht will be powered with a regulation Packard 12-cylinder motor and will be trademarked the Great Lakes-Packard motorboat runabout.

Seamless tubing will be manufactured by a new Wisconsin corporation, styled the Seamless Tube Co. of Wisconsin, with headquarters in Appleton, Wis. The incorporators are Math. Rossmeissl, A. G. Brusewitz and William Geenen, who represented a syndicate which some time ago bid in the property of the Reliance Motor Truck Co., bankrupt, Appleton, and will now convert the greater part of the factory into a seamless tube shop. The new concern is capitalized at $400,000, it is reported.

The Collins Engineering Co. of Conshohocken, Pa., near Philadelphia, is to be reorganized with a capitalization of $100,000. William S. Campbell, cashier of the People's National Bank of West Conshohocken, is to be the treasurer of the concern.

The various Southeastern railroads passing through Atlanta, Ga., are preparing to spend close to $100,000,000 for expansion and improvement of service during the coming year, several hundred thousand dollars of this including construction, additions and improvements to their shops in various sections, according to a survey recently by the Atlanta Chamber of Commerce. The Louisville & Nashville line heads the list, planning an investment of approximately $47,000,000, it is reported.

A. L. Reifsnider, cylinder grinding, has moved from 1,416 Madison Ave., to 1.120 Guilford Ave., Baltimore.

William Gaertner & Co. manufacturers of scientific instruments, at 5445-49 Lake Park Ave., Chicago, have just commenced building an up-to-date factory and office building, which will occupy the Southwest corner of Wrightwood and Racine Aves.

The big plant of the Louisville Sheet Steel Co., at Louisville, Ohio, idle four years, has been purchased by the Hydro Forge Co., of Alliance, Ohio. The new company will take possession immediately and will install complete new machinery for making forgings and black galvanized sheets.

What is considered the largest piping contract to be let in recent years has been given by the Carnegie Steel Co. to B. Floersheim & Co., of Pittsburgh, Pa., for furnishing and erecting complete piping installations for its works at Clairton, Pa. The contract includes furnishing and erecting of materials for steam, exhaust, water, air and gas, from the smallest size up to 66-in. Shipments will begin immediately, and will take about a year to complete.

Established during the last year of the Civil War, the Mameron & Berkley Co., of Tampa, Fla., distributors in Southeastern territory of machinery, supplies and machine tools, observed in July the 58th anniversary of the company's organization. At the time it was originally established this was one of the only companies of its kind in the South. It now operates four plants at Tampa, Jacksonville, Miami and Charleston, S. C. The company was incorporated in 1887, and since that time has been under the same management.

The Florida Steel & Wire Co. was organized and incorporated at Jacksonville, Fla., recently with a capital of $225,000, and will engage in the general manufacture of wire and steel and iron products, according to an announcement by W. A. Evans, president of the company. Other officers are: Thomas H. Evans and John G. Palmer, vice-presidents; and E. I. Carefoot, secretary and treasurer.

The offices of R. S. Stokvis & Sons have been moved from 1727 Whitehall Building, New York City, to 2843 Whitehall Building.

Sale of the foundry and machine shops of the Oliver Rim Co., manufacturers of automobile rims in Atlanta, Ga., has been ordered by the Federal Court in that city, the sale having been made to a syndicate of Atlanta business men headed by W. Woods White, who is named president of the new company. The purchase price was $85,000. Josiah T. Rose, who, for many years, has been prominently identified with the iron and steel industries in Atlanta, is associated with the new company, which will continue operation of the Atlanta plant. The Oliver concern went into bankruptcy some months ago.

The W. J. Murdock Co., Cincinnati, has moved from 116 Opera Pl. to 123 West Pearl Street.

The Connecticut Blower Corp., Hartford, Conn., has been incorporated under the laws of the state of Delaware with a capitalization of $250,000. The concern has taken over the International Blower Co. and the Hartford Sheet Metal Works. The officers of the corporation are: M. E. Keeney, president; C. H. Keeney, treasurer; and C. E. Keeney, secretary.

The Vanadium Alloys Steel Co., will move its Pittsburgh sales office Sept. 1 from First and Ross Sts. to the Oliver Building.

The Motch & Merryweather Machinery Co. are occupying new offices on the seventh floor of the Penton Building, Cleveland, Ohio.

The Brenner-Moxley-Mervis Co. has been organized in Chicago for the purpose of producing copper rods and drawn copper wire for power transmission. The company is capitalized at $600,000 and will build a factory on the south side of Chicago.

The Circular Tool Co. has been incorporated under the laws of Rhode Island for the purpose of manufacturing machinery. The incorporators are Walter B. Hopkins, George F. Hopkins and L. J. Hopkins.

George A. Coolcough of the American Chain Co., Bridgeport, Conn., sailed recently on a business trip to England. Mr. Coolcough expects to visit the continent and Africa after his visit to England.

An order for twenty-five large size pumps has been received by the Hill Pump Works of the Mid-West Engine Co., Anderson, Ind., from the Sinclair Oil Co. The Anderson-made pumps will be used in the new Sinclair refineries which are to be built in Texas and Pennsylvania.

The contracts and other papers necessary to the removal of the Columbus Machine Works from Columbus, Ind., to Crothersville, Ind., have been signed and the work of transferring the plant will start at once. The concern was founded about thirty years ago.

A five-year lease on the ground floor of the building at 227 East South St., Indianapolis, which formerly was used by the Prest-O-Lite Co., has been taken by the American High Speed Chain Co., and the company will move from Illinois and South Sts., to the building as soon as remodeling is completed.

Pamphlets Received

The Moline Plan. The Moline Plow Co., Moline, Ill. Eighteen arguments on agricultural implement selling are discussed from the dealer's standpoint in this pamphlet. The main idea is to show dealers that in spite of the low margin of profit on crops and the high level of factory wages, there is a profit in selling plows if the right methods are pursued.

Training Course for Oxy-Acetylene Welders. The American Welding Society, 33 West 39th St., New York City. This is the report of the committee on the training of welding operators of the American Bureau of Welding and was prepared under the joint auspices of the Federal Board of Vocation, the National Research Council and the American Welding Society. Following a short introduction, the subjects of qualifications for welders and fundamentals in gas welding are taken up and discussed.

Union Scale of Wages and Hours of Labor. Bureau of Labor Statistics, Government Printing Office, Washington, D. C. The union scale of wages and hours of labor as of May, 1923, have been summarized by the Bureau of Labor Statistics of the Department of Labor. Every branch of labor is tabulated with rate per hour, hours per day and a comparison with the year previous.

Safety Code for the Protection of Industrial Workers in Foundries. Bureau of Labor Statistics. Government Printing Office, Washington, D. C. Sponsored by the National Founders' Association and the American Foundrymen's Association, the Bureau of Labor Statistics has published this code. It is most comprehensive and thorough in its treatment of the subject.

Freight Claim Prevention. American Railway Association, Freight Claim Division, Chicago, Ill. By a series of sixty-eight exhibits, the causes and the remedies for freight claims are shown. The pamphlet is the report of the committee on freight claim prevention to the thirty-second annual session that was held in Montreal, Quebec, on May 29 of this year.

Commodities in Foreign Trade. The Chamber of Commerce of the United States, Washington, D. C. This pamphlet is a collection of speeches made at the eleventh annual meeting of the Chamber of Commerce of the United States in the Foreign Commerce Group Session held in New York City in May.

Part-Time Co-Operative Industrial Education. The Bureau of Vocational Training, Harrisburg, Pa. The plan of study and the methods of instruction are outlined in Bulletin No. 1 that has been issued by the Department of Public Instruction, of the Commonwealth of Pennsylvania at Harrisburg, Pa. The bulletin further tells what progress has been made and the most feasible manner of establishing similar schools. A limited number of copies are available.

Vocational Training. The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. The purpose of the course, as outlined in the booklet, is to make its students skilled mechanics, not only so they can do their own work, but so they can impart to others the knowledge of their skill. To be eligible the boy must be not less than sixteen years of age, and have a common school education. On the completion of the course, the student is presented with a tool chest, a set of tools, and $100, together with his diploma, in consideration of faithful service.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Portable forges. Australia. Agency. Reference No. 7269.

Mining machinery, mining cars and crushers. Antofogasta, Chile. Exclusive agency. Reference No. 7251.

Pneumatic tools. Australia. Agency. Reference No. 7269.

Wood bending machine. Leon, Nicaragua. Purchase. Reference No. 7278.

Woodworking machinery. Hongkong, China. Agency. Reference No. 7234.

Technical inventions. Zurich, Switzerland. Purchase and agency. Reference No. 7276.

Engineering tools. Melbourne, Australia. Purchase. Reference No. 7241.

Forthcoming Meetings

The Supply Association of the American Railway Tool Foreman's Association. Hotel Sherman, Chicago, Ill., Aug. 29, 30 and 31. Eleventh annual convention Herbert S. White, Cleveland Twist Drill Co., 9 North Jefferson St., Chicago, Ill., secretary and treasurer.

New Haven Branch of the American Society of Mechanical Engineers. Third annual machine tool exhibit Sept. 18, 19, 20 and 21. Mason Laboratory, New Haven, Conn. A. C. Jewett, chairman.

Association of Iron and Steel Electrical Engineers. Iron and steel exposition, Buffalo, Sept. 24 to 28. John F. Kelly, secretary, Association of Iron & Steel Electrical Engineers, 708 Empire Building, Pittsburgh, Pa.

American Society for Steel Treating. Annual convention at Pittsburgh in connection with the International Steel Exposition, Oct. 8, 9, 10, 11 and 12. W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio, national secretary.

Society of Automotive Engineers. Production meeting at Cleveland, Ohio, Oct. 25 and 26. Headquarters, 29 West 39th St., New York City.

American Management Association. October 29, 30, and 31 Hotel Astor, New York City.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Iron and Steel.—Low prices of pig iron attracting inquiries. Revival in buying expected to develop at any time. Steel buying on the increase, particularly in plates. Oil-storage tank, car materials and track accessories requirements taking bulk of current business. Price of plates and shapes firm at $2.50 per 100 lb., Pittsburgh, for shipments at convenience of mill; as high as $2.60, however, obtained for small lots or where immediate deliveries are required. Structural inquiries better but confined to small tonnages.

Advances.—Copper, electrolytic, advanced ⅛c. per lb. during week. Tin rose ¼c. and lead 3/16c. per lb. in New York. Lead inquiries for large tonnages, feature of the market; visible supply scarce. Zinc went up 10c. per 100 lb. in New York and East St. Louis. Antimony advanced sharply in New York.

Declines.—Raw linseed oil (5 bbl. lots) $1.05, f.o.b. New York, against $1.08 per gal., one week ago. Linseed, lard oil and lubricants markets weak. Furnace and foundry coke down 25c. per net ton in week.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$29.05
Northern Basic	29.27
Southern Ohio No. 2	29.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.25
BIRMINGHAM	
No. 2 Foundry	25.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	28.76
Virginia No. 2	32.17
Basic	27.76
Grey Forge	27.26
CHICAGO	
No. 2 Foundry local	29.1x
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.51
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	27.77
Basic	26.77
Bessemer	28.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5.00@5.50

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.95	4.45	5.05
Nos. 22 and 24.	3.75	5.00	4.50	5.05
Nos. 25 and 26.	3.80	5.05	4.55	5.10
No. 28	3.85	5.15	4.65	5.20

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00	5.15	4.70	5.35
Nos. 12 and 14.	4.10	5.25	4.80	5.45
Nos. 17 and 21.	4.40	5.55	5.10	5.75
Nos. 22 and 24.	4.55	5.70	5.25	5.90
No. 26	4.70	5.85	5.50	6.05
No. 28	5.00	6.15	5.80	6.35

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	62	50½	¾ to 1½	30	13
		LAP WELD			
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	26	11
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	60	49½	¾ to 1½	30	14
2 and 3	61	50½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded.	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	5.00	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	7.50	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.40	3.90	4.55
Cold finished flats, squares	4.90	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Carbon tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 3/32, 8½c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.37½
Tin, 5-ton lots, New York			39.50
Lead (up to carlots), St. Louis	6.40	New York	6.87½
Zinc (up to carlots), St. Louis	6.25	New York	6.70

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.20	27.00	28.00
Antimony (Chinese), ton spot	8.12½	9.50	8.25
Copper sheets, base	24.50	23.50	23.00
Copper wire (l.c.l.)	17.25	20.75	16.25
Copper bars (l.c.l.)	22.00	24.00	19.50
Copper tubing (l.c.l.)	27.00	29.00	23.00
Brass sheets (l.c.l.)	19.75	29.25	18.75
Brass tubing (l.c.l.)	25.50	29.25	20.50
Brass rods (l. c. l.)	18.00	29.00	15.75
Brass wire (l. c. l.)	20.25	23.75	.....
Zinc sheets (casks)	10.25	10.10	.....
Solder (½ and ½), (caselots)	29.50	27.75	20.00
Babbitt metal (83% tin)	52.00	48.00	40.00
Babbitt metal (35% tin)	25.00	17.00	16.00
Nickel (ingot and shot)	29.00	.....	35 00
Nickel (electrolytic)	32.00	.....	35 00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48 00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	12.00	12 50
Copper, heavy, and wire	11.50	11.50	11.50
Copper, light, and bottoms	10.00	9.50	10.50
Lead, heavy	5.00	5.00	5 00
Lead, tea	4.00	4.00	3.75
Brass, heavy, yellow	7.50	....	7.50
Brass, heavy, red	9.50	9.50	9.50
Brass, light	6.00	5.00	6.50
No. 1 yellow brass turnings	7.00	6.00	7.00
Zinc	3.75	3.00	3.75

TIN PLATES—American Charcoal—Bright—Per box.

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 20x28, 112 sheets	$23.50	$19.50	$18.50
"A" Grade:			
IC, 20x28, 112 sheets	21.00	17.00	17.00
Coke Plates—Primes, 20x28 in.			
100-lb., 112 sheets	14.00	12.60	14.50
Terne Plates—Small lots, 8-lb. Coating			
IC, 14x20	8.25	6.55	7 40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$ 0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13¼x13¼, per lb.	10.75@11.00	36.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	1.05	1.22	1.28
White lead, dry or in oil	100 lb. kegs.	New York,	14.00
Red lead, dry	100 lb. kegs.	New York,	14.00
Red lead, in oil	100 lb. kegs.	New York,	15.50
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.50@5.00	
Coke, prompt foundry, Connellsville	per net ton	5.50@6.00	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	30%	50-10%	45-5%
1⅛ and 1¼x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	15%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	20%	3.50 net	$4.00 off
Burton head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	30%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	25%	45%	40-5%
Bolt ends, with hot pressed nuts	30%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 9/16 and smaller	60%	.....	...
Semi-finished nuts, ⅝ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅜ in., per 100 lb. (net)	5.50	4.00	3 50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	List net	2.75	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	40%	50-10%	60%
Rivets, tinned	40%	50-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30-10%	30-10%	30-10%
Heavy grade	20-5-2½	30%	20-5-2½%
Rubber and duck:			
First grade	.50-10-5%	50-10%	40-10%
Second grade	60-10%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1 40
Cloth	3.38	2.67	3.20

New and Enlarged Shops

Machine Tools Wanted

D. C., Wash.—Maculson Co., Inc., 2103 14th St., N. W. (auto repair)—lathe for metal work, gear cutting machine, shafting, pulleys and belting.

Fla., Jacksonville—H. W. Dexter, P. O. Box 665, Bisbee Bldg.—boring mill capable of boring 33 in. carwheels, 24 in. shaper, 26 in. or 30 in. upright drill press.

Fla., Orlando—Cohoon Bros. Co. (machine shop)—power metal lathe.

Ill., Chicago — Clinton Mchy. Co., 128 South Clinton St.—one No. 6 B. G. punch press.

Ill., Chicago—Illinois Central R.R., 135 East 11th Pl.—42 in. drill press.

Kan., Arkansas City—W. F. McEwen, 312 North E St. (cabinet maker) — power sander, power drill press, wood lathe, belting, emery wheel and stand.

Kan., Arkansas City—Mansfield & Sons, 117 East Central St. (blacksmith and machine shop)—power drill press, metal lathe, belting, shafting, emery stand and pulleys.

Kan., Buhler—Janzen & Reffel (garage)—power drill press.

Kan., Buhler — Martins Motor Co. (garage)—power metal lathe.

Kan., Lyons—J. A. Anderson—tinners brake.

Kan., Lyons—C. & S. Auto Supply Co. (garage)—power metal lathe.

Kan., Lyons—Hoffman & Danah Motor Co. (garage)—power metal lathe (used).

Kan., Lyons—Lyons Hardware Co.—all-metal tinners brake.

Kan., Lyons—Moline Implement Co., W. J. Myers, Purch. Agt.—power metal lathe (used).

Kan., Lyons — R. D. Moore (garage) — power metal lathe, boring machine, burning-on machine for automobiles.

Kan., Lyons — Weld-it-All Shop, A. I. Roberts, Purch. Agt.—power emery stand and wheel, and drill press for power equipment.

Kan., Lyons—Winters Oil Co. (garage)—drill press and power metal lathe.

Kan., Lyons—Young-Townter (garage)—power metal lathe.

Kan., Winfield—Irwin Bros. (blacksmith and machine shop)—power metal drill press, power metal lathe, 11 in. (used preferred).

Mass., Boston—Boston Gear Wks., 256 Franklin St.—metal working machinery for proposed factory addition at Norfolk Downs.

Mass., Boston—P. K. Lindsay & Co., 384 Atlantic Ave. (manufacturer of air compressors)—bench type engine lathe, about 9 in. swing, ⅞ in. diam. spindle hole, lateral and cross feed, compound rest.

Mass., Fitchburg—H. Foster, 72 Fox St.—complete line of small and large machine tools for proposed $100,000 garage and machine shop, for city.

Mass., Worcester—R. H. Long Motor Co., Millbrook St. (auto manufacturer)—metal working machinery, including lathes, planers, drills, shapers, milling machines, pulleys, shafting, belting, etc.

Mass., Worcester—M. J. Whiteall and associates, Brussels St.—small bench type engine lathe, upright drill for driling to 2 in., small tools and accessories for new machine shop.

Mich., Detroit—Bd. Educ., 1354 Bway. Ave.—electric bench grinder, 2 wheel to take up to 6 or 8 in., equipped with motor, 110 volt, 60 cycle, 3 phase, A.C., also guard for grinder.

Mich., Detroit — Precision Speedometer Co., 9 West Woodbridge St.—light machine shop equipment.

Mo., St. Louis—Excelsior Motor Supply Co., 102 North 12th St.—one lathe chuck, Universal or Independent, and machine shop tools.

N. J., Camp Alfred Vail—U. S. Quartermaster—taking bids until Aug. 15, for one current lathe and 2 drilling machines.

N. Y., Jamestown — J. N. K. Machine Corp., 108 Harrison St. (general machine and automotive repair works), E. R. Swanson, Purch. Agt.—milling machines and machine tools.

N. Y., Syracuse—Zube & Kahrs, 908 East Water St., (automobile repair shop), J. C. Kahrs, Purch. Agt.—one 18 in. lathe for general job work.

O., Columbus—D. L. Auld Co., 6th Ave. and 5th St., (manufacturing-stamping), H. M. Bellows, Purch. Agt.—2 lathes, several automatics, 2 punch presses and other equipment to enlarge shop facilities.

Pa., North Glenside (garage)—G. Klein—power metal lathe.

Tex., Galveston—U. S. Engineers Office, Trust Co. Bldg.—taking bids until Aug. 20 for 24 in. motor driven screw cutting lathe.

Tex., Godley—S. L .Hardcastle, Box 156, (mill and elevator)—power grinder.

Va., Richmond—W. B. Atkins, Meadow and Broad Sts. (auto dealers and repair shops)—drill press.

Va., Richmond—D. T. Burch, 2043 West Broad St. (autos)—lathe and drill press.

Va., Richmond—H. K. Dabney, 1831 West Broad St. (autos)—lathe and drill press.

Va., Richmond—L. A. MacMullen, 3504 Hermitage Rd., (general machine shop)—lathe, drill press, milling machine, emery wheel and reamer.

Va., Richmond—Richmond Battery Co., 1839 West Broad St. (auto repair work)—lathe.

Va., Richmond — Transportation Motor Co., 1410 West Broad St.—lathe, drill press, reamer and bench tools.

Wis., Kenosha—C. Mantkuss, Elizabeth St. and Howland Ave. (auto repairs)—drill press, 20 in., electric drill and emery grinder.

Wis., Milwaukee—Delta Mfg. Co., 853 3rd St. (manufacturer of auto accessories)—1 lathe, 6 or 8 in. bed.

Wis., Milwaukee—Everdy Auto Jack Co., 1306 Burleigh St., E. Rabe, Purch. Agt.—1 medium size grinder, 1 or more large drill presses, belting and shafting.

Wis., Milwaukee — Jim's Repair Shop, 1524 Galena St. (auto repairs)—22 in. drill press, 1 chain hoist and 1 air compressor.

Wis., Racine—Belle City Malleable Iron Co., C. A. Anderson, Mgr.—shop equipment, including forge and small tools.

Ont., Brantford — Dayton Iron Co., c/o Pratt & Letchford—complete equipment for the manufacture of castings for automobile trade.

Que., East Broughton — T. Jacques (garage)—repair equipment.

Que., Lake Megantic — A. Moirsette, Market St.—garage and auto repair equipment.

Que., Lennoxville—R. W. Oughtred, Main St.—repair equipment for auto repair shop.

Que., Maniwaki—A. Latourelle (garage)—repair equipment.

Que., Montreal — A. Leblanc & Cie, 16 Rue Notre Dame Est, A. Leblanc, Purch. Agt.—power shear to cut No. 8 zinc, 60 in. long.

Que., Montreal — G. A. Ross, 149 Christophe Colomb St.—equipment, including gasoline tank for garage and repair shop.

Que., Plessisville—E. Boulanger (garage)—repair equipment.

Que., Richmond—E. Dyson, Main St.—additional repair and garage equipment.

Que., Rock Island—J. H. Aldrich (garage)—repair equipment.

Machinery Wanted

Conn., Southington — Walker Stewart Fdry. Co., Summer St.—furnaces, blowers, ventilating and conveying systems, etc., for proposed new foundry.

Conn., Waterbury—General Baking Co. 1052 North Main St.—new ovens, shipping equipment, etc.

Colo., Ft. Collins—C. Presusch, 608 West Laurel St.—power job printing press.

Fla., Jacksonville—H. W. Dexter, Bisbee Bldg. (machinery dealer)—upright drill press from 24-30 in. swing, and 24 in. crank shaper (used).

Ill., Chicago—Inderrieden Canning Co., 336 River St.—modern canning machinery, conveyors, belting, shafting and hangers for proposed canning plant at Centuria, Wis.

Ill., Chicago—Wanner Mchy. Co., 714-716 Dearborn St., G. H. Simons, Purch. Agt.—power paper cutter.

Ind., Hobart—News—7 column newspaper folder.

Ia., Bayard—Bulletin (newspaper)—10 x 15 power job printing press.

Ia., Dubuque—The Adams Co. (machine and tin shop)—slitting shear No. 10 gauge.

Ia., Dubuque—Leader Oil Co., 3rd St.—gasoline tanks and pump for proposed filling station, at Cuba City, Wis.

Kan., Arkansas City — F. Smith, 420 North East St. (tinner)—tinners brake (used).

Kan., Lyons — Lyons Republican (job press work and newspaper), J. Laurence, Purch. Agt.—power metal saw and trimmer, also power paper cutter (used preferred).

Ky., Harrodsburg — Reliance Printers, South State St., E. Hoffer, Purch. Agt.—newspaper press, job press, belting, hangers, pulley, power paper cutter.

Mass., Boston—Tileston & Hollingsworth Co., 49 Federal St. (manufacturers of paper)—equipment for new unit on River St., Hyde Park.

Mass., Cambridge—E. J. Lamothe Co., 35 Albany St. (manufacturer of cans)—horning press (used, in first class condition).

Mass., Fitchburg—W. A. Harchy & Sons Co., Water St.—equipment for new foundry, including furnaces, forges, blowers, ventilating system and miscellaneous equipment.

Mass., Newburyport—The Town School Com., address Chairman — machinery for manual training department of new high school, including medium or small size lathe, planer, jointer, matcher, circular and band saw, tables, benches, pulleys, shafting and small tools.

Mass., South Walpole—Bird Machine Co.—machine tools (large and small), for proposed $25,000 machine shop.

Mich., Detroit—Dept. Purchases & Supplies, 700 Marquette Bldg., C. J. Finn, comr.—1 Universal milling machine for Dept. Pub. Wks.

N. Y., Jamestown—Barkay Co., Inc., 24 Institute St. (designers and founders in bronze and brass), W. Kidd, Secy.-Treas.—furnaces, lathes, polishing, plating and other foundry equipment.

N. Y., New York—Pacific Knitting Mills, 19 West 4th St. (manufacturer of knitted goods)—14 in. cylinder, 24 or 36 gauge, for Brinton sinking top knitting machine (used).

O., Columbus—Automatic Door & Gate Co., 318 East 11th Ave., F. A. Guth, Pres.—metal working machinery.

O., St. Clairsville—H. T. Nestrol, Box 176 (job printing)—power paper cutter.

Okla., Cushing—A. G. Stone—broom making machinery.

Ore., Goble—S. H. Thomas (saw mill and lumber)—Donkey engine 10 x 11 in. cylinder, drum and nigger head, with full equipment of tools and lines, wood burner, etc.

Pa., Albion—The Albion News—300 lb. gasoline metal furnace.

Pa., Beaver Springs — J. Catherman (woodworker)—4 side planer and matcher.

Pa., Berlin—L. N. Wilson (job printing)—power paper cutter.

Pa., Lock Haven—A. F. Stonch & Co., c/o V. R. Garleb, P. O. Box 87—planing mill machinery incl. one 8, 9 or 10 in. motor driven moulder, one No. 2 chain mortiser, one motor driven rip saw, one motor driven cut off saw, veneer presses and clamps, rawhide belt lacings.

Pa., Susquehanna — The Ledger (newspaper)—Mustang mailer.

Pa., West Chester—The Black Planing Mill Co., 220 North Church St., D. N. Showalter, Purch. Agt.—power dado machine and trucks.

Tenn., Athens — Athens Hosiery Mills, "Scott & Williams" Model B-5 footers, 3½ in. diameter, 200 needle, 48 gauge (used).

Tenn., Knoxville—White Oak Corp., Box 1094, H. T. Spencer, Pres.—200 ton wheel press (used).

Tex., Ft. Stockton—L. H. Dyche, Box 164—newspaper press and job printing press (used).

Tex., Ft. Worth—G. M. Adams, 214 Moore Bldg.—drilling machine.

Tex., Hereford—Chamber of Commerce—cotton gin.

Tex., Tyler—Byrne Publishing Co., P. E. Hixson, Purch. Agt.—power job printing press and perforator.

Vt., Castleton—R. R. MacRae—ice manufacturing machinery, conveyors, cold storage machinery, etc., for new plant.

Va., Crewe—Crewe Furniture Co.—full equipment of the latest and best machinery for the manufacture of kitchen furniture.

Va., Richmond — Brown Mills Printing Co., 11 Bank St.—power paper cutter and small job press.

Va., Richmond—J. G. Skelton Co., Inc., Railway & Power Bldg. (machinery dealers), J. G. Skelton, Purch. Agt.—locomotive crane, 20 ton, double drum, eight wheel, equipped with 35 or 40 ft. boom, and four 6 or 8 yd. standard gauge, 2 way dump cars.

Va., Richmond — W. F. Telshow, 2221 West Broad St. (cabinet maker)—rip saw.

Va., Winchester — Ridgewood Forest Growers Assn.—machinery for the manufacture of wood stave baskets.

Wis., Brownsville — Brownsville Canning Co., c/o P. H. McCarty—canning and conveying machinery.

Wis., Cudahy—S & S Paper Products Co., Lake Rd.—power punches to punch out milk bottle caps.

Wis., Eagle River — Bd. Educ., C. H. Adams, Clk.—laboratory and manual training equipment including planer, mortiser, woodworking tools and small tools.

Wis., Green Bay—Green Bay Sugar Co., 123 North Washington St., C. D. Hine, Mgr.—power machinery, pulp drying machines, conveyors, etc.

Wis., Green Bay—W. J. Rowley, 1148 Main St. (foundry)—cupola, melting furnace and moulding machines.

Wis., Kenosha—Kenosha Evening News, 261 Wisconsin St.—additional presses, paper cutter and proof machine for addition to printing plant.

Wis., La Crosse—Perfect Oil & Gas Co.—gasoline tanks and pumps for proposed filling station.

Wis., Madison—R. A. Rott, 908 Jenifer St.—gasoline bulk storage tanks and pumps for proposed wholesale oil station.

Wis., Madison—A. J. Sweet, 639 West Wilson St.—20 ton ice machine.

Wis., Milwaukee—Charmas Products Co., 63 7th St.—candy making machinery, including dipping, mixing, coating machines and kettles.

Every one of these items is reported by our authorized correspondents who are instructed to verify every item sent in. This free weekly service is published in the interests of the buyer and the seller, to bring them together and get machinery moving.

Everything possible is done to insure authenticity and timeliness.

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BUSINESS NEWS DEPARTMENT
Tenth Ave. at 36th St., New York.

Wis., Milwaukee—W. C. Felkner, 1183 Lincoln Ave. (garage)—1 air compressor, 180 lb. pressure, with 2 hp. motor.

Wis., Milwaukee—Jersey Ice Cream Co., 387 11th Ave.—refrigeration machinery.

Wis., Milwaukee—Milwaukee Boiled Ham Co., 901 Holton St.—belting, shafting and hangers.

Wis., Milwaukee—C. Schott, 1281 28th St.—1 chain hoist.

Wis., North Milwaukee—C. Lutz, Green Bay Rd. (carpentry and millwork)—4 in. planer and 20 to 30 in. band saw (used preferred).

Wis., Portage—E. Weinke—auto repair machinery, drill press, storage tanks, pumps and small tools.

Wis., Racine—Lakeside Malleable Casting Co., 23rd and Clark Sts.—new melting furnace, forges, etc.

Wis., Stevens Point—I. B. S. A., 1314 Clark St., (print shop)—power printing press.

Wis., West Allis—Marks Bros. Co., 7501 Summit Ave., (millwork), F. Marks, Purch. Agt.—large planer, sanding machine, 20-30 in. band saw, to replace that which was recently destroyed by fire.

N. S., Montague—Clark Gold Mines Corp., Ltd., E. S. Smith, Genl. Mgr.—mining and testing machinery (changing from steam to electric equipment).

Ont., Brampton—Gummed Paper Co., W. Hood, Mgr.—additional machinery for the manufacture of gummed paper for wrapping parcels.

Ont., Brantford—Slingsby Mfg. Co. Ltd.—additional equipment for woolen mills.

Ont., Carp.—W. Weatherby—additional equipment for blacksmith shop.

Ont., Collingwood—Postal Lock Nut Co., Ltd., F. A. Bassett, Genl. Mgr.—special equipment for new plant, for the manufacture of lock nuts and specialties.

Ont., Kingston—Fallon Bros.—granite cutting equipment.

Ont., Port Arthur—Mountain Stone Co., H. F. Hewitson, Mgr.—drills, crushers, screens, etc., for modern rock crushing plant at Mount McKay, Ft. William.

Que., Drummondville — MacDonald Wire Goods Co., Ltd.—additional equipment for the manufacture of wire and stamped kitchenware.

Que., Hereford—J. Dumoulin—additional blacksmith shop equipment.

Que., Kinnears Mills — A. Hall (blacksmith)—forge and other equipment.

Que., Lennoxville—J. O. Gorslein, Main St. (blacksmith)—equipment for blacksmith shop.

Que., Magog—O. Langlois, Victoria St. (sawmill)—additional equipment.

Que., Maniwaki—A. Roy (blacksmith)—forge and other equipment.

Que., Montreal — Argonaut Gold Mine, Ltd., 145 St. James St., address J. M. Morrisson, Genl. Supt., Dane, Ont. — mining equipment, including steel sharpeners, mine cars, drills and other equipment, for increasing capacity.

Que., Montreal—Colonial Chocolate Co., 382 Gilette St., A. Langeois, Mgr.—complete candy making machinery and equipment to replace that which was recently destroyed by fire.

Que., Montreal — Mirror Publishing Co. Ltd., c/o A. J. Goodstone, 120 St. James St.—printing and binding equipment.

Que., St. Marc des Carrieres—Gingras & Frere, Ltd.—quarring and crushing equipment.

Que., Westmount—Ingranis Limited, c/o F. B. Common, 418 Clark Ave.—complete equipment for manufacture of furnaces, stoves, ranges, etc.

Que., Woburn—J. N. Beaule—equipment for blacksmith shop.

Metal Working Shops

Calif., Los Angeles—Price Pfister Brass Mfg. Co., 2923 Humboldt St., is enlarging its shop and adding a new foundry, which will about triple its capacity.

Calif., Los Angeles—J. D. Watson is having plans prepared for the construction of a 4 story, 90 x 275 ft. garage on Figueroa St. near 15th St. Estimated cost $315,000. Milwaukee Building Co., Wright and Callendar Bldg., Archts.

Calif., Merced—The Merced High School Dist. awarded the contract for the construction of a 40 x 120 ft. machine shop and manual training buildings. Estimated cost $18,000. Noted July 5.

Calif., Oakland—Field & Lee, 3865 East 14th St., awarded the contract for the construction of a 2 story auto service building. Estimated cost $75,000.

Calif., San Francisco — J. D. Phelan, Phelan Bldg., awarded the contract for the construction of a 1 story, 222 x 312 ft. garage on Valencia and 17th Sts. Estimated cost $200,000. Noted July 19.

Calif., San Francisco—W. H. Woodfield, c/o J. H. Hjul, Engr., 1342 Mission St., awarded the contract for the construction of a 1 story machine shop and foundry on Folsom St. Estimated cost $17,000.

Conn., Glenbrook — The Norma Co. of America, Anable Ave., Long Island City, N. Y., plans the construction of a 1 story, 100 x 400 ft. ball bearing factory.

Conn., Hartford—S. S. Nelson, 20 Magnolia St., awarded the contract for the construction of a 1 story garage at 201

Church St. Estimated cost $65,000. Noted July 19.

Conn., Hartford—Progressive Mfg. Co., 52 Norwood St., Torrington, manufacturer of screws, awarded the contract for the construction of a 2 story, 60 x 100 ft. factory. Estimated cost $60,000.

Conn., Meriden — Manning & Bowman Co., Pratt St., manufacturer of nickel, silver plated and enameled ware, plans to build a factory comprising several buildings. Estimated cost $100,000. Architect not selected.

Conn., Southington — Walker Stewart Fdry. Co., Summer St., plans to build a new foundry. Estimated cost between $50,000 and $60,000.

Conn., Waterville—The Amer. Pin Co. awarded the contract for the construction of a 1 story, 40 x 120 ft. and 25 x 35 ft. factory. Estimated cost $70,000.

Ind., Whiting—The Whiting Fdry. Equip. Co. is having plans prepared for the construction of a 1 story addition to its plant. Estimated cost $40,000. L. G. Hallberg, 116 South Michigan Ave., Chicago, Engr.

Mass., Fitchburg — The city is having plans prepared for the construction of a 2 story, 50 x 150 ft. garage and machine shop. Estimated cost $100,000 or more. H. Foster, 72 Fox St., Archt.

Mass., Norfolk Downs (Boston P. O.)—Boston Gear Wks., 256 Franklin St., Boston, plans to build a 2 story, 75 x 100 ft. addition to factory, here.

Mass., Pittsfield — Nesbit Bros., 20 4th St., is having plans prepared for the construction of a 2 story, 100 x 120 ft. garage and service station. Estimated cost $50,000. G. E. Haynes, 184 North St., Archt.

Mass., South Walpole—Bird Machine Co. plans to build a 1 story, 75 x 150 ft. machine shop. Estimated cost including equipment, $25,000. Private plans.

Mass., Worcester—Amer. Steel & Wire Co., Grove St., will build a 1 story, 60 x 100 ft. annealing house. Estimated cost $40,000. Private plans.

Minn., Minneapolis—Acme Transfer & Storage Co., 524 South 4th St., plans to build a 1 story garage and 4 or 5 story warehouse on 3rd St. and 10th Ave. N. Estimated cost $125,000. J. Juster, Pres.

Mo., St. Louis — Amer. Car Co., 1518 South Vandeventer St., awarded the contract for the construction of a 1 and 2 story addition to car manufacturing plant. Estimated cost $40,000.

Mo., St. Louis — W. D. Kunkel, 3132 Washington Blvd., awarded the contract for the construction of a 1 story, 50 x 115 ft. garage on Washington St. Estimated cost $45,000.

Mo., St. Louis—N. O. Nelson Mfg. Co., 20th and Chestnut Sts., awarded the contract for the construction of a 1 story, 62 x 293 ft. plumbing supply factory on Boyle St. Estimated cost $45,000.

Mo., St. Louis—Smith Davis Mfg. Co., 20th and Locust Sts., plans to build a bed and spring factory, comprising 1 and 2 story buildings, on Kingsland St. Estimated cost $300,000 to $400,000.

O., Cleveland—I. G. Kohn, 640 Guardian Bldg., plans to build a garage and commercial building at 2027 East 105th St. Estimated cost $50,000. W. S. Ferguson Co., 1900 Euclid Ave., Archt.

R. I., Providence—S. Priest, c/o Imperial Printing & Finishing Co., Bellefont, awarded the contract for the construction of a 1 story, 190 x 300 ft. garage and service station on Elmwood Ave. Estimated cost $150,000. Noted May 24.

Wis., Madison — University Motor Co., 2201 University Ave., is receiving bids for the construction of a 2 story, 50 x 100 ft. garage and repair shop. Estimated cost $40,000. J. Fishbank, Prop. Private plans.

Wis., Portage—E. Weinke is having plans prepared for the construction of a 2 story, 50 x 70 ft. garage and repair shop. Estimated cost $40,000. R. A. Phillips, Beaver Bldg., Madison, Archt.

Wis., Racine—Belle City Malleable Iron Co., awarded the contract for the construction of a 1 story, 115 x 306 ft. foundry. C. A. Anderson, Mgr.

Wis., Racine—Lakeside Malleable Casting Co., 23rd and Clark Sts., awarded the contract for the construction of a 1 story, 40 x 120 ft. addition to foundry. Estimated cost $60,000.

Wis., Milwaukee—Jersey Ice Cream Co., 387 11th Ave., plans to build a 2 story factory on Mitchell St. Estimated cost $40,000. Architect not selected.

Ont., Oshawa — General Motors Corp. plans to build a 2 or 3 story factory on Division St. Estimated cost $200,000.

Que., Montreal—Central Garage Co., St. Denis St., awarded the contract for the construction of a 3 story garage on St. Denis St. Estimated cost $30,000.

Que., Montreal—The Harbor Comrs. will construct a 1 story, 45 x 245 ft. machine shop, on Notre Dame St. E. Estimated cost $39,000.

ADDITIONAL OPPORTUNITIES

Employment Equipment
Miscellaneous Business

See the

SEARCHLIGHT SECTION

This Issue, Pages 172 to 185

American Machinist
Volume 59 NEW YORK, AUGUST 9, 1923 Number 6

Cost Keeping for the Small Shop

By E. M. PIERCE

Overcoming the problems of the small jobber by a simple chart system — Available uses of the chart — Rejection tags and special order forms

HIGHLY efficient systems of cost keeping and control of production have been devised for the large manufacturing establishments and a vast amount of literature is available for those who wish to study such problems as they apply to the larger organizations, but comparatively little attention has been paid to the problems of the manager (frequently the owner) of the small shop, more particularly those engaged in jobbing work. This does not mean that the difficulties of the small shop are less than those of the larger firm; they are quite as hard to solve and are complicated by the necessity of keeping the cost of operating any system to the smallest possible amount. The small jobber frequently encounters more or less trouble with his customer when he presents his bill, because the latter usually fails to think of the added costs resulting from the changes and alterations that he has requested during the progress of the work. The jobber is then confronted with the problem of a lawsuit or a cut in his bill, either of which will make his profit disappear. He not only loses his profit but a customer and makes a bitter enemy as well. That means he must go out and find new customers and fight against the reputation that the angry customer has unjustly given him.

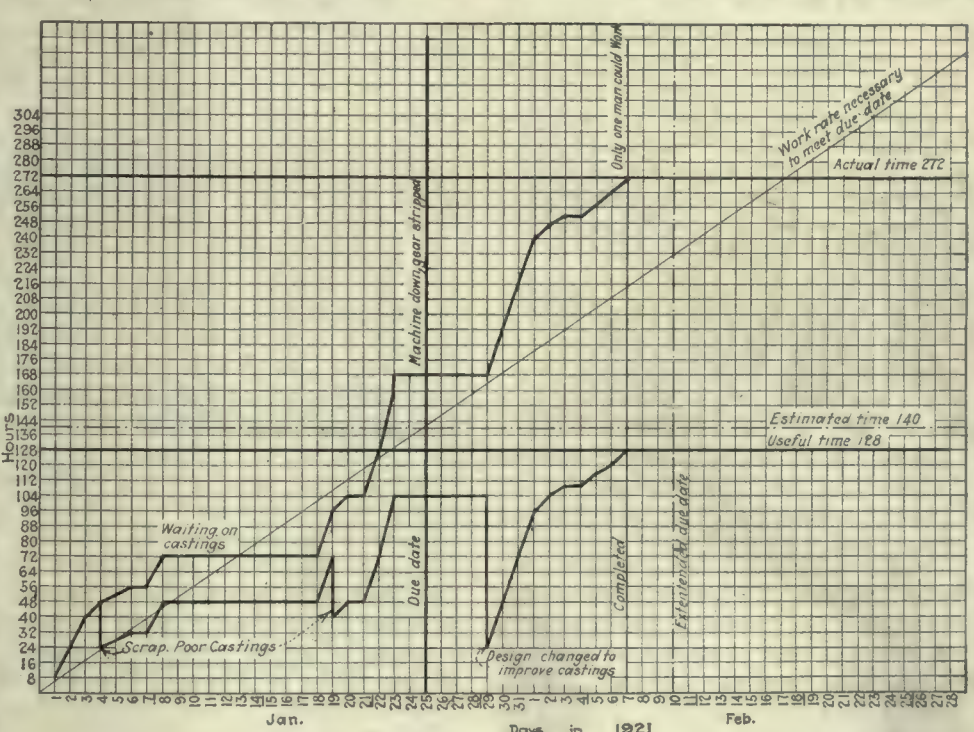


FIG. 1—CHART FOR SHOWING THE PROGRESS OF WORK ON A JOB

There is no need for such trouble and instead of the shop having to hunt new customers all the time due to the loss of old ones every time a settlement is made, old customers should be made firm friends and return every time they have work to be done.

It is the purpose of this article to point out a way by which this desirable state of affairs may be brought about and the customer be kept in constant touch with the state of his account and know from day to day just what his changes and alterations are costing him. All of this can be accomplished with little trouble and with very small expense and it will be in such form that the results can be seen at a glance. This system would also hold in any court of law in case a dishonest customer wished to avoid payment. All shops have some sort of a time-keeping and inspecting system even if it is only the workman himself who passes on the work which he is doing. This is the basis on which my system is founded. From these two simple facts can be evolved the system which I am about to describe with the aid of the chart in Fig. 1.

Each job is given a distinguishing number and the detailed parts of the job have the same number with some sort of a distinguishing suffix, such as No. 1000-1

or No. 1000-2; all work done on that order number is charged against the customer whose job it is. The bookkeeper or other clerk whose duty it is to make up the time on the various jobs is provided with some plain quadrille ruled paper of letter size which may be punched so that it can be kept in a loose leaf binder. He is informed as to the estimated time required to do the job and on the left-hand margin of the sheet he makes a scale of hours which represents "time worked" on the job. This scale should be in units of a working day or multiples thereof. It should be so arranged that the estimated time line will be about one-half the height of the sheet to provide for possible excess of time. If eight hours constitutes a working day each of the horizontal lines may be made to represent 8, 16, 24 or more hours. In the bottom left-hand corner the date of starting the job is placed and each of the vertical lines is dated including Sundays and holidays. We now have the basis

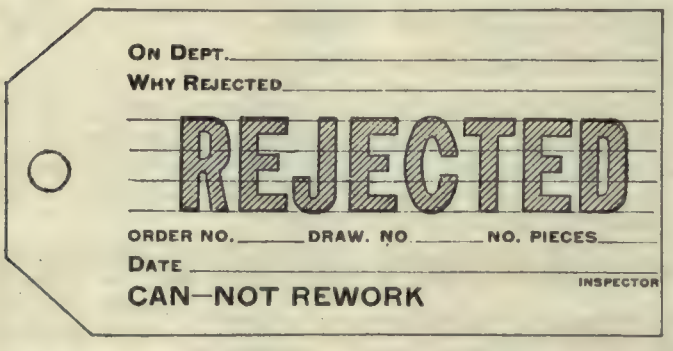


FIG. 2—REJECTION TAG ATTACHED TO SPOILED PIECES

of a chart which is quite conventional and it is a simple matter each day to add the time devoted to any order number and make a point on the chart for that date representing the time for the day. By connecting these points from day to day we have a curve showing the progress of the work and the total time to date.

So far the chart is purely conventional and does not add anything to the knowledge already had, all that it does is to make that knowledge visual and easy of access. Work proceeds in the normal manner for some time but one day the customer rushes in and wants a certain part changed, and if a mechanic is already working on that particular part, the customer decides whether it can be changed or not. The mechanic is then given a new job card of a distinguishing color bearing the same order number and part number as the old one but in addition having a dash and letter suffixed to the numbers as No. 1,000-1-A, and he starts to work on this new job order. The job order bears on the face of it the reason for its existence and is signed by the customer as authority for its issuance. If any useless work has been done on the particular piece the time required for this work is noted on the job card for future reference.

Suppose instead of being able to utilize the part already made or in process it has to be entirely thrown away and a new part made. In this case the procedure is exactly the same as before except that the new job order carries a letter, dash and the order number as No. A-1000-1. A third case may arise where the mechanic spoils a piece of work and the charge is clearly against the shop rather than against the customer. In this case the order number would be made with a dash following the part number and the man's number or initials as No. 1000-1-JD, the JD standing for John Doe. In this way the responsibility is placed where it belongs. No matter what the cause of the "set-back" may be, it appears on the chart. We now have three possible sources of added expense as against the customer or the shop, any one of which is readily distinguishable on the time tickets when they are received by the clerk for charting. In handling the first case where a piece is re-worked the job ticket will show on its face the number of hours of useless work on the original part and this amount is set off on the chart on the proper date as a line drawn vertically from the time curve and subtracted from it. In the second case, where the piece can not be re-worked, the original job card and time tickets are consulted to determine the amount of time expended on the particular piece and this amount is deducted from the time curve as in the first case. The third case is handled in a similar manner.

Against each of these set-backs a concise explanation of the reason thereof is written on the chart so that a glance will reveal the cause of any set-back which may be under duscussion at a later date. The job cards are, of course, filed and bear much fuller explanation of the causes of additional work having to be done.

Charting the Time Element on a Job

If the chart fulfilled no other purpose than that outlined above it would well justify its existence but this is only the beginning of the useful things which it accomplishes. Frequently the time element for the delivery of a job is important and the chart can be made to serve an extremely useful purpose in this case. When a due date is given on a job the chart in Fig. 1 is dated in the usual manner and on the date when the job should be completed a heavy vertical line is drawn to call attention to the due date. A time estimate having been given a horizontal line corresponding to this time estimate is drawn on the chart. From the starting date to the intersection of the "estimated time line" and the "due date line" a diagonal line is drawn; this line represents the daily flow of work required to complete the job within the estimated time and the manager can see from day to day just how he stands in regard to the delivery date. In case of a delay due to any cause the actual work time curve flattens out or becomes a straight line, informing the manager immediately of a delay or stoppage of work and he can take the necessary steps to correct the difficulty. In such cases, a bracket drawn over the flat part of the curve indicates a note written on the chart explaining the cause of the delay.

A contract for the performance of work where the time element is involved, really hinges on the number of men that can be kept at work on the job and this is the basis on which the contractor makes his estimate and his guarantee of delivery. It would be well for him to have his contract worded in such a way as to cover this assumption as it would save him serious trouble in many cases where he fails to deliver on the date contracted for. If he had covered himself by making a contract of this kind, he could claim extension of time for every change order by the contractor as well as for delays beyond his control which are ordinarily covered in contracts, all of which are shown on this chart.

From the foregoing it will be seen that the chart serves a very useful purpose and fills a want that has never been satisfactorily met to the writer's knowledge by any system in use in a small shop.

The use of this chart is by no means confined to the small shop but will be found extremely useful in any

shop where diversified production goes on. The writer devised it for use in a shop where the work was entirely experimental and where an accurate record was wanted of the work done on each job. One clerk, a girl, took care of an average of 700 jobs in process at the same time and kept all the charts for them besides doing considerable other office work.

In this shop, a very rigid system of inspection was kept and work was inspected in process as well as after finishing. In case of a piece failing to pass inspection, a rejection tag was attached to the piece. Fig. 2 shows the form of the tag and the data which it contains. Besides the rejection tag the form illustrated in Fig. 3, was filled out by the inspector in triplicate, and was signed by him and the foreman of the department where the fault originated. One copy of this form was held by the inspection department, one by the foreman of the department at fault and one copy was sent to the factory manager. This system placed the blame for all changes or faulty work squarely where it belonged and no possible way of dodging the responsibility could be found; it was also easy to trace the responsibility to the individual workman and so influence his efficiency record.

I found this chart a perfectly satisfactory method of production control and it made my work as works manager very much easier. I was not interested in the jobs which were progressing smoothly and never saw the charts on them, but when a delay occurred or there was a decided "set-back" for some reason or other, the clerk laid the chart on my desk about 10 a.m. and thus called the trouble to my attention. The chart showed the cause of the trouble so that I could at once take the necessary steps to remedy the conditions.

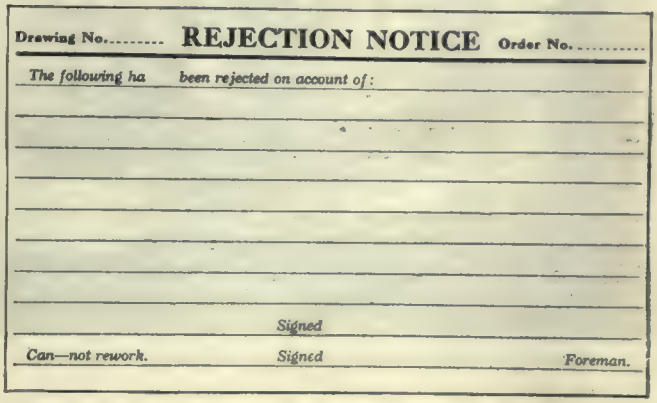
Special Order Forms

Perhaps it is needless to say that when a rejection tag was put on a job, work was immediately stopped on that order number and a new order number was issued bearing the proper dash letter or symbol so that the workman's time would start on the new order. These new order numbers were received from the factory planning department by phone and were followed by the proper form as soon as it could be made out, thus no delay was caused. Each of the special order forms covering the three cases previously mentioned were printed on a card of a distinguishing color so that as they came back the color of the form called attention to its character and the clerk knew just what procedure to follow in handling it.

It is useless to explain in much detail the system in use in any factory or shop; the fundamentals of a system can only be given as the details must be worked out to fit the conditions found in a given place. I believe, however, that any superintendent will find that he can adapt this chart to his own needs and find that he has a system by which he can keep himself informed of the progress of any particular job with the least possible expenditure of time and energy. It can readily be adapted to tool-room or experimental work and its utility for controlling production in these departments is obvious. The superintendent will find that he has here all the data necessary for keeping track of the individual jobs which are going through these departments.

When installing this system, some educational work with the foremen and personnel will be necessary. The foreman will come to regard it very highly because of the fact that it places all responsibility where it belongs and there is no possibility of evading it or "passing the buck." Any case where the responsibility for error is in dispute must be settled at once because when a foreman signs a rejection slip he accepts the full responsibility for that error.

In handling experimental work the chart serves still another purpose and makes it possible to estimate the time required to build a given machine or part after the experimental changes are eliminated. As all such changes have been noted on the chart as set-backs, the final time curve will show the actual amount of time taken to do the job, in other words the real cost for the experimental job and also the lower time curve which may be called the "useful time curve" or the time taken to do the work with the experimental work eliminated. From this latter curve we have a good foundation on which to estimate the time that will be required to do the job a second time. Any job shop can build up a very useful file of such information because the jobs which they get can be grouped and classified in such a way that nearly


Drawing No..... **REJECTION NOTICE** Order No.....

The following ha *been rejected on account of:*

Signed

Can—not rework. *Signed* *Foreman.*

FIG. 3—INSPECTOR'S REJECTION NOTICE

all new work will naturally fall into one of these groups. When a similar job comes in a chart can be selected which will be very helpful in estimating on the new job. Since most work will bear a resemblance to some previous jobs, the new work can be estimated more rapidly than if no guide were at hand.

As the charts are used from day to day new and unsuspected uses will be found for them. They also constitute a permanent record which may be invaluable in many cases that might arise. When the President of the company calls you into his office and wants to know "why" about a certain job, put the chart on his desk and you don't have to talk at all, all of his questions are answered right there, the reasons for delays and changes and so on are explained in a manner that he can see at a glance. Try it.

American Valve Grinders in Denmark

Valve grinders are used but little in Denmark, repair shops not being so advanced in the use of modern equipment as in the United States, according to *Commerce Reports*, published by the Department of Commerce. Dealers are frank enough to admit, however, that the rapid increase in number of cars in use will make necessary the development of repair shops along more efficient lines, thereby offering a very good opportunity to introduce valve grinders for more general use.

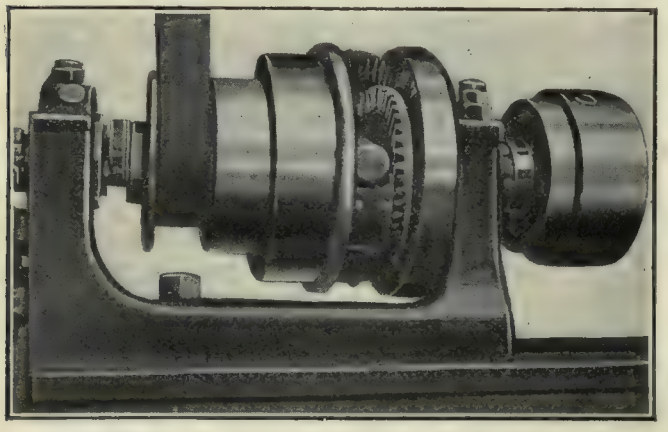
Those now in use are said to be largely of American manufacture and to be satisfactory. There should be a good market in this line with little competition from foreign manufacturers.

A Problem in Epicyclic Gearing—Discussion

By T. Humpage

I WAS interested in reading the article on page 283, Vol. 58, of the *American Machinist*, entitled "A Problem in Epicyclic Gearing." As I am the inventor and patentee of this particular form of gearing, I thought that a few personal details would be of interest to the readers of the above-mentioned paper.

In the year 1885, I had a small plain lathe on which I made various things at home as a hobby, and I frequently wanted back-gearing to slow down the speeds for turning various metals. The idea then occurred to me to fit some sort of gear inside the cone pulley of



THE FIRST EPICYCLIC-GEARED HEADSTOCK

the headstock. After careful thought I decided not to alter my small lathe, but to make a new 6-in. screw-cutting lathe complete with this epicyclic-geared headstock, which I finished in 1886. This lathe headstock is shown in the accompanying illustration and is still in regular use in our toolroom.

Applications of the Epicyclic Gear

Realizing that there were possibilities for its usefulness, I took out a British patent, No. 15,289 in 1887 for it, and in this same year I received a letter from the Yale & Towne Manufacturing Co., Stamford, Conn., offering to take up its manufacture in America. I was young, inexperienced and suspicious at that time, and to my great regret I never replied to their letter. Since then, however, I believe they have made thousands of their triplex lifting pulley blocks, and we are pleased to state that the best and most efficient lifting gear in our works is one of these. The principle of the gearing in these blocks is exactly the same as shown in my patent specification, with the addition of a clever device for sustaining the load automatically in any position, while being raised or lowered.

Many sets of this gear of both bevel and spur gearing types have been made for lathes, drilling machines and electric motors. A working model of the gear mechanism was by request placed among the exhibits of the machinery department of the South Kensington Museum, in London.

With but a small alteration of the numbers of teeth in the wheels an extremely wide range of reduction can be made. The chief point to bear in mind when designing these epicyclic gears, is to have the fewest number of teeth inter-changing with each other in a given time for the required ratio of reduction. The teeth of the gears should be generated, and the pressure angle of the involutes should in every case be not less than 20 deg. so that the teeth are not undercut but the involute curves are carried to the root of each tooth, thereby insuring quiet running. The highest efficiency under full-load which I have ever obtained has been 97 per cent.

National Economic League Favors Employee Representation in Management

As the result of a study of over 1,000 plans for improved relations between employers and employees, a special committee of the National Economic League on "Readjustment in Industrial Relations" recommends that employees should be given participation in management under certain limitations, and that they should be given the opportunity to acquire some financial interest in the establishments in which they work. The committee concludes that the term "industrial democracy" is misleading and should be abandoned; that employees, as a whole, are not interested in assuming the responsibilities of management; and that, while they should be given the opportunity to have a voice in management on matters affecting their immediate welfare, it would be inadvisable to have them participate in management on questions of policy, such as selling, purchasing, finance, and similar matters. An important point made by the report is that employees and executives should be given more instruction in the economics of business, as a step to better industrial relations.

The sub-committee which prepared the report is made up of the following: Daniel Bloomfield (secretary) lawyer and consultant in industrial relations; Charles W. Elliot, President-Emeritus of Harvard University; Edward A. Filene, President of William Filene's Sons Co.; F. P. Cox, General Manager, General Electric Co., Lynn, Mass.; James M. Head, former mayor of Nashville, Tenn.; Frederick A. Cleveland of Boston University; George E. MacIlwain of the Babson organization; John Calder, former Industrial Relations Manager, Swift & Co.; and J. P. Snow, a prominent Boston engineer.

Growth of Representation Movement

A vote was taken three years ago by the National Council of the League on the question, "Should there be active participation by employees or representatives of employees in all problems of management affecting the worker?" and the answer was an affirmative one by 78 per cent of the 500 members who voted. The present report aimed to learn what was done in this direction up to the present time, and the committee has made an intensive study of the experience with this question throughout the country.

The committee finds that the movement for representation of employees in the discussion and adjustment of working conditions is spreading rapidly, and that, in the majority of cases where such plans have been tried, they have been successful in establishing better relations. With few exceptions the plans in operation give employees advisory powers only, and that, says the committee, seems to be the most practicable method of representation at present. Actual responsibility for management cannot well be put on employees.

It Pays to Replace—

How a Shop Saved by Replacing Old Shop Equipment with New Equipment

BY HUGO F. PUSEP
The National Cash Register Co., Dayton, Ohio

This article won the second prize of $100

A METHOD of manufacturing a certain article which has been followed over many years may not be the most economical one now. The reason for this undoubtedly is the fact that machine tools of today are vastly more productive than their predecessors. This productiveness is chiefly the result of specialization in the design of modern machine tools.

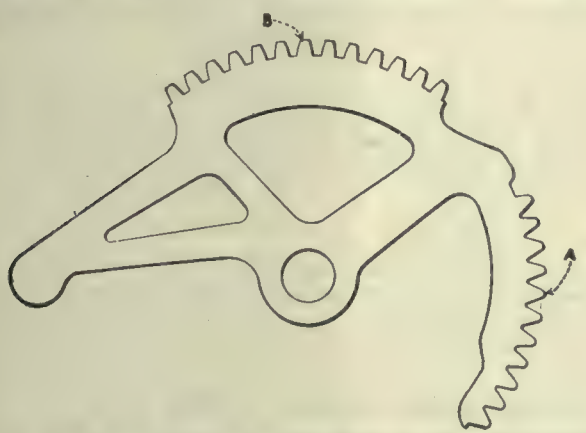


FIG. 1—FEED SEGMENT, ON WHICH THE COST OF CUTTING TEETH HAS BEEN REDUCED ONE-HALF

The National Cash Register Co., of Dayton, Ohio, has a big department where all the gears and segments for its registers are cut. There are thousands of gear segments of all kinds and sizes used on registers of different types manufactured by this company.

The teeth were always cut on plain gear cutters, it being out of the question to hob them. The segments, one of which is shown in Fig. 1, are steel punchings, 0.093 in. thick. Formerly they were mounted on an arbor holding from 30 to 40 blanks and the teeth *A* were cut. Then the teeth *B* were machined in the same way on another machine. As the two sets of teeth have to be in correct relation, it was necessary to locate accurately from a finished tooth of group *A* for the second operation. The gear cutters used were the company's own machines, known as the N. C. R. gear cutters, having been in use a number of years. Once the machine was set and started it needed no further attention until the stack of segments on the arbor was completed, the indexing being automatic. These gear cutting machines, when first built, were the last word in gear cutting efficiency.

A little less than a year ago it was decided to install a Fellows gear shaper for the segment cutting work. Consequently a high speed gear shaper was purchased. It is a machine admirably adapted to this class of work, and proved very conclusively that the old gear cutting equipment for the segments should be replaced by the gear shaper. Not very long after installing the first gear shaper another machine was ordered. At the present time the company has four high-speed special Fellows gear shapers installed, and practically all of the segment cutting is done on them.

Two types of gear shaper arbors, designed for quick loading and unloading, are shown in Figs. 2 and 3. The throw-off pins stop the machine at the completion of the cut. Fig. 2 shows ten blanks mounted on the arbor, and Fig. 3 shows two. In the second case the number is limited to two on account of the hub on the segment. One operator takes care of two machines and he is kept busy loading and unloading the arbors.

By replacing the old gear cutting machines with these modern high speed Fellows gear shapers the cost of production on all segments has been in most instances decreased by one half; in many cases it is even greater.

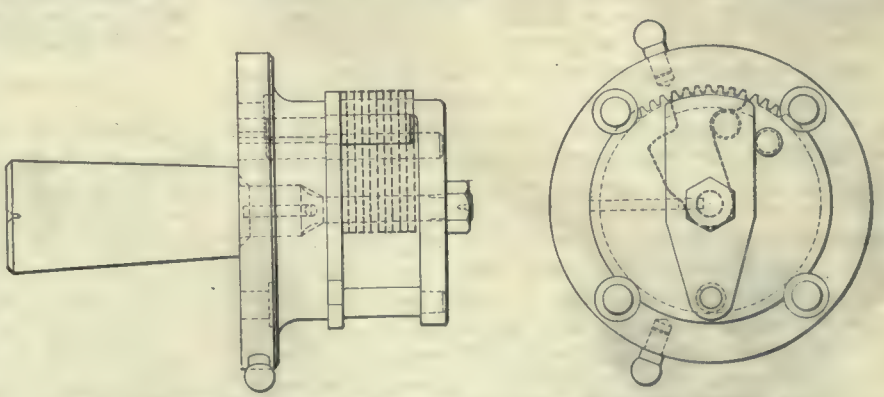


FIG. 2—FEED SEGMENT, MOUNTED IN LOTS OF 10 ON ARBOR, FOR CUTTING TEETH IN FELLOWS GEAR SHAPER

For example, it cost 84c. per 100 to produce the segment shown in Fig. 3 by the old equipment. Now it costs but 66c. per 100. The production cost of the feed segments shown in Fig. 2 has been decreased from 35 to 19c. per hundred.

The segment shown in Fig. 1 is a marvelous example of the efficiency of the new equipment. When cutting

In the contest, which closed July 5, nine prizes were given for articles telling how a shop saved by replacing old shop equipment with new equipment. The article that won third prize will be printed next week.

the two sets of teeth, *A* and *B*, with the old equipment, the cost was 69c. per 100 pieces, whereas the gear shaper turns these segments out at a total cost of 31c. per 100—a saving of more than one-half over the old equipment. This great saving is made possible by the fact that the gear shaper cutter, which generates the teeth in this segment, has two sets of teeth on its periphery, so that teeth *A* and *B* are finished in one setting. Both sets of teeth, although of different shapes, are of the same number to an inch of circumference, thus making the foregoing method of cutting possible. These segments are used in cash registers, of one type only, at the rate of 6,000 per month. But this segment is of comparatively small usage. Bearing this fact in mind and remembering that the National Cash Register Co. makes over 200 types of registers and that the monthly output has reached to over 14,000 registers, it can be seen very clearly what a tremendous saving of money it has meant to replace the old gear-cutting equipment with the modern high-speed gear shaper.

Here is a story that should be studied by every efficiency engineer and shop executive. Instead of worrying over the high cost of material and labor, why not set to thinking of improved methods and up-to-date machines which will reduce the production costs and thus more than counteract the increase in material and labor bills?

The manufacturer who delays in equipping his shop with modern machines and sticks to his old "stand-bys" is paying for the new equipment anyway, in the form of increased production costs, so why not install the most efficient equipment and realize the resulting saving in production costs in the form of increased profits?

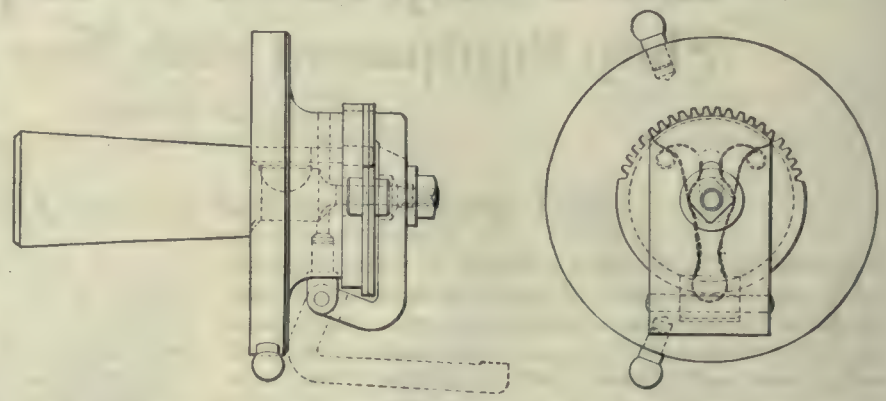


FIG. 3—RESET SEGMENT, MOUNTED IN PAIRS ON ARBOR, FOR CUTTING TEETH IN FELLOWS GEAR SHAPER

Johnson Posts Brown About Wages

By John R. Godfrey

SAY, Godfrey, do you remember how you chuckled when Jim was giving me hail Columbia about letting that flapper go because I was too dern mean to pay her decent wages? Thought it was a good joke, didn't you?" said old man Johnson the other day.

"Well, you ought to have heard me jolt old man Brown when he told me his wage troubles the other day. 'Can't get any good men to go into the foundry,' he told me, 'and it's hard to get enough to go into the shop. Men ain't got no ambition like you and I had, Johnson. Rather work outside than go into a good shop. I don't know where we're coming at,' he wailed.

"Then I waded into him, Godfrey, sort of got even with him for the way Jim tanned my hide last spring. 'Brown,' sez I, 'the trouble with you is, you haven't kept up with the times. You can't forget the time when you and I were dern glad to get fifteen dollars for a sixty-hour week. But them days have gone forever. Instead of being up with the band wagon, you're trailing back with the clowns and the side shows.

"'It doesn't make a hoot's difference whether we think 50 cents an hour is aplenty or not—or whether we think a sixty-hour week is O.K. They ain't a wearing 'em that way this season.

Trolley Car or Machine Shop?

"'Of course I think a man who'd rather work on a trolley car than in a machine shop has a screw loose somewhere. But unless a man has a love for the shop that will offset 20 cents an hour, and a wife and kids who love to live on two meals a day, he's a chump to work for you for 50 cents an hour when he can get 70 on the trolley. It may not be as good a job but a lot of men get a heap of fun out of being out where they see people, where they can boss even a trolley car, and occasionally help a nice-looking girl hist her suitcase aboard.

"'It isn't a high ambition to want to work in the street gang, but it isn't any worse than the foundry; he's out in the open and he gets more money and works shorter hours. And when it comes to bricklaying—well the bootlegger is the only one who has anything on him. They're even having short courses of six weeks or so, to train a man so he can pull down from 12 to 16 dollars per. Of course it's highway robbery, but so is the price we pay for sugar and shoes and a heap of other things.

Upward Revision of Ideas on Wages

"'Brown, my boy,' I told him, 'we've got to revise our ideas of wages upwards. There may be a lot of 'em too high, but why make the shop man the goat? I don't know of a single trade where a man has to have the same training and skill as a good machinist and yet he is the poorest-paid worker of the bunch. Is it any wonder they are getting to be scarce?

"'We've got to realize that we're in competition with other trades, as never before, and if we want men, we've got to pay the going rate, no matter if you and I did work for fifteen a week years ago.'"

The old man was tickled with himself at lambasting Brown for the same thing Jim got after him about a while ago. And it may help him to let the unpalatable truth sink into his own consciousness. With the coming of the bigger plants much of the personal contact is gone and men weigh jobs more for the dollar and cents side than when they called the boss by his first name, which makes shop management today a bigger job than ever before.

Machining Steel Cylinder Sleeves of the Wright Aviation Engine

By FRED H. COLVIN
Editor, *American Machinist*

Conclusion of second article—Cutting flanges which make the cylinders interlocking—Fixtures and tools for boring valve openings and seats—Final grinding and lapping

THE SLEEVE flanges of cylinders Nos. 2 and 4 are cut with a milling cutter on a radial drilling machine using the tool shown in Fig. 20. The threaded bushing *A* is screwed into the cylinder block in place of sleeve No. 1 and the hardened bushing in the center guides the pilot of the cutter *B* which mills out the front side of the flange of sleeve No. 2, previously screwed firmly into place. This operation is repeated with the same bushing screwed into cylinder No. 3 and sleeves Nos. 2 and 4 in position. Here the cutter mills out the opposite side of the flange on sleeve No. 2 and one side of the flange on sleeve No. 4. The cuts are gaged by the simple-limit gage shown in Fig. 21.

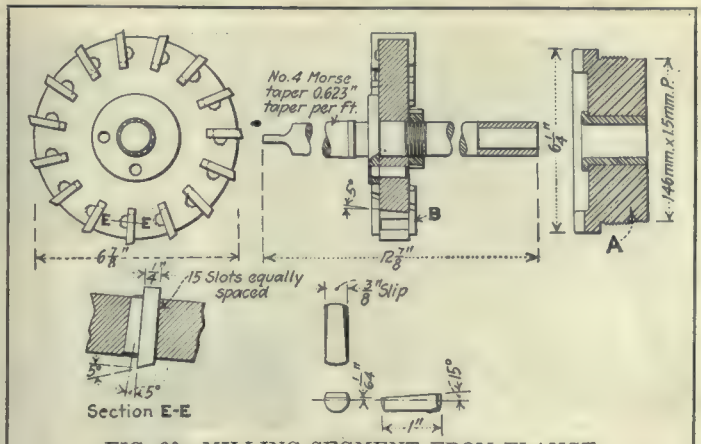


FIG. 20—MILLING SEGMENT FROM FLANGE

Sequence of Operations

Heat treatment
Brinell test
Rough turn flange
Rough bore
Face back of flange
Rough turn outside
Finish bore
Finish turn outside
Cut thread on outside
Grind solid end of sleeve
Assemble in block
Cut segments from flange
Bore valve seat holes
Finish mill top of block
Finish grind flanges
Lap top of block
Grind bore of sleeve
Inspection

The cylinder block, with all the sleeves screwed into place is put, sleeves up, in the fixture shown in Fig. 22, which is mounted on an 8-spindle Foote-Burt drilling machine. The first procedure is to put the drilling block, Fig. 23, into one of the sleeves. The body of the block is a sliding fit in the sleeve where it is clamped by the hook bolts as shown. The block guides the 2-in. drills used in the roughing operation and is moved from sleeve to sleeve. The valve holes are afterward finish bored with the tool shown in Fig. 24. An extension piece is fitted to the Morse-taper shank and the whole thing driven by a chuck in the spindle of the machine already referred to. The pilot on the end is guided by the guides *A* in Fig. 22. In Fig. 25 is shown the gage used in setting the cutter in the boring tool in Fig. 24. The pilot fits the small hole in the gage and centers it around the cutter. The opening at *A* enables the cutting point to be plainly seen when setting it.

The valves are seated after the valve guides are screwed into the aluminum cylinder-block. No fixture is required as the valve-seating cutter is guided by the guides used in boring the seat holes. A final cut of about 0.01 in. is taken through the valve hole, using the flexible boring bar shown in Fig. 26, using the valve guide as a bushing for the pilot on the end of the boring bar. This operation lines up the valve hole with the valve guide, which is an important point. The valve seats are then cut with 90-deg. (Included angle) seating cutters, slipped on the bar shown in Fig. 26, which is also used in connection with the flexible driving arrangement.

The assembled block then goes to the Becker milling machine shown in Fig. 27 and the upper surface is finish milled with a very light cut. The cylinder block goes next to the Pratt & Whitney vertical grinding machine, as shown in Fig. 28, where the sleeve flanges are faced off to the correct dimensions.

In Fig. 29 is shown the final lapping of the upper end of the cylinder block on the large lapping plate, while Fig. 30 gives an idea of the method used in handling the block while boring the end-shaft drive hole and similar operations. It will be noted that the flanges of the sleeves are carefully supported on steel blocks and that the jig *A*, which guides the boring bar at the upper end has a long bearing on the cylinder block. The boring bar is also piloted at the lower end.

Two of the inspection operations are shown in Figs. 31 and 32. In Fig. 31 the inspector is testing the accuracy of the valve-guide holes with relation to the upper face of the cylinder block which carries the cam shaft. These holes must be at 90 deg. to the cylinder block within a tolerance of 4 min. or $\frac{1}{15}$ of a deg. The small, square surface plate shown has a hole

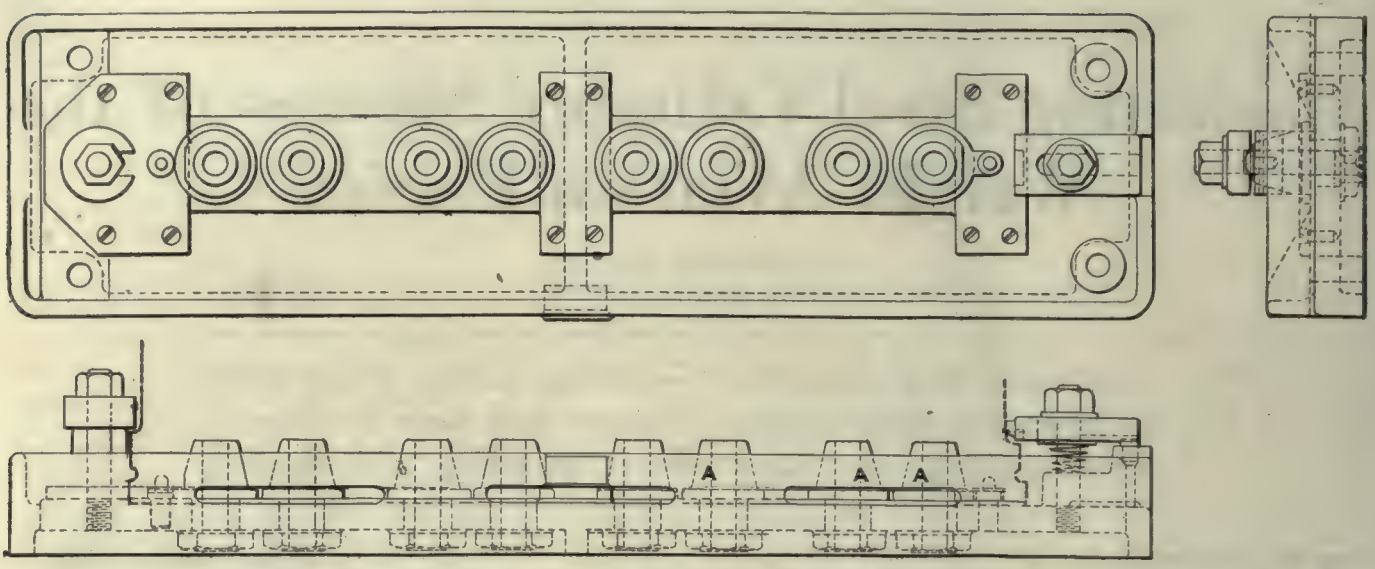


FIG. 22—FIXTURE FOR DRILLING VALVE HOLES

through which is inserted a plug gage that fits the valve-guide hole. This plug gage has a dial indicator attached to it which, when rotated, shows the variation from squareness of the plug with the surface plate. The allowable variation of 4 min. is equivalent to about 0.003 in. on the dial gage.

In Fig. 32 is shown finish grinding the bore of the sleeves on a Heald hydraulic cylinder-grinding machine. This is one of the few cases where cylinders are ground wet, the reason being that the sleeves are of steel instead of cast iron as generally used in cylinder blocks.

A visual inspection of the final grinding of the bore is shown in Fig. 33. The dial gage used in testing the diameter of the bore is shown on top of the second cylinder block.

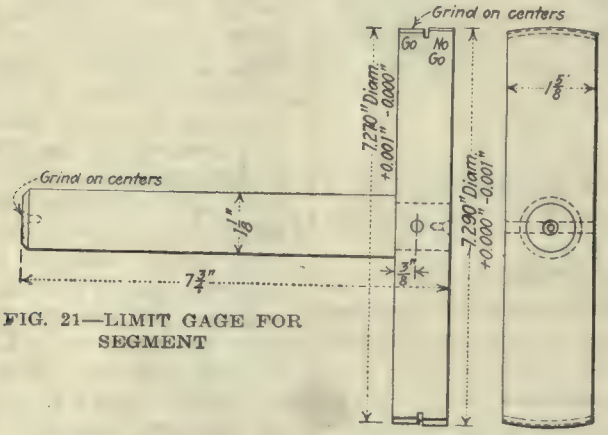


FIG. 21—LIMIT GAGE FOR SEGMENT

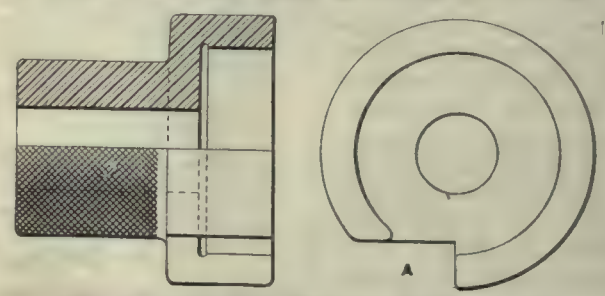


FIG. 25—GAGE FOR SETTING BORING TOOL

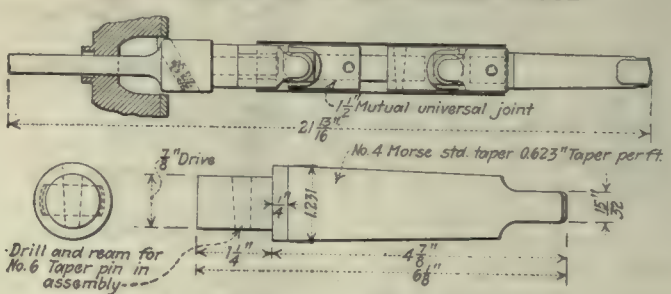


FIG. 26—FLEXIBLE BORING BAR DRIVE

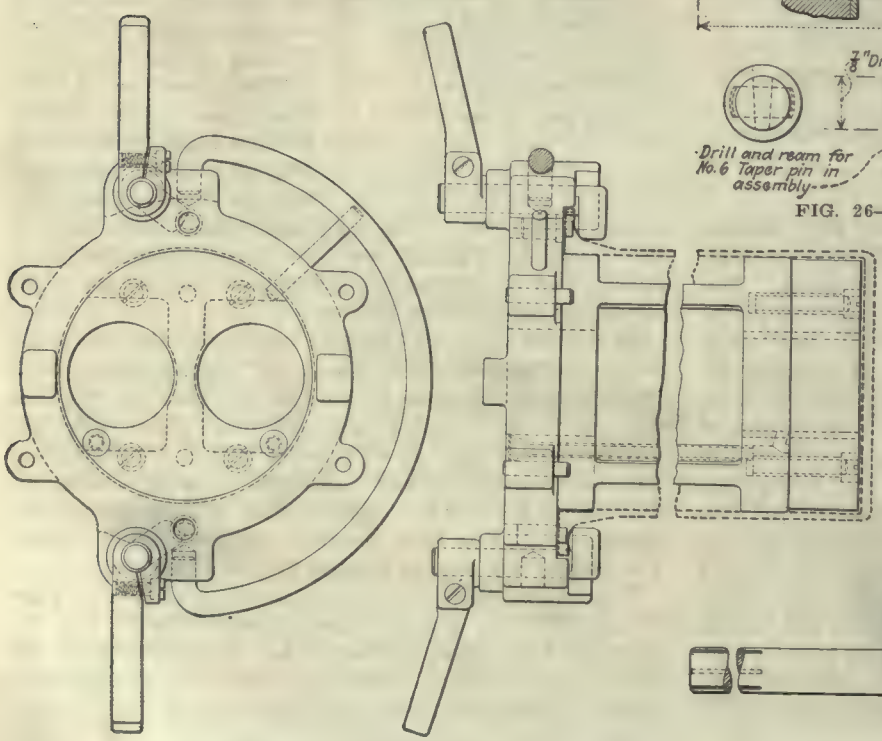
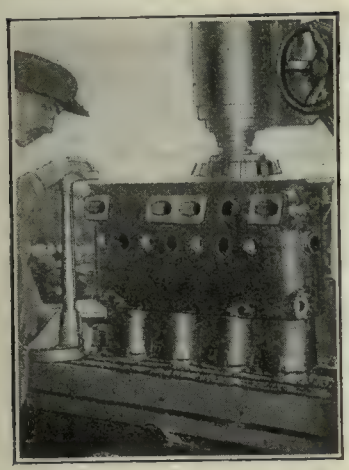
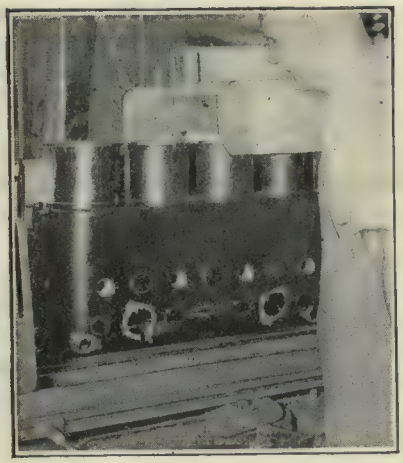


FIG. 23—GUIDE BLOCK FOR DRILLS



FIG. 24—VALVE HOLE BORING TOOL





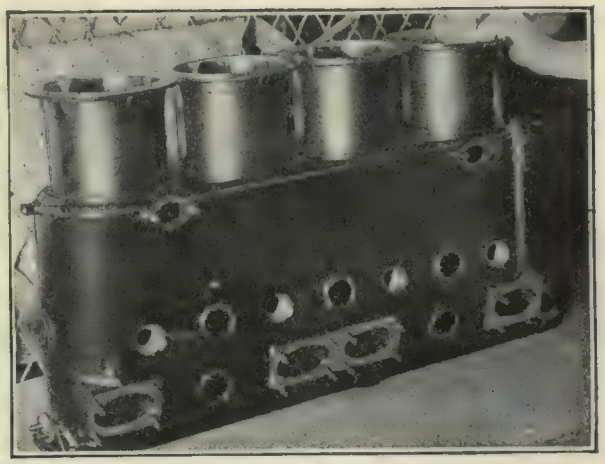
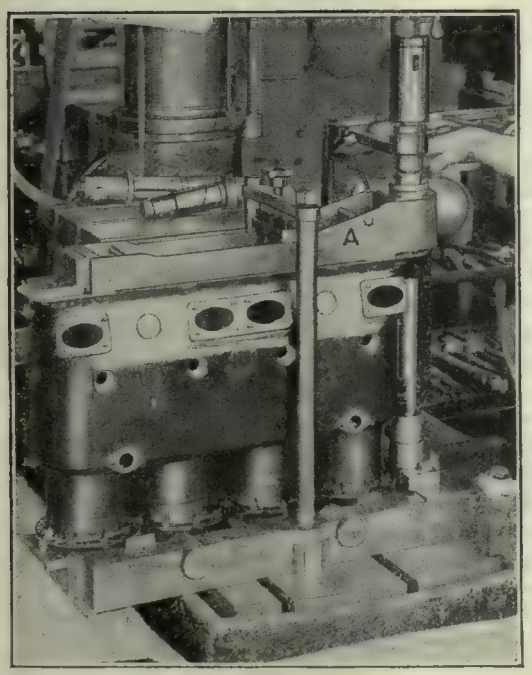


FIG. 27—FINISH MILLING CYLINDER BLOCK. FIG. 28—FINISH GRINDING FLANGES
FIG. 29—LAPPING TOP OF CYLINDER BLOCK



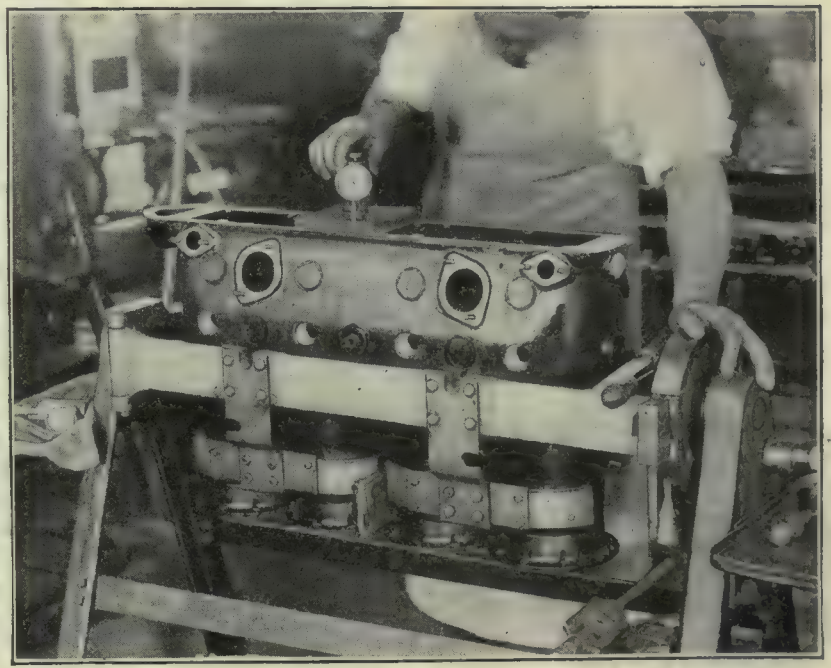
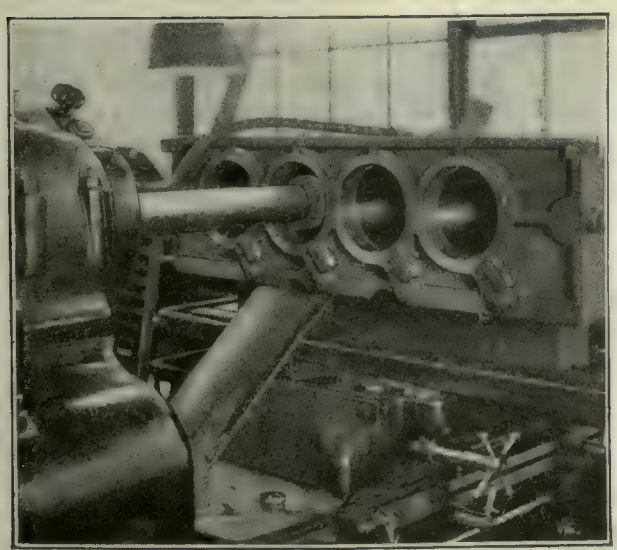


FIG. 30—BORING HOLES FOR CAMSHAFT DRIVE. FIG. 31—TESTING ALIGNMENT OF VALVE GUIDE HOLES



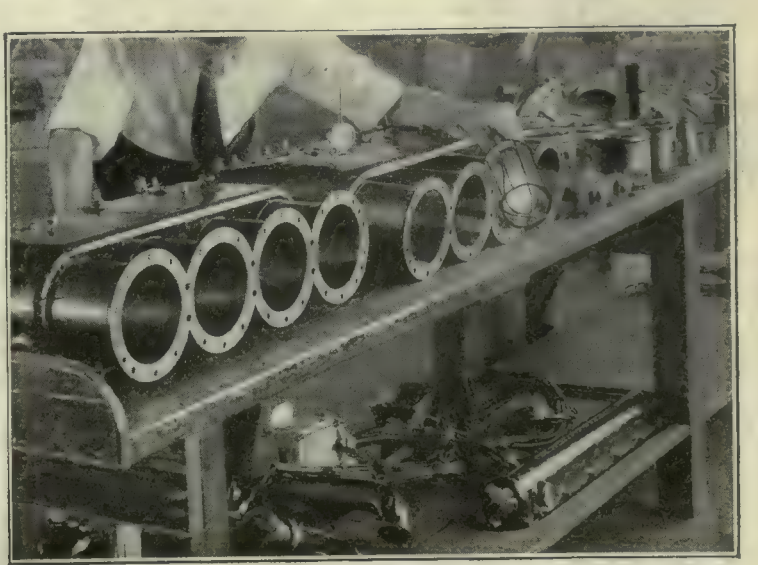


FIG. 32—GRINDING BORE OF SLEEVE. FIG. 33—INSPECTING BORE OF SLEEVES

Book Reviews

The Exclusive Agency. Prepared by the New York University Bureau of Business Research and published by New York University, New York City. Paper binding, 64 pages, 8½x11 in. Price $1.

Much of the material upon which this study in the marketing of manufactured products is based, was secured by questionnaires and interviews. These were furnished by both manufacturers' representatives and retailers and the book is of real value to one interested in these matters, since it represents the opinion of some of the most efficient business men in this country.

A general description of exclusive agency methods as used in marketing manufactured products is followed by the questionnaire and the tabulated returns. Comments from many executives who filled out the questionnaires are interjected throughout the book and are quite conclusive as to conditions under which the exclusive selling plan is desirable or undesirable.

The details of exclusive agency contracts are treated carefully and some interesting points are brought out, among them being a statement of the manufacturer's attitude on price-cutting.

Among the most interesting features of this book is the discussion of the advantages and disadvantages of the exclusive agency system. The study of these points is made both from the standpoint of the manufacturer and that of the dealer and gives a comprehensive insight into the general aspects of the exclusive agency system. Among the advantages to the manufacturer are noted the active sales effort of the agent, the closer control of distribution, more reasonable competition and lower unit selling expense. To the jobber and the retailer come such advantages as greater prestige, assured business, concentrated selling effort and purchasing power, and removal of unfair competition.

The evils of the system, from the manufacturer's viewpoint, consist of dependence on the agent and loss of competition stimulus, smaller returns from advertising, and promotion of substitutes by other dealers. The dealer faces such obstacles as dependence on manufacturer's sales policy and chance of loss of agency, lower margin of profit, hindrance to desirable price reductions, losses from overstocking or shortage of supply and "knocking" by competitors.

Considerable effort has been made to determine what kinds or classes of product are best marketed through exclusive agents. The common practice in arranging terms of agency agreements is stated, and a number of representative contracts are printed in full in the appendix. The practical value of the book is increased by the addition of these contracts.

Locomotive Catechism. By Robert Grimshaw. Nine hundred forty-six pages, 5x8 in., cloth boards, 468 illustrations. Thirtieth revised and enlarged edition. Published by the Norman W. Henley Publishing Co., 2 West 45th St., New York City. Price $4.

This book, well known everywhere to firemen, engineers, trainmen, switchmen, shop hands and roundhouse men, has been brought up to date in the thirtieth edition. Especial attention has been paid to the unaflow engine, the improved superheater, the latest design of power brake, and the electric locomotive.

There are 4,000 examination questions with correct answers, including official questions used by prominent American railways in examining firemen and engineers for employment and promotion. The questions are strictly practical and for that reason possess a very definite value for the railroad man. They deal with the design, construction, running and repair of all kinds of locomotives. Every man working with locomotives can add materially to his knowledge and efficiency by studying Mr. Grimshaw's book.

The Foreman and the Suggestion Box—Discussion

By W. Roland Needham
Goodmayes, England.

Frederick A. Pope, writing upon the above subject on page 572, Vol. 58, of *American Machinist*, makes out an excellent case from his particular point of view, but I am strongly of the opinion that no one point of view, however broad, can be entirely comprehensive. Much depends upon the mentality of the men themselves, of the foremen, and of those responsible to the management.

In one firm with which I have been intimately acquainted, suggestions are expressly solicited. Those offering their ideas do so quite openly, giving name and department. Approved suggestions are accepted and paid for in cash, and in addition the successful ones are specially mentioned in the company's quarterly periodical, together with the nature of the suggestion and the amount of the award. A pleasing feature of the system is that when an idea is turned down a reasoned statement is supplied. If an idea, as distinct from its immediate application, promises well, due credit is given for it.

In brief, the management welcomes suggestions and takes pains to let the fact be known. There is thus a healthy rivalry between the departments, and the heads of departments and foremen enter into the spirit and play the game fairly. Where such conditions prevail, Mr. Pope's ideal is achieved.

Where, however, the management is keen for improvement and the foremen prove the stumbling block, two main alternatives offer: there is the sealed suggestion box system, which cannot be expected to work very successfully where there is a big inertia drag to overcome, or the management can make it known quite plainly that the foremen have been told that suggestions are invited from the operatives in their respective departments, that it is up to them to encourage their men and that progress shown will be adjudged a department success. When the individual foreman once realizes that his co-operation and support can help his men to make good, not only will the team work improve but he will know something of the scoutmaster's pride in the success of his troop.

There is the case, however, where not only is the foreman apathetic if not entirely in opposition, but the management itself is indifferent. In such a state of affairs, unless the whole thing is allowed to fizzle out, the closed suggestion box seems to be the most practicable method.

The question of mentality looms very large here, as almost everywhere. Once men's imaginations are fired, things begin to happen. A little sympathy will show them that they are kin. It is good business, too.

The Elements of Production Grinding

By ELLSWORTH SHELDON
New England Editor, *American Machinist*

The third article—The selection of grinding wheels—Effect of grain and grade—Wheel and work speeds—Relation of the various factors

IN NO other branch of our industry do the quantity and quality of work turned out depend upon so many factors, all of which are interdependent, as in production grinding. Factors to be considered are: the grain and grade of the wheel, the diameter and rotative speed of wheel, diameter and rotative speed of work, nature of material to be ground, nature of the abrasive with which it is to be ground, amount of stock to be removed, finish required, and last but by no means least the condition of the machine upon which the work is to be done. A material change in any one of these factors is sure to affect all the others.

THERE is nothing mysterious about a grinding wheel, even though the art of grinding seems to be enveloped in a fog of mystery. Why, then, should a set of conditions under which excellent results are secured in one shop prove to be so unsatisfactory in another? Why does one expert operator reach a maximum production upon a given machine and piece of work, with a wheel that another operator, equally expert and capable of turning out equally good results, says is wholly unsuitable? The answer to these questions lies in the fact that successful grinding involves so many factors, all of which are interdependent, that it is difficult to determine when all of them are duplicated.

The kind of abrasive to be used, whether silicon carbide or aluminous oxide, may fairly be determined by the nature of the material to be ground. This does not mean that certain materials cannot be ground with one abrasive and can be ground with the other, for, because of the close relationship of all factors concerned, we may compensate in some degree for the use of the wrong abrasive by altering other conditions to suit.

The principal difference in the physical characteristics of the two abrasives is that while silicon carbide is slightly harder than aluminous oxide it is also more brittle, and therefore it would logically follow that it should be used on materials that offer less resistance to the cutting action of the grains, leaving the tougher materials to the less easily broken aluminous oxide.

The Quality of Toughness

It is difficult to say just what constitutes this quality of toughness. It is not necessarily hardness, for the use of high-speed steels has taught us that hardness alone is not the quality that offers resistance in a cutting tool. High-speed steels are not as hard as carbon steels, yet they are more difficult to cut. Manganese steel is much softer to the scleroscope than hardened tool steel, yet a tool of the latter material will make no impression upon it.

The grinding wheel is no less a cutting tool than the steel tools used on lathes or planers and it is sensitive to the same conditions as govern the latter; therefore in deciding upon what kind of a wheel to use upon a given material we must look to something besides the actual hardness as the deciding factor.

In the present state of the grinding art it is difficult to say just what this quality is, but from many experiments conducted by well-known manufacturers of grinding wheels and machinery it has been found that the tensile strength of the material to be ground is the most accurate index of its power of resistance to the wheel, and this quality is the one commonly accepted to decide the question as to which kind of abrasive to use.

Among the materials for which the aluminous abrasives should be used are carbon, high-speed and the various alloy-steels, annealed malleable-iron, wrought iron, tough bronzes and tungsten. For grinding gray iron, chilled iron, brass, soft bronze, aluminum, copper and the softer materials generally, the silicon carbide abrasives will be found to give the best results. From the above-mentioned experiments, in which many wheels were thoroughly tried out upon various materials and under all conditions, it has been determined that materials having a tensile strength of above 50,000 lb. per sq.in. of section should be ground with the aluminous abrasives, while for those below 40,000 lb. the silicon carbide should be used. This leaves a rather wide debatable margin, and for materials the tensile strength of which falls within the uncertain range, only individual experiment can be relied upon to determine the selection.

The proper size of grain to use upon a given job depends upon many conditions, among which are relative hardness of material to be ground and quality of finish desired upon the work. In general it may be said that the less refined the work the coarser may be the grain of the wheel, yet this does not necessarily follow, as a very fine finish indeed may be secured with a coarse grained wheel if other conditions are right.

To gain a proper understanding of the action of the abrasive grains in service, let us consider a disk of steel having a single tooth, or cutter, inserted in the

periphery. If the disk be held stationary with the cutting point in contact with the work and the latter revolved against it, the point will curl a single continuous chip before it, and the thickness of the chip will be dependent upon the distance that the cutting point projects from the disk. If the disk is revolved rapidly and the work slowly the material of the latter will be cut away in a series of triangular chips, each beginning in a sharp point where the cutter enters and terminating in a blunt end as the cutter passes out of contact with the work.

The thickness of chip will be in proportion to several things; it will be less if the speed of the disk is relatively high and greater as the speed becomes slower; similarly, it will increase or decrease as the advance of the work becomes fast or slow. At a given rate of advance for both disk and work, the thickness of the chip at the blunt end will increase as the diameter of either or both disk and work become larger and will decrease as they diminish. In any case the thickness of the chip can never be more than the space between the work and the periphery of the disk will allow.

The Wheel as a Single-Tooth Circular Cutter

A grinding wheel is such a disk, not with a single tooth but with hundreds of thousands of teeth. The amount that these tools (grains) project from the periphery of the disk (chip clearance) is largely determined by the grain size. We may consider the thickness of the chip the tools can be made to cut to be dependent upon the strength of the tool, and this is determined by the nature of the abrasive. We can see that the thickness of the blunt end of the chip may be diminished by revolving the wheel faster, the work slower, or by lessening the diameter of the wheel or work.

Grain size is therefore affected by wheel speed, work speed, and by relative diameters of wheel and work. It is also affected by the condition of the machine upon which the work is done. A fine grained wheel may be used effectively at a high velocity and may not be at all satisfactory when driven at a slower rate of speed, for the reason that the number of chips removed in a given time would be greatly increased and the thickness of the individual chips thereby lessened. Finer grained wheels may be used when wheel and work diameters are small than when both are large. Finer grained wheels may be used at slow work-speeds than at fast ones. Finer grained wheels can be used on external cylindrical work than upon flat or internal work, and a fine grained wheel may be made to counteract to some extent the evils introduced by a faulty condition of the machine.

Fine grained wheels should be used upon soft materials that exhibit a tendency to cling to the surface of the wheel. This trouble is technically known as "loading," and while with some materials it cannot be entirely eliminated, changing from the wheel in use to one of finer grain may reduce it materially.

Combination wheels may be used very effectively upon work of such nature that it is desirable to take off a considerable amount of stock quickly and still leave a good finish. This is not infrequently the case when the work is so heavy as to make it inconvenient to pass it through two operations.

With a 24-60 grain wheel such work can be reduced almost to the required size and then by redressing the wheel with two or three passes of a blunt diamond, an excellent finish may be obtained. By the time the finishing cut has been completed, the wheel will be in condition to take the roughing cut off the next piece, after which it should be again redressed to do the finishing.

In selecting a wheel for a given job, the grade is a very important consideration as it affects more conditions and to a greater degree than any other factor. To say that a work piece of hard material requires a soft bonded wheel and *vice versa* is quite correct, but tells only a small part of the story. A relatively soft bonded wheel may become an apparently hard bonded one by merely increasing the surface speed at which it is running. The same condition may be brought about by changing from a work piece of small diameter to one of larger diameter and adjusting the number of revolutions per minute to maintain the same surface speed of work, or, with the same work piece, reducing its surface speed. Conversely, a hard bond automatically becomes a soft one as the wheel diminishes in diameter unless compensation is made therefor by increasing the rotative speed of the wheel spindle or the surface speed of the work.

Two wheels of the same grade-letter are not necessarily exactly alike in the matter of hardness, even though both are from the same maker. The operation of grading is entirely manual and much depends upon the skill and judgment of the grader. The grading tool is a cross between a screwdriver and a blunt hand-chisel, and the manner of using it is to force it into the wheel with a twisting motion, the resistance offered to the tool by the wheel being the grader's sole means of knowing how hard the wheel is.

The hardness of a wheel is, therefore, not an arbitrary standard. Its quality in this respect as designated by the grade letter indicated that it lies somewhere between the degrees of hardness represented by the preceding and following letters. Further, of two wheels having the same grade letter, one a silicate and the other a vitrified wheel, and presenting approximately the same degree of resistance to the grader's tool, the silicate wheel will appear to be the softer in action. The silicate wheel seems to be freer cutting and to generate less heat. This circumstance may be remembered to advantage in grinding thin or small work when trouble is experienced from undue heating.

Effect of Wheel and Work Speeds

From the foregoing it would seem that the speed at which a grinding wheel should be run is a factor not easy to establish arbitrarily. It has taken grinding machine makers and operators a long time to reach this conclusion and there is still much divergence of opinion, so much that some makers of grinding machinery so design their machines as to make no provision for changing the wheel speed, while others, by means of cones or change pulleys upon the spindle, make it comparatively easy to suit the wheel speed to the work in hand.

Though it is true that changes in work speed may be made to compensate for the reduction in wheel speed as the wheels becomes smaller in diameter from wear and redressing, such changes also bring about apparent changes in grade and it is not always expedient to make them. A designer of grinding machines has said many times to the writer, that "a change in work speed does not affect the rate of output." A change in work speed results immediately in an apparent change in grade of the wheel, and to slow the work speed without decreasing the output involves increase of arc of contact

and increases bearing pressures, which in turn react upon the wheel.

If all of our grinding machines were so rugged and all of our work so heavy that we could always gage the depth of cut to suit the rate of speed at which the wheel is running, the necessity for variable wheel speeds would disappear and we could make all compensations through the medium of the change gears of the work head; but, unfortunately, much of our work will not lend itself to this method of compensation and we are, therefore, often compelled to vary the wheel speed to suit other conditions.

Five thousand feet per minute was long ago established as the proper speed at which to drive a grinding wheel, but it is difficult today to get grinding machine operators to say just why this speed is correct and very easy to find such men advocating wheel speeds ranging from 3,500 to 7,000 ft. per min. for various classes of work. The best we can do is to consider the 5,000-ft. rate as the basis or point of departure from which to reckon the speed that will give us the best results and alter it as may be necessary to suit the work in hand.

The effect of a wheel that is running too fast is to burn or glaze the work, and to counteract it we must increase the work speed or reduce the depth of cut, or both. This burning or glazing is also the effect of a wheel that is too hard for the work, and it may in this case be corrected by changing to a softer wheel.

Wheel speed may, therefore be considered, within limitations, as a corrective factor to be applied for the purpose of making a hard bonded wheel act as a softer one or *vice versa.* It is the least proportionately effective of the variable factors, for it requires a change of approximately 1,000 ft. per min. to produce the same effect upon the work as would be caused by a change of one grade in the matter of wheel hardness.

Physical conditions limit the range of application sharply, for the reason that the bursting strain increases as the square of the velocity, and to run a wheel at a speed much faster than it is rated by its makers is to introduce a hazard that cannot be tolerated.

"Arc of contact" is a term applied to the actual length of the wheel's periphery in contact with the work and has no connection with "area of contact" which applies only to cup or cylindrical wheels that grind upon the face. It is a term directly related to "depth of cut" and has nothing to do with the width of the wheel.

Arc of Contact

Arc of contact is smallest upon round work when wheel and work are of minimum diameter, increasing as the diameter of either or both increases. Flat work may be regarded as of infinite diameter and the arc of contact increases or decreases directly with the diameter of the wheel. When the work is concave the condition has changed from external to internal grinding and the arc of contact becomes greater as the wheel increases or the work decreases in diameter.

Arc of contact affects the grain as well as the grade of the wheel, and the reason is not far to seek if we remember our experiment with the steel disk. Each particle of abrasive in the periphery of a grinding wheel in action is cutting a small triangular chip from the surface of the work and these chips are necessarily carried through the arc of contact before they can escape. Longer contact will clog the wheel more quickly and make it act as would a finer grained wheel upon the shorter arc.

The term "area of contact" is used only in connection with cup or cylindrical wheels, in which form the active grinding surface is the face of the wheel. Such wheels are used on several types of surface- and face-grinding machines whereon the area of contact may easily cover half the working face of the wheel. In this case, as in cylindrical grinding, the chips must be swept over the entire area before they can be expelled, and therefore the wheels used are much coarser in grain and softer in grade than the average of wheels used for cylindrical grinding.

In selecting wheels for this type of machine, the same conditions are observed in respect to the nature of the abrasive. The matter of grain and grade is determined by the superficial area of the work. If the piece is wide it will be necessary to use the coarser and softer wheels, while if it is narrow, harder bonds and finer grains may be selected.

A rough, uneven surface to be ground demands a wheel harder than the nature of the material would naturally require, for the reason that such a surface will wear away the wheel too rapidly. For such work it is advisable to make two operations and change to the wheel normal to the material as soon as the roughness has been reduced.

In surface-grinding machines of this type, provision is seldom made for changing the wheel or work speeds, and the area of contact is arbitrarily imposed by the size and shape of the work. Therefore the variable factors are limited to the characteristics of the wheel itself.

Tests of Bronze, Duralumin and Electron Metals

One of the papers presented at the 26th annual meeting of the American Society for Testing Materials, held at Atlantic City, June 25 to 29, 1923, dealt with the resistance of manganese bronze, duralumin and electron metals to alternating stresses. This paper is the result of an investigation made by the Engineering Division of the U. S. Army Air Service at McCook Field, Dayton, Ohio, to determine the endurance limit of duralumin bar stock as rolled, annealed and tempered. It also includes similar investigation on manganese bronze and electron metal. Tests were made on rotating steam machines of the same type as used in the fatigue investigation at the University of Illinois and on the same type of specimens.

The endurance limits of the metals tested are as follows:

Manganese Bronze	15,000	lb. per	sq.in.
Electron Metal	17,000	"	"
Duralumin "As Received"	14,000	"	"
Duralumin tempered at 925 deg. F.	12,000	"	"
Duralumin annealed at 700 deg. F.	10,860	"	"

It is believed that the endurance limit of non-ferrous metals can not be determined by applying 10,000,000 repetitions of stress, as is the case with most steels. This is borne out by tests in which failures have been obtained at 30, 50, 80 and 100 million repetitions. In some cases, it may be necessary to go as high as 200 to 400 million repetitions of stress, as was the case for duralumin.

The endurance limits of the non-ferrous metals tested, do not seem to bear any definite relation to other physical properties. Difficulties were also encountered in adapting types of machine and of specimens which were primarily designed for steel, to light aluminum alloys.

World Trade in Metal Working Machinery—Imports

Prepared by Industrial Machinery Division, Bureau of Foreign and Domestic Commerce

United Kingdom, 1921

Supplement to table published on page 805, Vol. 57.

Countries	Quantity Tons	Value, £	Number of Pieces
Sweden	42	6,731	76
Germany	797	79,232	1,462
Netherlands	79	16,458	223
Belgium	7	1,421	4
Denmark	42	8,298	67
France	45	6,595	69
Switzerland	24	15,674	109
United States of America	1,761	460,283	2,089
British Possessions	2	1,054	4
Other Foreign Countries	201	36,459	723
Total	3,000	632,205	4,826

Value of £ at parity is $4.8665.

Argentine Republic, 1918-20

Imports of Lathes ("Tornos")

Supplement to table published on page 188, Vol. 58.

Country of Origin	1918 Kilos	1919 Kilos	1920 Kilos
Germany	.....	843	49,795
Austria-Hungary (Austria only from 1920 on)	.....	.....	2,038
Belgium	.....	.....	30
Spain	3,293	5,452	3,651
United States	45,826	68,884	212,470
France	117	52	7,303
Italy	.....	.....	87
Netherlands	.....	.....	639
United Kingdom	1,591	16,683	38,660
Sweden	30	151	3,662
Switzerland	.....	943	.....
Denmark	.....	.....	5,831
Brazil	.....	.....	.....
Uruguay	105	.....	.....
Chile	.....	.....	.....
Norway	.....	.....	.....
Japan	.....	24	.....
Total of Imports	56,962	93,032	324,166

Philippine Islands, 1921

Supplement to table published on page 266, Vol. 58.

Country of Origin	Dollars
United States	213,848
United Kingdom	4,405
Hongkong	76
Belgium	.....
France	.....
Germany	2,352
Hawaii	.....
Total of Imports	220,681

Spain, 1920

Supplement to table published on page 82, Vol. 58.

Country of Origin	Kilograms	Peseta
Canary Islands	.....	.....
Germany	497,351	805,709
Algiers	.....	.....
Argentina	.....	.....
Austria-Hungary	.....	.....
Belgium	28,316	45,872
Denmark	771	1,249
United States	204,235	330,862
France	254,199	411,802
Great Britain	165,161	267,496
Holland	22,822	36,972
Italy	13,147	21,298
Morocco (Spanish)	.....	.....
Norway	6,856	11,107
Portugal	117	189
Sweden	124,144	201,113
Switzerland	36,273	58,762
Other Countries	.....	.....
Turkey	465	753
Totals	1,353,817	2,193,184

Par value of peseta is 19.5c.

Chile, 1921

Supplement to table published on page 1003, Vol. 57.

Country of Origin	Quantity Kilos	Value Pesos
Great Britain	56,988	77,166
Germany	22,534	25,839
United States	17,873	39,209
France	5,300	2,000
Belgium	.....	.....
Argentine Republic	.....	.....
Italy	.....	.....
Total of Imports	102,695	144,214

Germany, 1921

Supplement to table published on page 840, Vol. 57.

Country	Quantity 100 kgs.	Value 1,000 Marks
Belgium	.....	
Denmark	.....	
France	.....	
Great Britain	.....	
Italy	.....	
Netherlands	4,719	
Norway	.....	
Austria (formerly Austria-Hungary)	1,660	
Sweden	.....	
Switzerland	2,027	
U. S. of America	2,077	
Other countries	3,051	
Total	13,534	257,981

Total no. of pieces: 1,726

Denmark, 1921

Supplement to table published on page 924, Vol. 57.

Country or Region	100 Kilograms
Hamburg	.....
Germany	.....
Great Britain	801
Norway	107
Sweden	1,544
Holland	.....
Switzerland	.....
France	72
Austria-Hungary	.....
United States	212
Other or Unknown Countries	142
Russia	13,020
Total Quantity (100 kgs.)	15,898

Sweden, 1920

Supplement to table published on pages 876-7, Vol. 57.

Country	Kilograms	Kroner
Norway	2,267	2,140
Finland	.....	.....
Russia	2,290,145	3,301,887
Denmark	125,096	225,217
Germany	.....	.....
Netherlands	.....	.....
Great Britain	36,267	170,144
France	.....	.....
Switzerland	.....	.....
Austria	.....	.....
Belgium	.....	.....
United States of America	486,958	2,115,312
Other Countries	94,459	312,047
Total	3,035,192	6,126,711

Par value of krone is 26.80c.

Japan, 1921

Supplement to table published on page 112, Vol. 58

Country	Piculs	Yen
Kwantung Province	41	5,000
Asiatic Russia	86	7,000
Great Britain	47,431	3,375,000
France	265	41,000
Germany	2,327	213,000
Belgium	157	12,000
Italy	.....	.....
Switzerland	120	35,000
Holland	10	1,000
Sweden	639	71,000
United States	68,240	7,211,000
Total	119,317	10,971,000

1 picul = 133⅓ lb.
1 yen = 49.85c.

Automotive Service Methods and Equipment

By HOWARD CAMPBELL
Western Editor, *American Machinist*

XVIII. Good tools considered a paying investment —To save time first law of this shop—Gages and fixtures that are used—Miscellaneous service tools

BELIEVING that good service consists of two major features, speed and quality, the management of the Chicago branch of the Cadillac Motor Car Co. is continually developing special tools for specific operations. The special tool equipment of the Cadillac shop represents at the present time an investment of approximately $75,000.

A view of the tool room is shown in Fig. 1. The machines are all painted light gray, a background against which dirt and grease contrast strikingly, thus encouraging a tendency to keep the machinery clean. All belts are guarded to prevent accident and benches are provided for tools and parts so that everything can be kept off the floor. One of the most interesting tools in the shop is the camshaft grinding attachment shown in Fig. 2. It can be applied to a lathe or removed in a few minutes. The gear *A*, which is bored to the same size as a camshaft end bearing, is slipped over the end of the customer's camshaft and locked in place by means of a setscrew. The shaft is then swung between the centers of the lathe, the dog, which is attached to the gear, fitting into the slot in the faceplate as shown. The master camshaft *B* turns in bronze bushings in two brackets that are bolted to the bed of the machine. The gear *C* is keyed to the shaft, the train being completed by a small intermediate gear so that the two shafts move simultaneously and in the same direction.

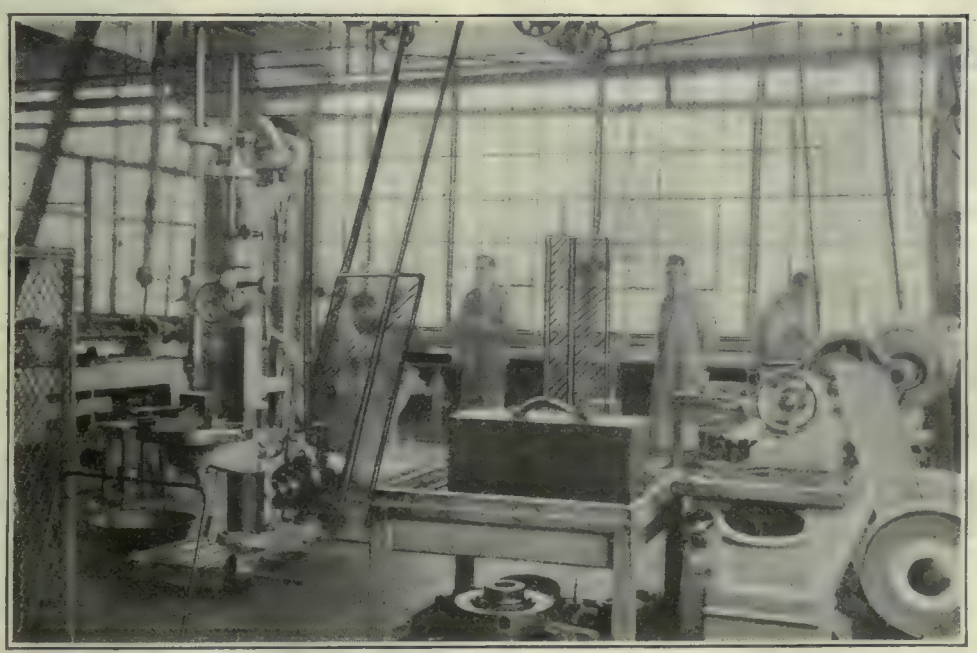


FIG. 1—TOOL ROOM, CADILLAC SERVICE STATION

The cross-slide of the machine is replaced with a slide that carries the master cam roller *D* and the small grinding wheel *E*, together with the motor by which it is driven. A weight attached to the cable *F* keeps the roller *D* in contact with the master cam, so that as the shafts revolve, the grinding wheel moves backward and forward with the master roller, thus grinding the cam on the customer's shaft to an exact duplicate of the master cam. The grinding wheel is a 3x¾ in., 36-P, Norton, and the motor is ⅛ hp., 3,400 r.p.m., made by the Bodine Electric Co., Chicago, Ill. The amount of stock removed is usually from 0.002 in. to 0.003 in. Ninety per cent of the worn camshafts that come into the shop are reclaimed with this tool. The time required is approximately two hours and the cost is only about 25 per cent of the cost of a new camshaft.

The tool shown in Fig. 3 is used for grinding the contact points on rocker arms, one of which can be seen in the machine at *A*. As there are two holes in the piece, it is located on two studs in the swivel arm *B*. The arm swings in a vertical plane on a shaft through the center, and the locating studs are so placed that the contact point on the rocker arm is just 4½ in. from the shaft. When the swivel arm is moved up and down, by means of the handle *C*, the contact point is ground on a 4½ in. radius. A wheel dresser *D* can be seen attached to a slide that is controlled by means of a small hand wheel. As the wheel wears down, the swivel arm is adjusted by loosening the cap screw by which the arm is attached to the bracket that supports it. The bracket can be adjusted to right or left.

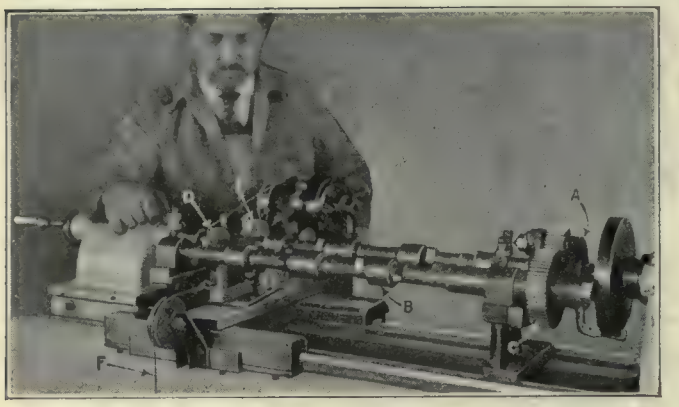


FIG. 2—CAM GRINDING ATTACHMENT FOR LATHE

Valves can be both straightened and checked for straightness on the fixture shown in Fig. 4. The valve is suspended between centers as shown. Then arm *A* is allowed to rest on the valve stem. The valve is rotated, and if it is not straight, the arm *A* will move up and down with the bend in the valve and the small pointer *B* will indicate the amount of variation on the

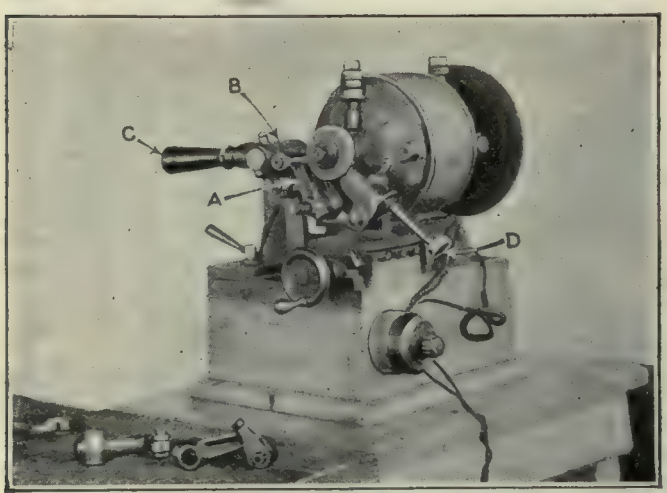


FIG. 3—MACHINE FOR GRINDING CONTACT POINTS ON ROCKER ARMS

vertical scale just back of it. The centers can be withdrawn, allowing the valve to drop into two Vs, and the arm *A* is then used as a straightening bar. The operations are repeated in that sequence until the valve stem is straight.

At the left of the valve head an indicator can be seen, which is adjustable so that it can be swung around to bring the finger in contact with the angle on the valve-

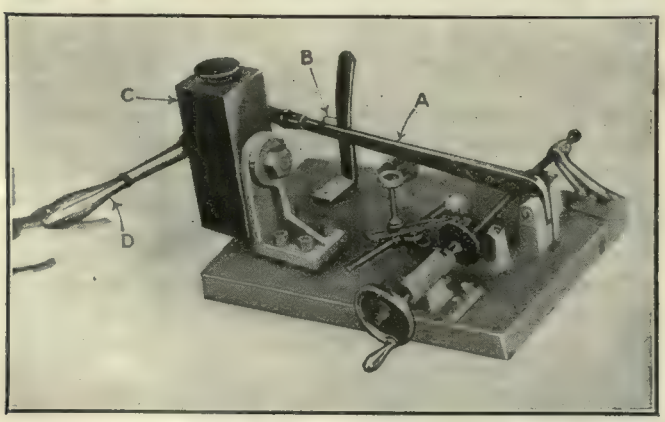


FIG. 4—TOOL FOR TESTING AND STRAIGHTENING VALVES

seat. This indicates whether or not the head is true with the valve-stem. If the head is not true, the valve is placed in the set of blocks *C*, bored with half of the hole in each block. The clearance and the proper angle for the valve seat are provided at the top end of the blocks as shown. The valve is placed in the hole between the blocks, with the head projecting a short distance from the top and the stem is clamped tightly

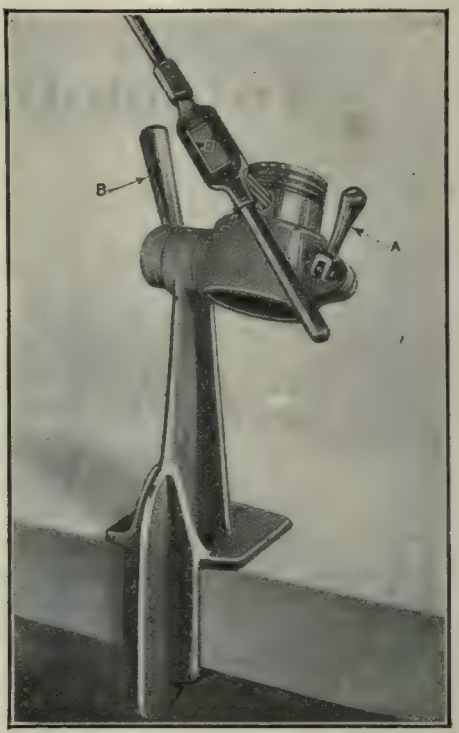


FIG. 5—PISTON-HOLDING FIXTURE

by means of the handle *D*. Then the head is struck squarely and sufficiently hard to drive it down into the seat in the blocks. One blow is usually enough to straighten the head.

The fixture illustrated in Fig. 5 is for holding pistons while the piston pin hole is being reamed, as shown, or for holding pistons while the rods are assembled to them. It is made of cast iron, and can be clamped to a table or bench. Turning the handle *A* closes the split in the ring in which the piston is held so that the piston

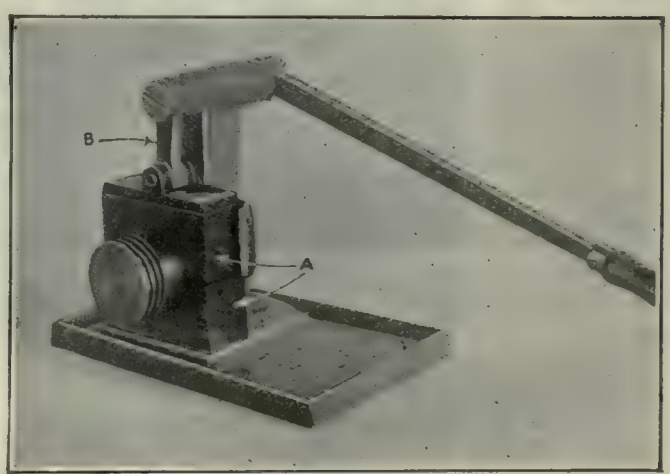


FIG. 6—PISTON STRAIGHTENING TOOL

is held firmly without scratching or distorting it. The handle *B* screws onto a stud that is a part of the ring and which projects through a hole in the bracket. By loosening the handle *B*, the piston can be turned to any angle in a vertical plane.

Every mechanic knows that a piston may be ground ever so carefully, yet it will be slightly heavier through the bosses than through the sides where the thin walls have no support. Consequently most pistons have to be straightened after they are ground. The tool indicated in Fig. 6 straightens them easily and quickly. The

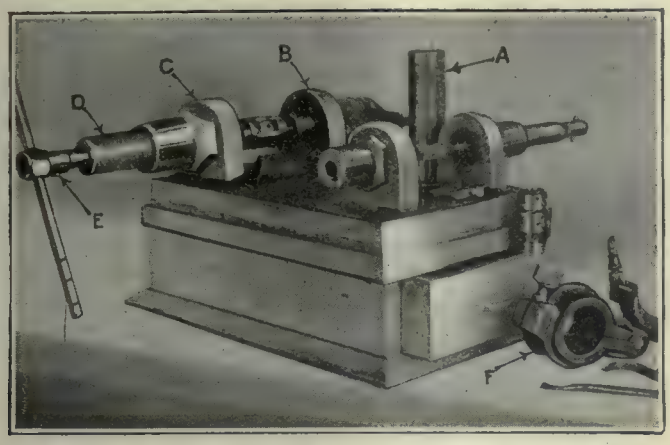


FIG. 7—CONNECTING ROD REAMING FIXTURE

two cold rolled steel blocks *A* are bored out to the diameter of a piston, as shown, then about $\frac{1}{16}$ in. is milled off the faces of the blocks where they come together, to provide necessary clearance. The hole is relieved also, so that about $1\frac{1}{4}$ in. of surface is left to contact with the upper and lower sides of the piston.

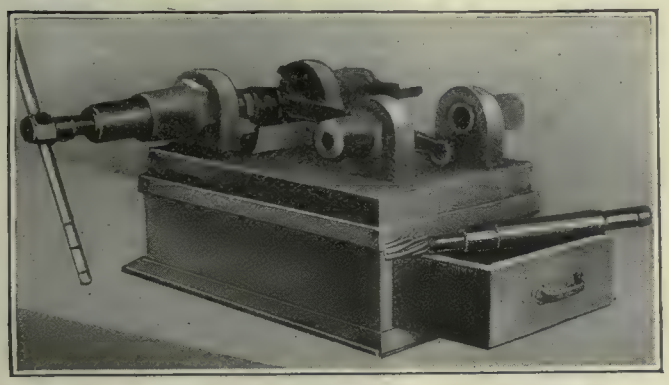


FIG. 8—SHOWING CONNECTING ROD IN PLACE

Dowel pins insure proper alignment of the blocks. The upper block is attached to the arm *B*, which is suspended from an eccentric shaft. Raising the lever turns the shaft and raises the upper block approximately $\frac{1}{4}$ in. Any desired amount of pressure can be applied with this tool and a piston can be quickly straightened.

An excellent tool for reaming connecting rods or crank case main bearings is shown in Fig. 7. A pilot sleeve, similar to the one shown at *A*, is inserted into the bracket *B* and a small clamp is attached by means of a setscrew to the outer end of the sleeve. To this clamp is attached a small steel cable that carries a weight, the cable being swung over a pulley in such a manner that the weight tends to pull the sleeve in toward the center of the fixture. The outside diameter of the sleeve is such that the sleeve is a sliding fit in the connecting rod bearing before the bearing is reamed. A hole through the axis of the sleeve is also a sliding fit for the pilot on the end of the reamer.

The bracket *C* is bored slightly larger than the reamer, so that the reamer can be inserted without injury to the blades. The sleeve *D* is a sliding fit in the bracket and also on the shank of the reamer. This sleeve can be removed from the reamer-shank when necessary by knocking out the taper pin *E* and removing the piece that carries the handle. The connecting rod that is to be reamed is placed in position as shown in Fig. 8, with the sleeve entering from one side and the reamer from the other. This keeps the bearing in alignment while the reamer is

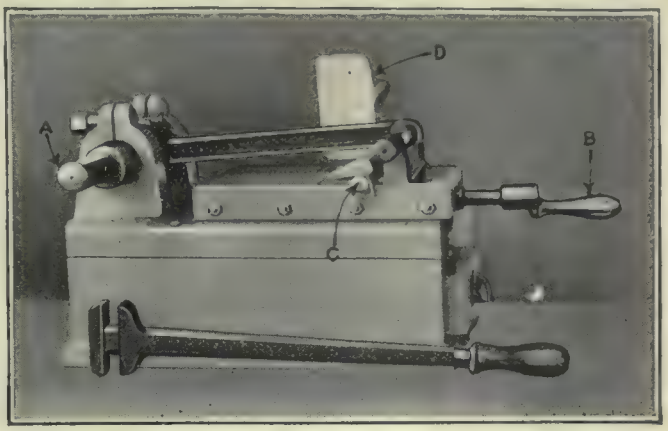


FIG. 9—CONNECTING ROD STRAIGHTENING FIXTURE

entering, and as it proceeds into the hole, it pushes the sleeve out on the opposite side.

The clamp *F*, Fig. 7, will hold a main bearing that is to be reamed before assembling. The clamp is made in two halves, hinged together, a swinging screw and thumb nut being provided to lock the clamp around the bearing. The convenience of this fixture is self-evident.

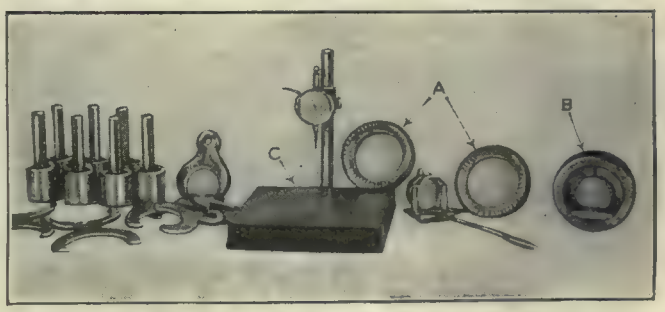


FIG. 10—SOME TIME-SAVING GAGES

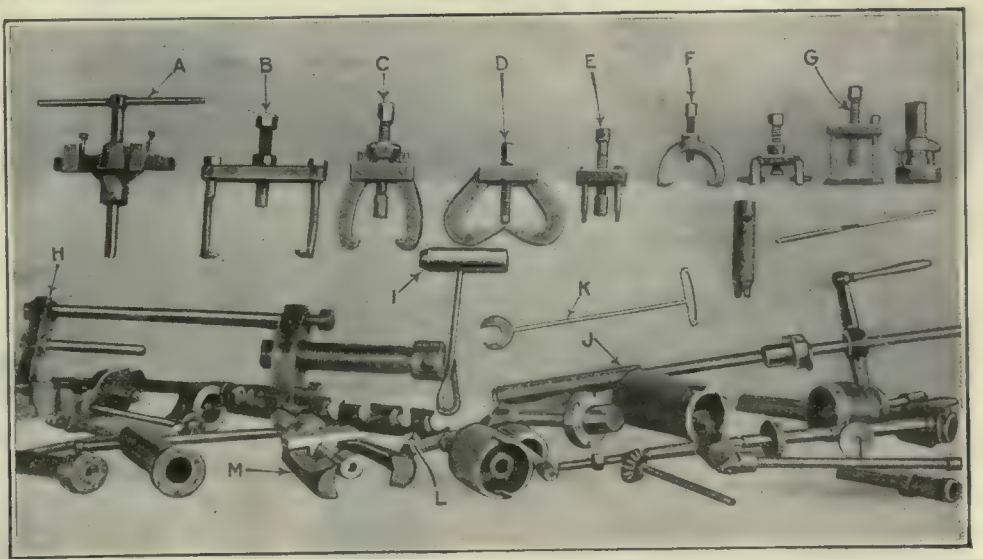


FIG. 11—MISCELLANEOUS SERVICE TOOLS

A fixture for testing and straightening connecting rods is shown in Fig. 9. The large end of the rod is held in place by the hardened and ground plug *A*, and a straight pin is placed through the small end of the rod. This pin is also hardened and ground to a size that makes it a push fit in the piston pin hole. The ends of the pin rest on the ground and polished surfaces of two blocks of equal height, and if there is any twist in the rod, one end of the pin will be raised accordingly. Operation of the handle *B* feeds the slide on which the blocks are located in so that the pin will be brought into contact with the surfaces on the back sides of the blocks, and the rod can be inspected for bend. If the rod has to be straightened, the knurled head of the screw *C* is turned, bringing a rest up under the rod so that the small end of the rod will be raised clear of the blocks. Then the bar shown resting at the side of the fixture is used to straighten the rod as desired. Provision is made for taking up any wear in the brackets in the head end of the fixture, as shown, and the polished surface plate *D* can be lowered into horizontal position so that the piston and rod can be tested for straightness after assembling.

Time-Saving Gages

The two hardened and ground steel rings shown at *A*, Fig. 10, are master gages for over-size piston rings. When a cylinder is bored over-size, it is bored to a standard dimension, which is the same as that to which the rings are ground. Thus by using the rings, a mechanic can file the piston rings to the correct size without having to be running back and forth to try them in the cylinder. The ring *B* is a master for cylinder bores. By trying the cylinder bore indicator in this ring and then in the cylinder, any variation from the correct size can be instantly noticed. The surface plate *C*, to which the dial indicator is attached, is used for testing piston rings for thickness, or for testing anything else where an indicator of this kind can be used.

The set of snap gages shown at the left of the illustration is used for checking crankshaft throws. There are five of these gages and they are graduated downward by degrees from standard, which is 1.375 in. When a shaft is 0.005 in. smaller than standard, it is returned or discarded. For each snap gage a corresponding plug gage is made which is 0.002 in. larger than the snap gage, to allow for clearance, and the crankshaft bearings are reamed to fit these plugs. The plugs and gages are numbered, each corresponding plug and snap gage bearing the same number.

A miscellaneous collection of tools is shown in Fig. 11, many of which will be familiar to every repair man. The tool shown at *A* is for reaming connecting rods before the bearings are assembled. The clamps shown on either side hold the rod and fixture solidly together while the reaming operation is being performed. The tool *B* is for pulling off cam gears. Another kind of cam-gear puller is shown at *C*, the advantage in this kind of tool being that as the bolt is screwed in, the round piece with the taper turned on it forces the legs of the puller together, thus giving a better hold on the gear. The tool *D* is a fan puller, the operation of which is obvious. The tool *E* is a plug puller and the tool *F* is a steering arm puller. The tool *G* is for removing generator couplings. The large tool *H* is used to remove spindle bolts from front axles. The puller is placed in position with the large screw, which is hollow, over the head of the bolt. In the opposite end of the puller is a stud, the upper end of which engages the lower end of the bolt. As the screw is turned, the stud is pulled upward, forcing the bolt up into the hollow screw, from which it is afterward removed.

It is sometimes necessary, when working on a rear axle that has been removed from a car, to drive the torsion rod bolts. The tool *I* is used to protect the thread when this is necessary. The end of the tool, on which a taper has been turned, is placed against the end of the bolt and the driving is done against the opposite end of the tool, so that no pounding will come on the thread of the bolt.

Applying Oil Retaining Washers

It occasionally happens that new felt washers have to be put into the rear axle, which is usually a several hours' job. A matter of approximately two hours can be saved by using the tool shown at *J* for this operation. The axle shaft is removed from the rear axle and the cover is removed from the differential gear carrier. Then the shaft of the tool indicated is inserted through the axle until the end projects into the gear box. By reaching down into the gear box now, one can place the felt washers over the end of the shaft. Then the tool *K* is inserted through the cover-hole and the horseshoe-shaped piece on the end of the handle is slipped into the recess in the end of the shaft so as to prevent the washers from slipping off. Turning the large handle on the threaded end of the shaft pulls the shaft outward and pulls the felt washers into place. Once in the required position, the tool *K* is removed, the shaft is withdrawn, and the job is done. Without this tool, the whole rear end has to be torn apart.

The piece *L* is a tool that is used to lift all the valves at once, so that work can be done without removing them. The edges of the recesses shown are machined down so that they can be easily slipped under the heads of the valves; then the whole thing is raised by turning the screws shown. The tool *M* is a puller for the spiral gear on the crank shaft.

(Conclusion of this article will be published next week)

Swedish Labor Unrest Reflected in Reduced Iron Output

The labor unrest which has obtained in Sweden since the beginning of the year is reflected in the greatly reduced output of the iron industry, Assistant Trade Commissioner H. Sorenson reports to the Department of Commerce. The entire pig iron production in Sweden for the first three months of 1923 amounted to only 37,300 metric tons as against 57,400 tons for the corresponding period of 1922, and 186,100 tons for 1914, according to the report just published by the Swedish Iron Works Association.

As a result of the general lock-out situation, there has been considerable drop in the number of furnaces in operation. Of 132 blast furnaces only 18 were active, of 204 Lancashire furnaces but 29 were working, none of the 18 Bessemer furnaces produced, 2 of the 82 Martin furnaces were in blast and 3 of the 27 electric steel furnaces were operating. Exports during the quarter have, however, improved, the total quantity of all kinds of iron and steel shipped during that period amounting to 48,600 tons as compared with 37,400 tons for the first quarter of 1922. The increase was due solely to pig iron, of which 22,600 tons were exported.

Modern Methods of Thread Measurement

By CHARLES L. BURNS
Production Research Engineer, Wright Aeronautical Corporation

A comparison of ring gages — The three-wire and projection methods—Defects of the former and economy of the latter

HOW OFTEN when we hear an inspector of threaded parts say, "Rejected because of loose fit to gage," or, "Alter because too tight to gage," do we stop to inquire whether or not his means of inspection are trustworthy? We learned, during our workshop days, to judge the various fits by the "feel" of the shaft in the hole, and so accustomed have we become to this method of judging, that the words "fit" and "feel" are considered by us almost as synonymous. But it shows a lack of analysis of the factors essential to the perfect mating of two threaded parts, not to discriminate between "feel" and "fit" where screw threads are concerned. This has such an important bearing on the choice of thread gaging methods that I shall endeavor to make an analysis of these factors before considering the relative merits of several gaging methods.

In each of two mating screws there are five things that have to be correct if a perfect fit is to be obtained. These are the major diameter, pitch diameter, minor diameter, pitch or thread, and angle of thread, all of which are illustrated in Fig. 1.

An ordinary screw and nut used in the assembly of mechanical equipment is chiefly intended to resist end pressure, and therefore must possess sufficient mechanical strength to do this. If we examine closely two tight fitting threads, we will see that the tightness is made up of a combination of inaccuracies rather than by close fitting and a little thought will show that it is possible to have a tight fit between a screw which is hopelessly undersize and a nut which would pass inspection. Fig. 2 shows such a case where, through having a progressive pitch error in the screw, it is possible to get a tight fit, even though the major diam-

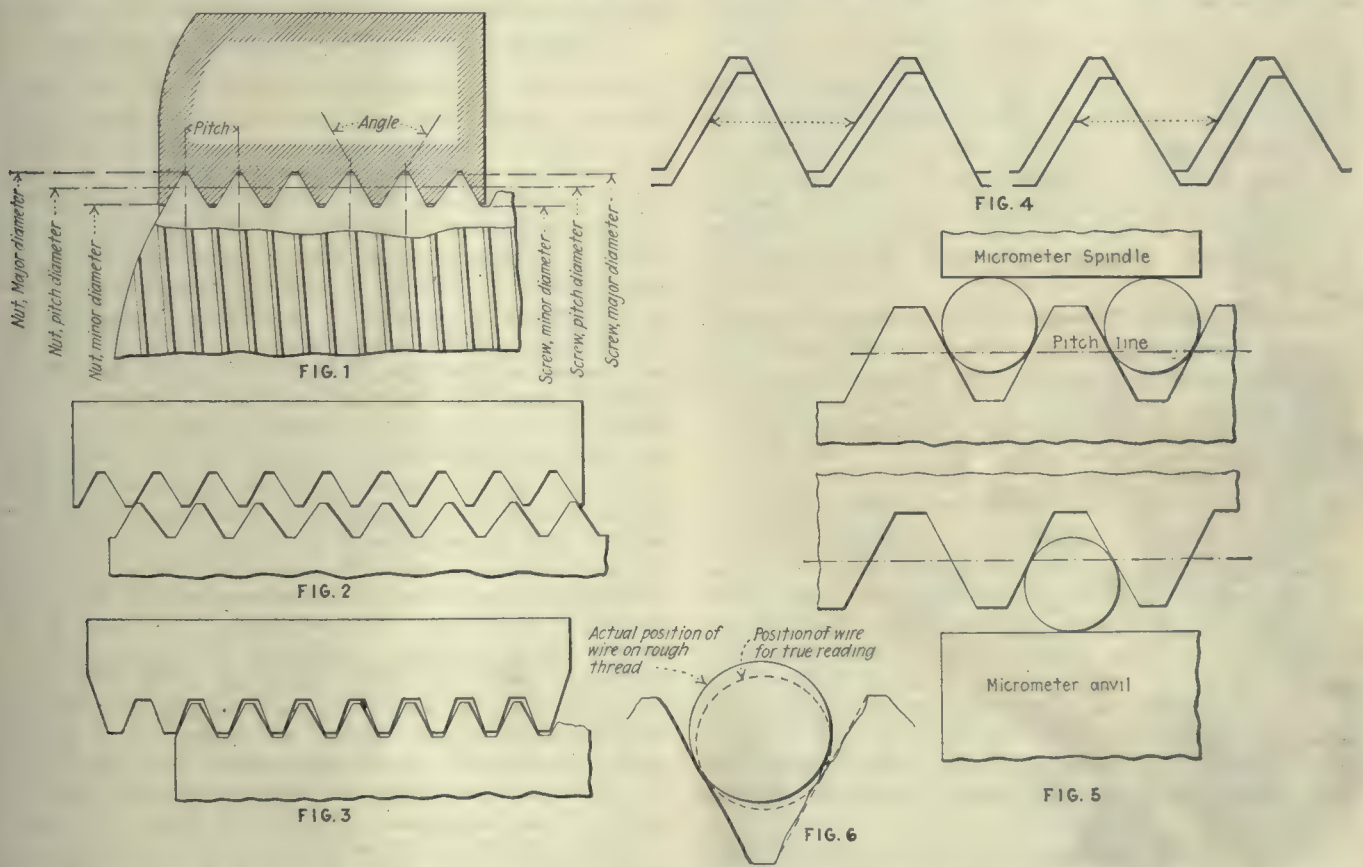


FIG. 1—THREAD ELEMENTS TO BE MEASURED. FIG. 2—EFFECT OF PROGRESSIVE PITCH ERROR. FIG. 3—EFFECT OF ERROR IN ANGLE. FIG. 4—EFFECT OF PITCH DIAMETER. FIG. 5—THE THREE-WIRE METHOD FIG. 6—ROUGH THREADS AFFECT MEASUREMENT

eter of the screw is very little larger than the minor diameter of the nut.

Such a screw would have no strength. The tightness is only secured by a deformation of the end threads, and the tighter the parts are screwed together the greater this deformation. A similar possibility is shown in Fig. 3, where an error in the angle of the thread on the screw will produce a tight fit but will give no flank contact between the mating parts and therefore little mechanical strength. These two examples, Figs. 2 and 3, should be sufficient to dispose of the general idea that "tightness" or "feel" are indicative of strength or quality of fit.

The really vital elements in screws are:

1. Pitch—the most variable of all elements and the most difficult to control, for as long as screws are made on machines with moving parts, errors will creep in, due to the clearances necessary to allow the machine to operate.
2. Angles of flank—a feature possible of control within fine limits.
3. Flatness of flank—also easy to control.
4. Pitch diameter—the plain diametral dimension which is the measurement of strength. (See Fig. 4.) The major and minor diameters are relatively unimportant, except in so far as it is important to provide such a clearance as will insure against interference between the mating parts at the crest and root.

We must accustom ourselves to thinking of qualities of screw fits as qualities of flank contact. Flank contact, as we have seen, is principally governed by the accuracy with which we make the pitch of threads and the pitch diameter. So this gives us two things—the pitch and the pitch diameter—which must be watched most carefully in thread gaging. The system we use must check these if it is to be efficient and reliable. The ideal gage, of course, will check all elements in a thread.

The most widely used methods of gaging screws are: By ring thread-gages. By three-wire system, and by projection apparatus. I proposed to consider each of these methods in the light of the previous discussion and see how far each comes up to the requirements for an efficient gaging system.

Ring Gages Least Efficient

Ring gages are probably the most widely used and yet in their usual combination of full form, "go" and "no go," they are perhaps the least efficient. They rely solely on the "feel of tightness" for their authority to accept or reject a screw. And we have seen from Fig. 2 and 3 how faulty the conclusions drawn from such a method of test may be. Such gages would accept the screws previously shown. All that is necessary to make ring gages accept too tight a screw, is to thin down the threads or reduce the pitch diameter of the screw.

For a system of ring gages to be trustworthy, no less than four separate gagings of each piece are necessary. It would require "go" and "no go" gages for the major diameter to insure that diameter is not so large as to cause interference with the crest of the thread in the nut, nor so small that the effective depth of engagement between the mating threads will be reduced below the prearranged minimum. To make sure that the minor and pitch diameters are not above the maximum, it will require a GO gage of maximum full form. To detect a pitch diameter which is smaller than the minimum, a gage which will check only that element is necessary. Such a system would be both cumbersome and expensive.

The three-wire system is one that is used very extensively in the checking of pitch diameters of thread gages. Several measuring machines have been developed around the idea of inserting accurately ground and lapped wires in the thread grooves, as in Fig. 5, and measuring over the tops of the wires with a micrometer. Though this method attacks the question at a very important point—the pitch diameter—it is only a partial check. Additional gaging or measuring has to be resorted to for the major and minor diameters, and some sort of lead testing device (which generally is an expensive and delicate instrument) has to be provided to check that most variable element, the pitch of the thread.

Even with this additional equipment, the three-wire system is beset with possibilities of error. For a true conversion of dimension over the three wires into pitch diameter, the wires should rest on the flanks of the threads at the pitch diameter line. With rough threads, this condition may not be secured because one or more of the wires may rest on rough peaks, as in Fig. 6, and false readings will be the result. Very often, also, the trailing flank of the threads will be slightly concave and again a false calculation of pitch diameter will result, this time due to the dropping of the wires into the concave surfaces.

Further Drawbacks to Three-Wire System

Disagreements between the inspector and the workman, due to difference of touch on the micrometer, are more likely to occur in measurements over wires than in almost any other cases where a micrometer is used, on account of the ease with which the small round wires can be forced into the grooves of the threads. Apart from the possibilities of error, the disadvantage of awkwardness in making three-wire measurements has to be taken into account, not forgetting the calculation necessary to convert the dimension over the wires into pitch-diameter reading. It is true that this calculation should be made in the drafting room or given in the form of a conversion table but the work has to be done and involves the possibility of error in the process.

An ideal gaging system should check all the five elements in a thread and this is what the thread comparator does by projection. Throwing the shadow of a thread (enlarged about 200 times) on to a chart consisting of two drawings of the maximum and minimum profiles of the thread (also enlarged in the same ratio as the thread shadow), enables us to see at a glance the exact conditions under which the screw will enter a good nut. The major, minor, and pitch diameters, and the angle of thread are all checked at a glance that tells whether or not the shadow of the thread being tested, lies within the boundaries formed by the maximum and minimum profiles of the chart. It is both a rapid and an accurate method.

Furthermore, the really vital element—the pitch of the thread—is tested over a distance about equal to the standard length of engagement of the screw in the nut (this length can be adjusted) and the cumulative pitch error may be detected if necessary by a simple lead testing device which can be fitted to the machine. This method of testing is quick and accurate and effectively remove the human factor so far as touch is concerned. It has the additional advantage of doing away with the necessity of scrapping gages when the limits on a part are altered. All that is needed is a new chart which can be drawn up in half an hour by any com-

petent draftsman. Internal threads over about 1 in. in diameter can also be tested by this method, by making a sulphur cast of a section of the thread and projecting the shadow of this cast on to the chart.

Another use of the thread comparator, and one which probably was not conceived by the originators of the machine, is that of providing instruction for the screw machine operators. Often, due to the application of too much pressure by the operator, the first few threads of a screw will be thin. This is detected in the shadow and it has been found that by showing the operator the shadow of his product, the cause of this defect has been removed and the workman has gone back to his job with a keener interest.

In this discussion no mention has been made of thread snap-gages or thread micrometers. These were omitted advisedly because they have the same disadvantage as the three wires—they check only the pitch diameters except in the case of some late developments of snap gages which do check all elements, but which are handicapped by the touch element as is the case with most gages.

Why Tools Crack in Hardening

AT A sectional meeting of the American Society for Steel Treating, held at Bethlehem, Pa., a paper was read by F. R. Palmer, metallurgist for the Carpenter Steel Co., Reading, Pa., which was full of meat for those responsible for the design, production and hardening of tools and cutters. Mr. Palmer's paper brought out the fact that while the analysis of the steel is the first factor in the susceptibility of the metal to strain, there are many other factors entering into the failure of steel, when the steel itself is perfectly good. The amount of carbon in the steel should practically determine the quality. As the carbon content is increased, the quality of the steel should be increased. The hazards of hardening are much greater with steel having a high carbon content than with that having a low carbon content. The amount of manganese in the metal should be taken into consideration in determining the quenching medium, and the percentage of tungsten should also be considered in this connection. Steel containing tungsten up to 4 per cent or 5 per cent should be water hardened, while that containing 8 per cent or 9 per cent should be hardened in air or oil.

The first consideration is that of quality, which includes the factors of uniformity and purity, and the next is that of design. For example, the teeth on opposite sides of a cutter should be alternated wherever possible, so that the cutter will be balanced and will therefore heat more uniformly, and keyways should be placed with an eye to the proximity of other sharp corners. If the corners of keyways can be rounded, the danger of cracking in hardening will be materially reduced. Flat surfaces are always more hazardous than round ones, as there are no projections or corners on the round surfaces.

Center Punch Marks Cause Cracks

Center punch marks made by the tool maker or layout man in the shop are also responsible for many cracks in tools. The punch pushes the metal aside as it enters the body of the piece, and the extra density of the metal at this point is responsible for many failures in the heat treatment. Dull cutters produce practically the same effect, as the dull cutting edges push up the surface of the metal, thereby setting up strains and increasing the possibility of loss in hardening. All these are cracking strains and emphasize the importance of the rule that when internal strains exceed the strength of the steel, the steel will crack.

Tools are sometimes cracked by allowing the outside of the piece to heat faster than the interior. At a certain point in the rise of the temperature—known as the critical point—the temperature suddenly lowers a few degrees and then continues rising. If the steel is heated so fast that the critical point is reached at the outside of the piece while the temperature in the interior is still rising, it naturally follows that the temperature at the outside will be rising again at the time when the temperature in the interior of the piece is dropping at the critical point. An inexperienced hardener might, judging from the temperature at the outside of the piece, decide that the piece was up to the proper hardening heat and proceed to quench it, with the result that corners or other parts of the tool will fall off, due to lack of support. If a reamer that is being treated for hardening is quenched just as soon as the outside of the piece appears to be up to the required heat, it is very likely to crack. The reamer should be "soaked" in the the heat long enough so that it will be of the same temperature all through. The pyrometer should not be depended on altogether in treating tools of this kind. The pyrometer may indicate that the proper temperature has been reached, when as a matter of fact the interior of the tool may lack several degrees of being the same temperature as the outside. Steel should not be allowed to soak in a fire of varying temperatures as this produces a coarse, uneven grain in the metal. The heat must be steady or rising. Chrome and chrome-vanadium steel should be soaked at hardening heat in order to obtain the best results.

Many Tools Ruined in Grinding Operation

The grinding operation is also responsible for many tool failures. The tool may be properly designed and carefully hardened, and then may be ruined by an incompetent grinding machine operator. If a tool cracks in the hardening, it is usually the result of a weakness in the steel, but checking is due to overheating the surface of the piece. A piece can be over-heated by taking a cut that is too heavy, by "crowding" the wheel, by allowing the feed belt to become loose, or by using a wheel that is "loaded." The wheel used may be of the proper grade and grain, but if it is used too long without dressing, the friction caused by the material that has accumulated on the surface of the wheel will overheat the surface of the work, causing expansion and resulting in fine cracks called "checks." The checking itself not only ruins the piece, but a piece may develop a crack at the least provocation.

All grinding wheel spindle belts and table feed belts should be kept taut. If a belt becomes loose, it may slip in the middle of a cut and allow the table of the machine to come to a rest with the result that the spot directly under the wheel will be almost instantly overheated. If the temperature of one spot is raised above the critical point, the grain of the metal will separate and the section will fall off the first time any strain is put upon it. A die can very easily be ruined in this manner, without the reason being apparent.

Where Do the Immigrants Go?

ANNOUNCEMENT in the New York press that many of the immigrants now entering the United States are making hasty departure for the farms and cities of the Northwest renews interest in the question as to the sections of the country which are to receive the greatly diminished supply of immigrants now being admitted to the country. The records of the movements of the new arrivals indicate that former occupation and climatic conditions still control the immigrant in determining his future abiding place in the United States.

Following Home Occupations

This is particularly noticeable in the movements of the new arrivals from northern Europe, a large percentage of the Scandinavian arrivals in the opening month of the new fiscal year having already departed for the Upper Mississippi Valley, notably the farms and cities of Minnesota, the Dakotas, Wisconsin and Illinois. With those from the countries of central and southern Europe the opportunities in the factories and mines of the North Atlantic frontage are more attractive, and the bulk of the small additions to our population made under the law which limits the number of each nationality permitted to enter will find homes in the area bounded by the Potomac and Ohio on the South and Rocky Mountains on the West.

This distribution of the new arrivals follows the custom of earlier years. Compilations by the *Trade Record* of the National City Bank of New York show that of the 14,000,000 persons of foreign birth now living in the United States, about 5,000,000 are residents of the Upper Mississippi Valley, 5,000,000 in the Middle Atlantic States, 2,000,000 in New England, about 1,000,000 in the South, and approximately a half million on the Pacific coast.

It is in this detailed study of the final distribution of the immigrants arriving in earlier years, says the *Trade Record*, that the disposition of the home seeker to select climatic conditions and occupational opportunity similar to those of his former home becomes apparent.

The last census of the United States shows the distribution by states of the 14,000,000 persons of foreign birth which still remain out of the total of more than 30,000,000 of arrivals since 1830. Of the more than 1,000,000 Scandinavians in the country in 1920, 220,000 were in the state of Minnesota, nearly 100,000 in the Dakotas, 90,000 in Wisconsin, 150,000 in Illinois, and 60,000 in Iowa, while the great manufacturing state of New York retained less than 100,000 of the more than a million entering through its doors.

Industrial Immigrants

The Germans, while seeking climatic conditions similar to those of their own country, are less devoted to agriculture than their Scandinavian neighbors, and of the 1,686,000 in the country in 1920, 295,000 were in the state of New York, 120,000 in Pennsylvania, 205,000 in Illinois, 151,000 in Wisconsin, 100,000 in Minnesota and the Dakotas.

The Poles, while accustomed to climatic conditions of northern Europe, are apparently less devoted to agriculture than some of their immediate neighbors, and they are found in those states offering opportunities in the mining and manufacturing industries, for of the 1,140,000 Poles in the United States in 1920, 247,000 were in the state of New York, 178,000 in Pennsylvania, 162,000 in Illinois, 103,000 in Michigan, and about 150,000 in New England as a whole.

The cosmopolitan Britisher distributes himself very widely. Of the 850,000 in the United States, 135,000 were in New York, 147,000 in New England, 90,000 in Pennsylvania, 54,000 in Illinois, 47,000 in Michigan, 43,000 in Ohio, 87,000 on the Pacific Coast, and 45,000 in the Mountain states.

Of the 1,037,000 natives of Ireland, the states having big cities get the bulk, New York 284,000, Massachusetts 183,000, Pennsylvania 121,000, and Illinois 75,000, having the largest shares.

Of the 1,400,000 Russians, the mining and manufacturing states had the bulk, New York 529,000, Pennsylvania 161,000, Illinois 117,000, New England 147,000. This is also true of the Italians, for of the 1,610,000 in the United States in 1920, 545,000 were in New York, 222,000 in Pennsylvania, 157,000 in New Jersey, and 117,000 in Massachusetts.

The South gets but a small percentage of the home seekers, due probably to climatic conditions and what is presumed to be a more plentiful supply of labor, for of the 14,000,000 persons of foreign birth in the United States in 1920, the entire South had less than 1,000,000, while the single state of New York had 2,876,000, Pennsylvania 1,387,000, Illinois 1,200,000, and Massachusetts 1,077,000.

How It Sounds in French

One of the French export magazines published a description of the new Crescent Kit recently. Here's what the poor French have to read, translated literally, word for word:

KIT OF ADVANTAGEOUS TOOLS

One of the most important makers of tools in the world has just hurled onto the market a kit of tools which is considered the most practical and the most useful in existence, and that which interests the more specially the importers, that kit sells itself at a moderate price.

It composes itself of a Crescent wrench truly of eight inches, of a plier thin straight nose Crescent of six inches, and the famous Crescent screwdriver, the whole hiding in an envelope of tough brown voile which occupies so little a place that one can easily carry the entire kit in her pocket or in the lateral pocket of the automobile.

The thin nose Crescent plier belongs to general works and is very comfortable in narrow straits. She is forged at the hammer durable and tempered with oil. The Crescent screwdriver is of the type of hammers conceived in a fashion that he who has a hand is able to rest it in a position where is formed a "T", after having given it a turn to the right angle, that which give is a force of irresistable leverage which can make penetrate without difficulty the most rebellious screw into the most durable wood. A pushing spring maintains the sleeve firmly in the one position as in the other. Someone is able to serve the sleeve like a hammer if one desires.

The Crescent Tool Company of Jamestown, N. Y., U. S. A., fabricates this kit so useful of which all the world has needs, for she contains the three tools most necessary. The carpenters, the ranchers, the plumbers, the electricians, the machinists, etc., are able to make the more part of their work with the aid of these sole tools—the greater argument of sale is that these three tools of quality superior are able easily to be carried on himself, and that they are above everything, of easy access.

Write to the maker to demand descriptive imprints and complete books on the occasions which offers this kit to the merchants of the entire world.

Two Good Railroad Shops

BY FRANK C. HUDSON

The difference between railroad and other shops—Specifying good machines and getting something entirely different—Need for standardization—Oil-saving not always an economy

WE HAVE recently visited two railroad shops which had been recommended as being particularly "good" shops by machine-tool men. And the very fact that they were pointed out as being way above the average, shows how very low the standard of railway shops really is in comparison with other shops. These are "good" shops as railway shops go, far better than the average. They have some very good machinery and more is on the way. But right beside the new machines we found old drilling machines which must have been doing duty when Garfield was President, grinding and milling machines that dated back forty years and other equipment to match.

One of the shops which had been suggested as having good equipment, bore out the fact that most machine men have entirely different standards in judging railroad shops. The other shop which was highly recommended, had a few good tools but a number of them dated back to 1881, when the shop was built. A new roundhouse had been built and boasted one new lathe and a drill grinder. The rest of the equipment had been gathered up from various parts of the system and dumped into the new shop.

This, however, is not a reflection on the mechanical men in charge, they all wanted better equipment. They had put in requisitions for new machines for so many years that it had become a habit—and they were almost shocked when a new machine really came through. Nor must we blame them because the few machines that did materialize, were not those best adapted to the work.

The "Just as Good" Disease

Specifying machine equipment is much like the grab bag at a church fair. You know what you want but you haven't any idea what the average purchasing agent is going to hand you. When it comes to substituting "just as good" the P. A. can give the drug clerk a full hand and win in a walk. And when a shop superintendent has been handed a few lemons in the way of machines, it sort of takes the ambition out of him, so it is small wonder that he doesn't lay awake nights to find better methods. Nor does it encourage the workmen to see the officials' fine private cars and poor machine equipment on the same road.

The two shops referred to, showed a fair uniformity in milling cutters, reamers, etc. The coarse tooth milling cutters prevailed but they were not of the same brand, because the P. A.'s eyesight was sometimes bad when it came to reading the make of cutters specified. The cost of repairs was also higher than it should have been because of the great variety of locomotives to be repaired and the lack of standards for parts to be used in such repairs.

This is where Ford's plan of replacing crankpins and parts of standard dimensions will pay in the long run —standard parts can be carried in stock just as with automobile repairs. It will mean not only cheaper repairs but that the locomotives will be returned to service in less time, which counts even more.

Shop Executives Prefer Standardization

No one appreciates the advantages of this standardization more than the live executive in the railroad repair-shop, but he is helpless in most cases to begin any standardization work of this kind. For example, the Ford method of using hardened vanadium-steel hub liners, costs much more than the usual brass or babbitt liners. But Ford's liners have already run nearly two years with a wear of but $\frac{1}{16}$ in. on the bronze rings in the driving boxes, while the bronze hub liners will rarely run more than a few months before requiring renewal. While it is much easier to renew the bronze rings in the driving boxes, yet the difference in service obtained from the locomotive will soon offset the extra cost of doing a good job.

Another item of expense in repairing locomotives comes from the lack of proper lubrication, for there are still many traces of the great wave of oil economy which swept over the railroad field about twenty-five years ago. While there is no doubt that much oil was wasted, just as there is in lubricating all kinds of machinery, it is safe to say that every ten-cents worth of oil saved has cost the railroads at least a dollar in repairs. When a locomotive comes in for repairs in such a condition that the piston valve has to be forced out of the bushing with a hydraulic jack, one can get some idea of the power wasted in the locomotive itself.

Nor is this all. The valve that is stuck in place, and there are many, frequently has to be replaced, as well as the valve bushing in which it runs. Pistons wear more rapidly than they should, from insufficient oil, and must be built up (usually with bronze) by oxy-acetylene welding, or replaced by new ones. Piston and valve rods also wear unduly from the same cause and require regrinding, seldom to a standard size, so that the packing must be bored to fit.

A very suggestive incident regarding lubrication occurred in one of the shops visited. During the strike the foremen and other shop executives went into this shop to try and keep the motive power in operation. The chief gave orders to let up on the restrictions as to oil, if they wanted to keep the engines moving. Lack of oil caused more repairs than they could handle.

In one of the shops, complete spare boilers are built for different classes of locomotives and held in reserve. Then, when a locomotive comes in for general repairs, a new boiler can be quickly substituted for the old one, which can be repaired without holding the locomotive out of service.

Another time-saving method is in the use of steel bushings in the spring hanger links. These bushings are forced in the eyes of the links and the whole thing casehardened, as is the pin. The pin is not finished but fits the bushing within a sixteenth of an inch or less. If the bushing wears it can be easily pushed out and a new one put in place, or a new pin used, or both.

As one bright shop superintendent put it, the railroad produces two things, transportation and scrap. They try to keep the scrap as low as possible by utilizing it so far as possible. It sometimes takes close figuring to know when to throw away a part and when to salvage it. In the case of tool equipment it is nearly always necessary to salvage it and patch it up, because of the difficulty in getting a new one. And it sometimes happens that with the limited output of a given kind or size, the fudged-up machine may justify itself even without the alibi of the new machines not being forthcoming.

The solution of one of the main problems in locomotive maintenance-costs, is to reduce the kinds of locomotives used in similar service, to standardize parts so far as possible and to make these parts at a central point for distribution to the different repair shops. This practice is well known to many railway shop-men but, being helpless to bring about the change, they must plod along doing the best they can under the unfavorable conditions imposed upon them by those who know nothing of machine costs, but only of stock quotations and the financial statements which affect them.

Every railroad shop executive visited was interested in Ford's plan of standardizing the parts of his locomotives to save making and carrying so many different parts for repair work. They agreed that while his repairs were costing more money than theirs, it would prove economical when spread over a period of years. And several wanted to know if the Ford repair shop bought the machines the executives wanted or if they had to take whatever the purchasing agent sent them. All of which is significant and bears out the contention that most of the blame for non-standardization and for poor machine equipment must be laid at the doors of those outside the mechanical departments of the railroads.

The Man Who Knows Why—Discussion

By John Thomas

Entropy's article under the above head on page 734, Vol. 58, of the *American Machinist*, is very interesting. Knowing how and why is education, and how the information is acquired makes little difference. It may be acquired from individuals, from books, by experiment or by means of analysis and deduction.

Psychologists tell us that at six years of age we have all of the intelligence we ever will have, that is, we have all of the mental tools we will ever get; beyond that age we can only develop what we already have. We can store up facts in our own minds, and even discover new ones, if we will only use the mental equipment we have.

All successful men have the power of deduction to a marked degree, whether college men or not. The college man has some advantage since, in his particular line, he has a good idea of what has been done and is able to start where others have left off. The practical man in studying the same subject may waste his time and energy in going over material that has already been worked out to a conclusion.

Analysis and deduction are about our only means of mentally looking into the unknown. By assembling known facts we may, by means of deduction, discover other facts previously unknown to us. Excepting those made by accident, most of our great industrial and scientific discoveries have been due to deduction. The scientist reasons to a conclusion and then verifies or disproves by experiment.

We can all increase our reasoning powers by simply asking questions of ourselves and then depending on our own minds for a solution. We must remember, however, that one solution seldom exhausts the possibilities of any problem. The mind should be trained to look at a problem from many angles. For practice and to make the solution of real value to us it is best to select problems which have a direct bearing on our daily work. No matter what our job may be, there must surely be something about it which we do not know or understand. If we take up one of these problems at a time, concentrate on it whenever we have an opportunity, and "stay with it" until we have at least one solution, in a short time it will be found that the mind will take up and solve ordinary problems almost automatically. Once the habit is acquired, little effort is needed to concentrate. This accounts for the rapid and accurate decisions of some great executives.

Occasionally we hear of men who complain that their jobs are uninteresting and monotonous. This is almost a sure sign that they are not looking for problems concerning their work, much less trying to solve them. We cannot improve our work without first giving it some thought.

What has all this to do with the machine shop? Just this—big and little alike we seem to have gotten out of the way of constructive thinking. Most of the time we only think we think and nearly all of us are apt to imagine, at times, that some kind of business other than the one we happen to be in, would be much more profitable to us. The fact of the matter is that someone has made a success in every kind of business under the sun, the only difference being that the successful man puts more brains in his business than did the rest.

Every day we are literally stumbling over opportunities for improvement and money saving in our work, simply because we will not stop long enough to take up and really examine even one of our many problems, and concentrate on it long enough to find a solution. In the shop we use up all our steam trying to get out a large production and, at the same time, give practically no thought as to whether we might be able to find more economical methods of production. We are entirely too well satisfied with things as they are. Trying to find a better method is just as important a part of managing a shop or plant as is getting out production, in fact we must improve or be left behind. Progress is being made continually in all lines of business and we can all have at least a small part in it, if we will only use our brains.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Bars for Boring Cylinders and Valve Ports

By Harold Brown

The boring equipment shown in the accompanying illustrations was designed primarily for boring the cylinder and valve ports of a 16x36-in. Corliss engine. The time necessary to do the job being of utmost importance, the devices were made with this condition constantly in mind.

The bar for boring the cylinder, Fig. 1, consists of

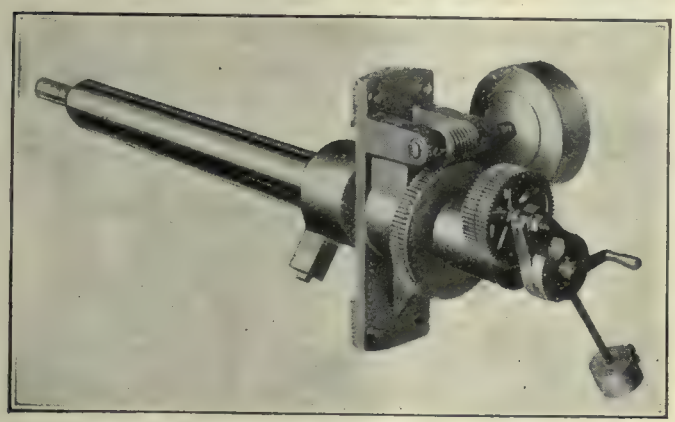


FIG. 1—BAR FOR BORING CYLINDERS

a hollow casting, 5 in. in diameter and having a ¾-in. slot cast in one side to accommodate the feed screw and a solid pilot 2½ in. in diameter, which is the same size as the piston rod. A cutter head mounted on the bar is driven by a key projecting through the slot,

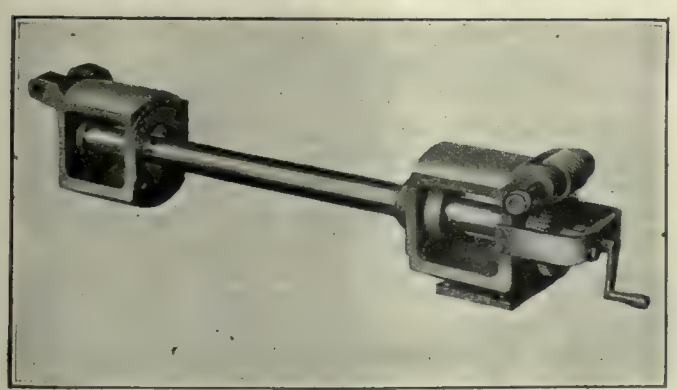


FIG. 2—BAR FOR BORING VALVE PORTS

the key also forming the nut for the feed screw. The bracket shown is machined to fit the counterbore of the cylinder and is provided with holes to fit over the cylinder studs for clamping. The bracket is also provided with lugs for carrying the driving worm and pulley.

The feed mechanism consists of a pinion fixed to the bar and a pinion fixed to the screw, the large gears shown being mounted on a stud and so arranged as to give a differential feed to the screw. The speed of the bar is 25 ft. per min., and the feed is 0.025 in. per revolution for roughing, and 0.010 in. for finishing.

The feed gears were selected from a set of change gears from another machine.

As the engine was in operation when the bar was made, it was necessary to make the bar to an approximate length and after the engine was disassembled, the correct length was determined and a space collar of pipe was used to make up the additional length of bar, the collar being shown between the worm gear and feed gears.

The valve-port boring rig shown in Fig. 2 was designed on the same principle as the bar for boring the cylinder, the ends of the brackets being turned to fit the counterbore of the valve ports. The bar was made of steel and drilled from the solid to accommodate the feed screw and driving key. To bore the cylinder, it was necessary to make a bushing to fit the stuffing box of the engine and the pilot on the boring bar. The actual time for taking three cuts with the cylinder boring equipment was 16 hours. The valve-port boring equipment required 4 hours per hole or a total of 16 hours time for the 4 holes.

As the plant was to be shut down only one week to make all repairs, a sufficient time was allowed in which to turn the valves, making a new bull ring and new packing rings for the piston and to do the necessary repair work to the valve mechanism. The engine was assembled on Friday, the valves were adjusted and set and the engine tried out on Saturday. It was started on the following Monday and has been in operation ever since.

The labor cost of making the equipment is as follows: Design, 15 hr. Pattern, 50 hr. Machining and assembling, 140 hours.

Boring Bar for Stellite Tools

By Gene Phelps

Those who have used Stellite as a cutting tool in a boring bar probably have experienced difficulty in clamping the tool as tightly as desired, due to the possibility of its breaking under pressure. The average boring bar, such as used on turret lathes, is provided with a square hole sufficiently large that a tool bit or boring tool will have a slight clearance. The clamping is accomplished by means of a setscrew which contacts directly onto the tool. Stellite, being somewhat more brittle than other tools, is subjected to fractures if held by this method, especially if the square hole is not straight and the tool does not have an even bearing. The drawings given illustrate a bar designed to overcome this trouble, which has many features worth consideration, even if used with other types of tools.

There is shown in Fig. 1 the bar *A*, assembled with boring tool and holder in position. A reamed hole in

the bar receives the toolholder *B* and the clamp *C*, the holder being a pressed or driven fit and the clamp a loose fit. The holder should be hardened and have a ground slot so that the tool *D* will be a snug fit in it. The clamp is held from falling out by means of the pin *E* which is pressed into the holder as shown. A

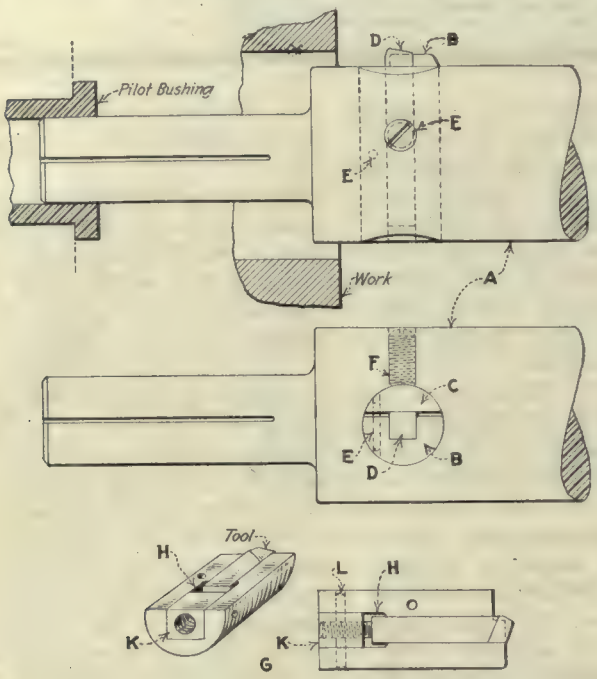


FIG. 1—BORING BAR FOR STELLITE TOOLS

setscrew *F* applies pressure on the clamp, which bears on the tool. This method of clamping is suited to Stellite, as the pressure is evenly distributed over the

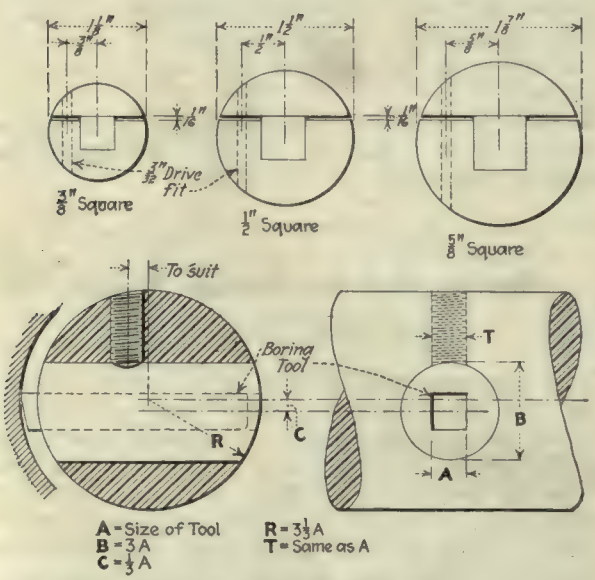


FIG. 2—SIZES OF BAR AND HOLDER FOR ⅜, ½ AND ⅝-IN. TOOLS

entire top of the tool instead of at one point as is the case when a setscrew only is used.

It is sometimes desirous to use a backing-up screw for adjusting purposes and at *G* is shown a method for use with this type of boring bar. The tool slot in the holder is enlarged at *H* and a block *K* is assembled as shown. It is held by a pin *L* so that it will not be forced out when the setscrew is tightened against the tool.

Some details of construction are shown in Fig. 2 for use with ⅜-in., ½-in., and ⅝-in. square tools. A section of the boring bar is shown with recommended dimensions, although slight changes will not matter, providing of course that the bar is not weakened by the hole enough to permit it to warp or twist under pressure of the cut. The hole should be placed somewhat below the center line of the bar so that the tool will have the proper position relative to the center line of the work. The setscrew used for the clamp is shown forward of the center of the bar, an arrangement which has a slight advantage; yet if required, two setscrews can be used. The tabulations shown will work satisfactorily on tools of sizes other than those shown.

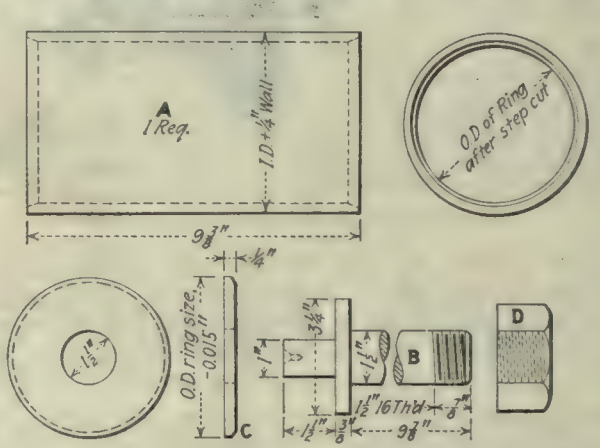
The principle of this design is ideal for Stellite application and has proved very successful in increasing feeds and speeds without any trouble in tool breakage.

Making Piston Rings Round—Discussion

BY LEONARD A. GAREY

Supplementing the article under the above title by E. V. Allen, on page 527, Vol. 58, of the *American Machinist*, I would like to illustrate the method we use, and which I believe to be entirely practical where quantity production is to be considered.

After the rings have been rough turned and the step-



ARBOR FOR GRINDING PISTON RINGS

cut made, a quantity of them are stacked on the bench and the sleeve shown at *A* in the accompanying drawing forced over them. The inner diameter of the sleeve is 0.001 in. over the outer diameter of the rings *after* the ends of the latter have been forced together.

An arbor, *B*, which may be used for several sizes of rings, is provided with a pair of collars, *C*, to fit the arbor and the end is threaded for a clamping nut *D*. The corners of the collars as well as the bore at each end of the sleeve should be slightly chamfered in order to render the assembling somewhat easier.

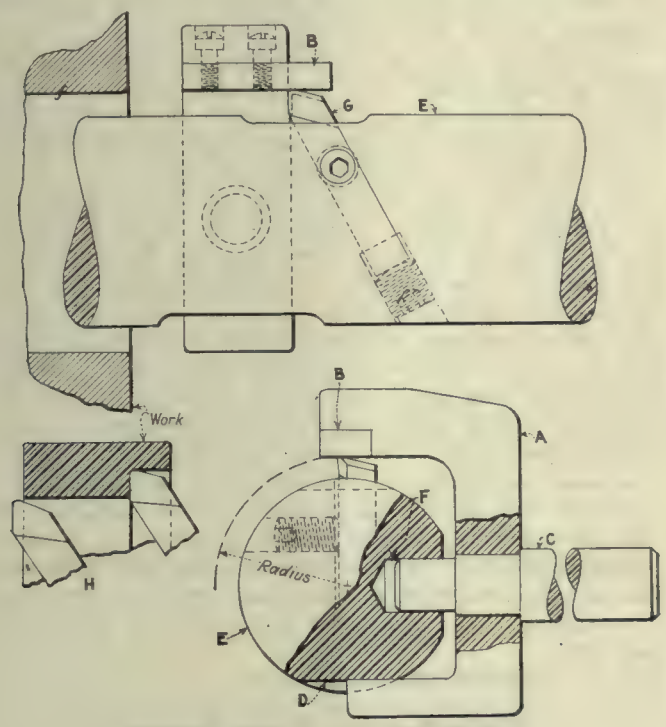
With one collar on the arbor the sleeve full of rings is placed in position, the other collar put on and the clamping nut run up. As the inner diameter of the sleeve is but 0.016 in. larger than the outer diameter of the collars it is easy to set it approximately true with the latter before finally tightening the nut.

After tightening the nut enough to hold the rings securely by the end pressure of the collars, the sleeve may be driven off and the rings turned or ground to the nominal diameter of the cylinder.

Gage for Setting Boring Tool

By Gene Phelps

Users of boring bars such as applied on turret lathes, are familiar with the difficulties encountered in correctly setting boring tools where limits of accuracy are close. Tools are often set to a finished piece of work; but they generally require adjusting, either one way or the other, before the proper size is obtained. If a piece of work of correct size is not available, the operation of



GAGE FOR SETTING BORING TOOL

setting a boring tool can be called one of "guess and try."

Micrometers are often used for this purpose with more or less success, but due to the small adjusting surface of the anvil, it is not safe to depend upon these settings. Gages of many styles have been made for tool setting on various machining operations; but it does not appear that in the case of the boring bar as many gages are used in setting the cutting tools as might be employed to advantage.

The accompanying illustration is an example of a gage used when boring an aeroplane engine, and which has proved very satisfactory in setting the tool correctly and rapidly. The general design is simple in that there are only three parts in the unit, the body *A*, the hardened set-block *B* and the locating plug *C*. It is necessary to machine a flat portion *D* on the boring bar *E*, in order that the lower arm of the gage body will fit as shown. A hole *F* is also made in the bar, so that the plug *C*, which is fastened in the gage body, will enter into it as the gage is set in the proper position.

The distance between the center line of the plug and the flat portion of the arm should be held very accurately to size, to make the gage fit on the boring bar with a push fit, for any play will cause improper tool setting. After the gage is in position, the tool *G* is adjusted to the set-block *B*. The tool is then clamped in position and the gage removed, completing the setting operation and leaving the boring bar ready for use.

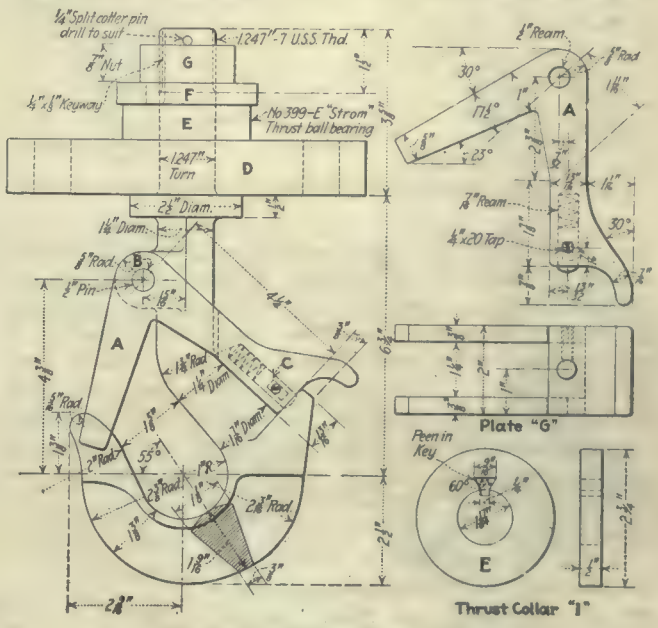
After using this gage a few times it will be easy to determine the correct pressure for setting the tool to the set-block, so that an accurate hole may be bored within proper limits. The arm of the gage block should be made of cold-rolled steel, cyanided; the plug of machinery steel, hardened and ground; and the boring bar should be heat-treated to give proper wearing qualities. A bushing can be placed in the boring bar if desired, so that constant use will not rapidly wear the hole *F* and cause errors due to looseness of the gage when fitted to the bar.

Feelers will be found of assistance when machining both rough and finished holes, and various styles of set-blocks can be used for cuts such as shown at *H*. Thus one gage body may be used for several different pieces of work which it may be necessary to machine in small quantities with the same boring bar.

A Safe Crane Hook

By Harold A. Peters

In lifting motors from the test stand to the bench for repairs or adjustment and then back to the stand again, we experienced trouble from slippage of the crane hook, dropping a motor now and then and some-

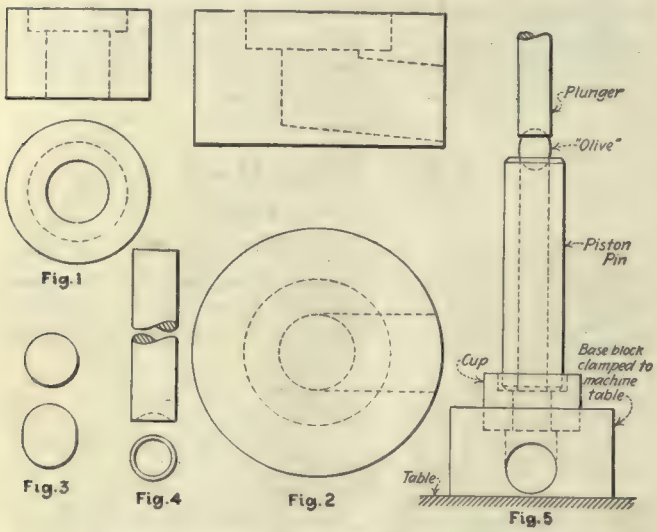

¼"Split cotter pin drill to suit
1.247"-7 U.S.S. Thd.
⅝" Nut
G
F
¼"x⅛" Keyway
No 399-E "Strom" Thrust ball bearing
E
1.247" Turn
D
2½" Diam.
1⅝" Diam.
⅝" Rod
B
½" Pin
A
C
1⅛" Rod
1⅛" Diam.
2" Rod
55°
R
2⅜" Rod
2⅛" Rod
2⅜"
2⅜"
2⅜"
1⅛"
1⅛"
1⅛

Salvaging Automobile Engine Piston Pins

By Francis M. Weston, Jr.

When an automobile or aviation-engine piston pin becomes so badly worn that it can no longer be used, it can be put into service again at a cost of about 25 cents.

In order to be made serviceable, a worn pin must be expanded to a little more than its original diameter and reground. This requires that the pin be annealed before expanding and then hardened again. When the pins are accumulated from successive jobs and handled in lots of two hundred or more, all four operations can be completed at a cost of not more than 25c. per pin, and that without the need of any special machinery. In smaller lots, twenty-five or more, this cost rises to from 30 to 35c. each. Three of the four processes, annealing, hardening and grinding are so familiar that they need no more than passing mention. But the expanding process, requiring only a simple fixture and the use of either a slotter or a power press of some kind, may be of interest.



TOOLS AND METHOD FOR EXPANDING PISTON PINS

A cup and base block to hold the pin on the machine table, a plunger and a set of hardened tool steel "olives," comprise the entire equipment.

The cup, Fig. 1, is designed to support the piston pin in a vertical position under the plunger of the machine. The drilled hole in the center must be a little larger that the hole in the pin will be after expanding. The counterbore is enough larger than the outside diameter of the pin so that it will not bind during a normal amount of expanding of the pin. The cup fits snugly into a counterbore in the base block, a separate cup being needed for each type of piston pin handled. The outside diameters of all the cups are the same, but the counterbores and central holes suit the particular type of pin for which the cup is intended.

The base block, Fig. 2, merely receives the cup and holds it central on the table of the machine. The holes in the top and side must be larger than the largest olive used in order to insure the prompt delivery of the olive after it has passed through the pin.

The olive, Fig. 3, is an elongated ball of tool steel, hardened and ground. It is pushed through the annealed piston pin under the action of the plunger, expanding the pin. A set of four or five olives, each 0.002 in. larger than the one preceding, is required for each type of pin to be treated. The smallest of each set is 0.002 in. larger than the original inside diameter of the pin for which it is intended. The size, or sequence, should be marked on the end.

The plunger, Fig. 4, is merely a cylindrical bar of steel a little longer than the longest pin and small enough in diameter to pass through the smallest pin without touching. Its lower end is made concave to avoid the chance of its slipping on the olive.

In operation, the fixture is set up on the table of the machine as shown in Fig. 5. An annealed piston pin is stood up in the counterbore of the cup, and the smallest olive placed in position on the upper end of the pin. A stroke of the machine shoves the olive through the pin and the second olive is placed in position ready for the next stroke. After two or three olives have been used, the outside diameter of the pin is tested with a gage and further expansion is given if found necessary. The olives roll through the hole in the base block and are recovered after each stroke.

It has been found that a helper can be assigned to this job after the fixture has been set up by a competent machinist. With a little practice, and provided the pins do not require more than two or three olives for expansion, he can expand from thirty to forty pins per hour.

Time-Saving Press Tools

By S. A. McDonald

When small holes are punched in heavy stock, the wear on the punch and die calls for frequent stops for sharpening. This sharpening sometimes becomes necessary at the most inconvenient time and if it is possible, the operators will use a dull punch or die long after it is too dull to do good work, rather than go to the trouble of taking out the dull tool and sharpening it.

This condition existed in our shop until the tooling arrangement shown in Fig. 1 was made.

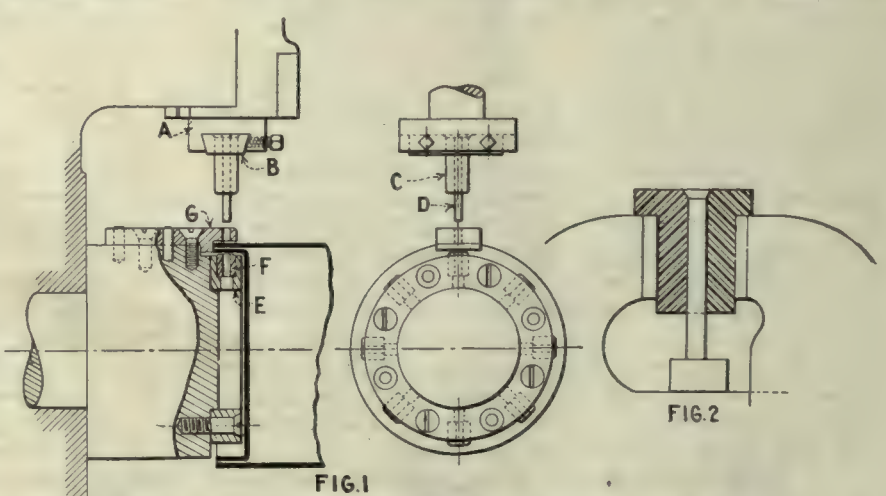


FIG. 1—TIME-SAVING PRESS TOOLS. FIG. 2—DEVICE FOR UPSETTING PUNCHES

A horn press was used for punching rivet holes in tanks. The punch holder *A* has a dovetail slot to which a pad *B* is fitted. In this pad is the punch sleeve *C* which contains the punch *D*. The punch sleeve has a tapered head to prevent it from pulling out of the pad. A lot of punches were made from drill rod and after being hardened at one end, they were upset at the other end in the device shown in Fig. 2. They were then straightened and the cutting ends ground.

On the end of the horn is located the machine-steel die ring *E* which contains eight hardened dies *F*. The stripper plate *G* is fastened to the top of the horn as shown. One end of the work (a tank with a flanged end) is located on the end of the horn, the other end resting in a cradle. As each hole is punched the tank is revolved to the position of the next hole.

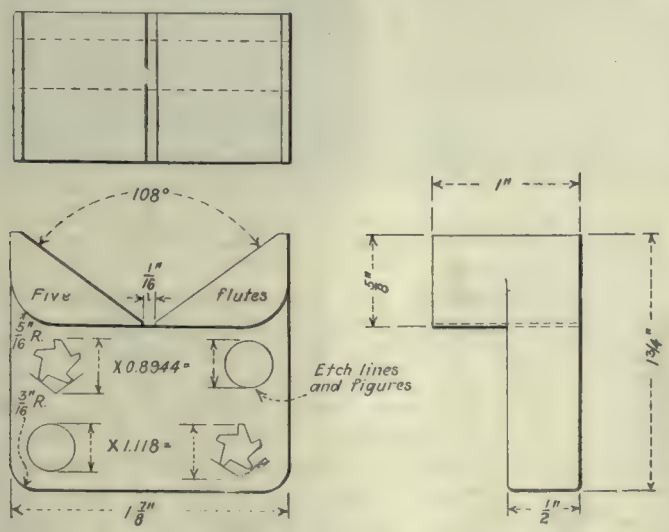
As the stock is heavy and the holes small, the wear is great on both punch and die. When a punch is dull the pad *B* is taken out and a sharp punch put in its place and the pad put back. Before tightening the pad in place, the ram of the press is brought down by hand and the punch located by entering it in the die. The renewing of the die is a simpler matter still. All that is necessary is to loosen the die ring, revolve it to bring the next die under the punch and lock it in position. When all the dies are dull, the ring is removed and the dies either sharpened or renewed.

V-Block for Measuring Five-Fluted Cutters

By G. B. Olson

The V-block illustrated makes the measuring of five-fluted cutters a simple proposition. All that is required is a regular micrometer and the use of one of the constants given below.

A good way to make the V-block is to use a standard



V-BLOCK FOR MEASURING FIVE-FLUTED CUTTERS

one-inch plug and grind the V to the dimension shown on the lower formula. With the plug placed in the V, the dimension from the top of the plug down to the horizontal line should be 1.118 in. When ground to this dimension and to the angle shown, the two lines of the angle will intersect the horizontal line.

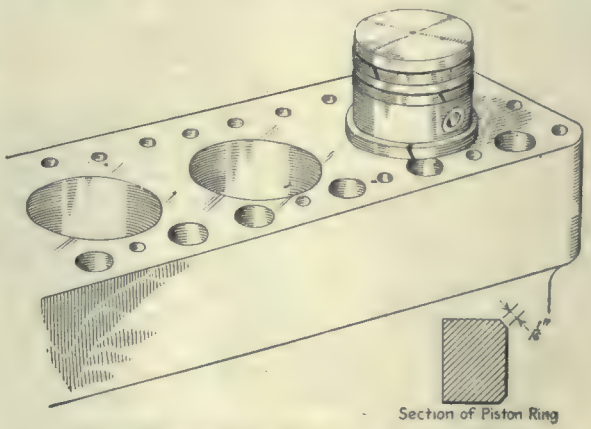
The formulas should be etched on the block as shown. The top formula, which is the reciprocal of the lower one, is carried to only four figures, which is close enough for ordinary work. If more accuracy is required, it can be carried further.

Assembling Piston Rings in Cylinders

By H. L. Wheeler

When assembling piston rings in gas engine cylinders I use an old piston ring, snapping it over each ring before it enters the bore, as shown in the illustration. I have found this to be a very easy and simple way, and better than any other makeshift devices and methods I have tried. It is quite as efficient as some of the special tools made for the purpose.

A ring of the same size as used in the piston has just



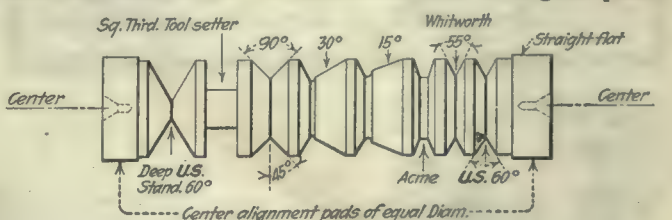
COMPRESSING RINGS FOR ASSEMBLING

enough spring to hold the ring being entered, in its true position, and the piston will push down very easily. The guide ring should be beveled on the inner edges with a file as shown in the section.

A Setting Gage for Lathe Tools

By Joe V. Romig

A handy tool for toolmakers who have much threading and similar work to do is shown in the accompanying illustration. It should be made of a good piece



SETTING GAGE FOR LATHE TOOLS

of annealed tool-steel, and due care should be exercised to make the various angles correct.

The ends should be carefully finished to like diameters so that the tool can be used to align the lathe centers by checking the position of each end with a dial gage.

The deep V-groove is handy for setting large threading tools, while clearance for square threading tools is made certain by slipping them into the square groove. All tools should correspond exactly in height to the center line of the lathe when the setting is made.

[We are not so sure that "clearance for square threading tools is made certain," etc.; what about the lead or helix angle of the thread?—Editor.]

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors
August 9, 1923

President Harding

The sorrow of the nation at the death of its President, Warren Gamaliel Harding, is profound. Coming as it did, just as he was reported out of danger, the news was a distinct shock to the hundred and ten millions of the United States. Warren Harding is dead, but he will always live in the memory of the great country which he led.

The President commanded the love of the individual and the faith of industry. He surrounded himself by capable men, who understood their chief and the needs of the country. Because he took them into his confidence and delegated to them, so far as he could, the responsibilities of their offices, he has prepared the country in no small measure to continue a straight course during the change of the watch.

As a nation, we can do nothing that would be more characteristic of our dead president than to "carry-on," and we are heartened by this statement of our new leader, Calvin Coolidge, thirtieth President of the United States:

"It will be my purpose to carry out the policies which he had begun for the service of the American people and for meeting their responsibilities wherever they may arise.

"For this purpose I shall seek the co-operation of all those who have been associated with the President during his term of office. Those who have given their efforts to assist him, I wish to remain in office, that they may assist me. I have faith that God will direct the destinies of our nation."

How Much Shall We Pay For Insurance?

MOST men who profess to have any familiarity at all with modern business principles accept the soundness of providing for insurance against death, fire, accident or other unforeseen or unpreventable occurrence.

Death, fires and accidents happen with such distressing frequency that people are forced to reckon with them at every turn and protect themselves or their dependents as best they can. Wars, on the contrary, have been so infrequent in the life of the United States that no sooner is one over than the great majority of the people settle down with a sigh to the vain belief that there will never be another. Sad to say, it never works out that way.

It would seem the part of wisdom to insure ourselves as far as possible against the recurrence of a catastrophe so disastrous as the Great War. It is futile to contend that we can escape from taking a part in the affairs of Europe or of any other important division of our world. Modern communication and transportation facilities have settled that once and for all. Would that the complete disarmament of one great nation would result in similar action by all others! The chances against it are incalculable. Would any insurance company assume the risk?

With things as they are there remains but one form of insurance for the nation: The maximum preparedness at the minimum cost to the taxpayer. How the compromise is to be reached between the two opposite factors is a problem for experts. One thing at least seems certain. Obsolete methods and implements of warfare should be scrapped at once and all efforts concentrated on the development and maintenance of the weapons likely to be used when trouble again threatens.

Perhaps the most modern arm is the airplane. Certainly the French are placing immense faith in it and of late the British are taking a keener interest. The chief of our own army air service has asked for twenty-five millions to maintain our skeleton force at its present low strength and carry on the experimental work vital to progress. Certain worthy pacifistic Congressmen will do their utmost to reduce the amount asked by General Patrick and it is therefore up to hardheaded and practical business men and manufacturers to state in no uncertain terms where they stand on the maintenance of our air force so that those members of Congress who really have the welfare of the country at heart may be strengthened in their fight against the vote-seeking politicians and soft-headed sentimentalists. Insurance against war can be had in no better way under present conditions.

The Can Opener Comes into its Own

NO LONGER must the festive can opener confine its activities to meek and lowly occupations; no longer must it be only the "open-sesame" to one of the fifty-seven varieties. It has graduated from being an instrument of kitchen necessity in modern civilization, to being an adjunct of luxury in the garage, the habitat of the motor car. For while its vocation may still link it with the odors of canned beans and spaghetti, its avocation brings to it the much more expensive perfumes of gasoline.

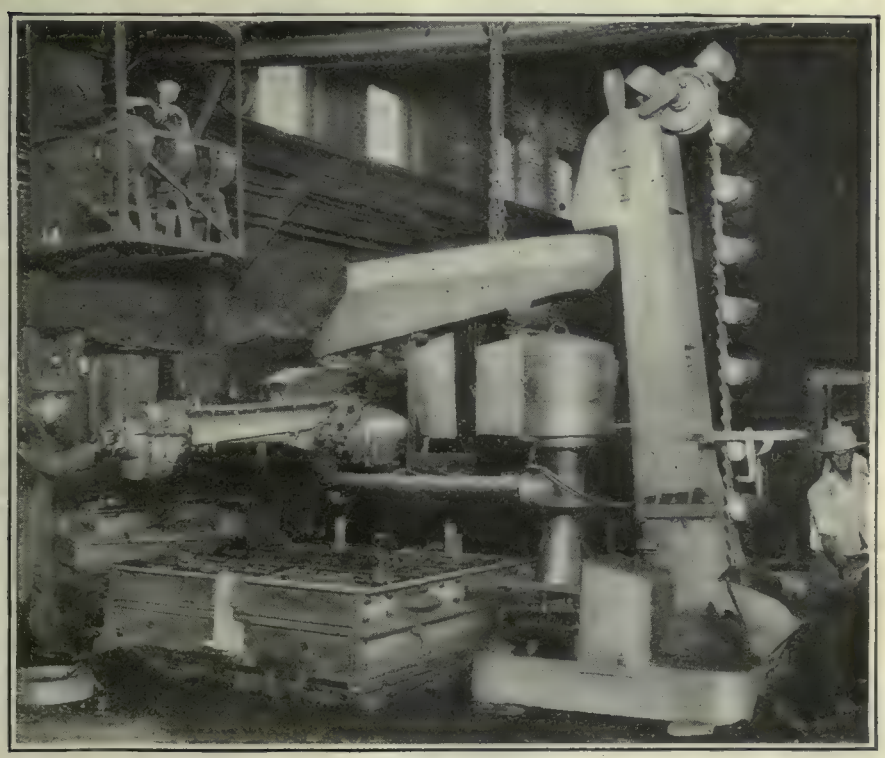
In other words the can opener now forms part of the kit for applying a nifty cowl ventilator to any variety of auto from which this luxury is omitted, be it the humble flivver or the more costly variety. All you have to do is to buy a cowl ventilator and with it comes a drill and a can opener. You lay out the desired openings, worry your way through the tin or whatever metal your particular "can" happens to be made of, insert the can opener and the opening is cut as easily as though you were in the kitchen toying with a can of pork and beans.

And so, as the energetic citizen struggles onward and upward, he uplifts not only his neighbors and the community, but also the tools with which he carves his way to fame and fortune. And the kitchen utensil which was once an insignificant adjunct to a can of soup, is now a "tool" in the kit of the garage mechanics.

Shop Equipment News

Beardsley-Piper Portable Type Sandslinger

Of particular interest to general jobbing foundries, as well as others, is the portable type "Sandslinger" recently placed on the market by the Beardsley-Piper Co., 312 Union Park Court, Chicago, Ill. This machine is an addition to the line of molding machines manufactured by this company, which also includes stationary, tractor and locomotive types.



BEARDSLEY-PIPER PORTABLE TYPE SANDSLINGER

The accompanying illustration shows the portable machine in operation in a foundry. A jointed swinging arm is pivoted on a heavy base in which is arranged a hydraulic leveling device for leveling the machine as soon as it is placed on the floor. The sand is shoveled into a hopper and carried by a vertical bucket elevator to an oscillating riddle mounted on the main arm. The riddle is so constructed that scrap, gaggers and cores work to the front where they are delivered to a chute and deposited in a scrap box also mounted on the arm. The riddled sand is deposited in a hopper on the impeller arm and is carried to the impeller head by a conveyor belt. The impeller head discharges the sand into the mold by centrifugal force.

The impeller head not only throws sand at high velocity but forms wads or compressed handfuls before projecting the sand into the flask. A single blade or paddle is fitted to the head and since this is the only part of the machine liable to wear out quickly, it is a simple iron casting of which a quantity may be made in the foundry and kept for replacement. The casting costs little and is quickly replaced.

The maximum radius of the jointed arm is 10 ft. and, if the mold is too large to be entirely reached by the arm, the whole machine can be lifted and placed in another position by the crane before completing the making of the mold. The arm pivots are fitted with ball and Timken roller bearings so that the head is easily swung over the flask and any desired density in any part of the mold may be obtained by regulating the speed of the impeller head. The impeller head paddle revolves at motor speed and will sling sand at from 2,700 to 6,000 ft. per min. The machine will riddle and ram from 7 to 10 cu.ft. of sand per min., and no special flask or pattern equipment is necessary. It will ram to a depth of 10 ft. and may be used on pit jobs if required. Best production on small molds is made in conjunction with a stripping plate machine. No additional ramming is required.

Three motors are used, one for the impeller head and belt conveyor, one for the riddle and one for the bucket elevator. The impeller shaft is mounted in Timken bearings. Gears are hardened and ground and are lubricated by a splash system. All working parts are protected from sand.

It is stated that the "Sandslinger" does not wear or damage patterns as much as hand ramming, since the first sand thrown into the mold covers and protects the pattern from that which follows. The overall height of the machine is 11 ft. 6 in. and the discharge outlet of the impeller is 3 ft. 9 in. above the floor.

Wallace 6-Inch Bench Lathe

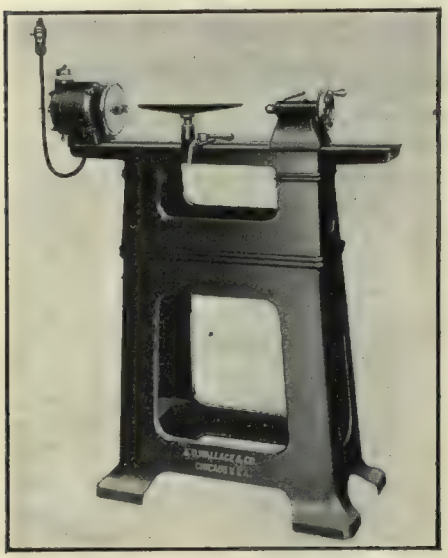
J. D. Wallace & Co., 1401 W. Jackson Blvd., Chicago, Ill., have recently introduced a 6-in. bench lathe for use in pattern and woodworking shops.

The principal feature of the construction is that the machine is self-contained and can be moved to various parts of the shop and close to the bench, if desired, for more convenient work. The motor is built into the headstock and is totally enclosed. The armature is carefully balanced and runs in Gurney ball bearings. The ½-hp. General Electric motor runs at a constant speed of 3,400 r.p.m., which is a suitable speed for the class of work handled on a lathe of this size. A toggle switch is conveniently located on the motor, and lamp cord and plug are furnished for attaching to any convenient socket.

The capacity over the tool rest is 5 in. and the maximum capacity on

the face plate is 7 in. A distance of 24 in. is available between centers. The face plate is finished so that it also serves as a handwheel, and a spur center, interchangeable with other centers or chucks, is provided.

The bed is a single casting with an over-all length of 35 in. and the



WALLACE 6-INCH BENCH LATHE

ways are planed and ground on top and inner surfaces. A lever clamp holds the tailstock in position and the tail center is provided with the usual screw and handwheel and a suitable clamp.

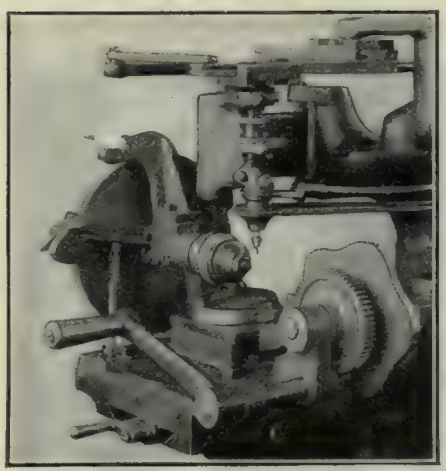
Two tool rests are provided, 6 and 12 in. long respectively. The rest and holder are easily adjusted and a locking device is provided on top of the holder. The base and sub-base are box-shaped castings, designed so that the lathe will stand firmly without being too heavy to be portable.

The over-all height of the lathe is 47 in. and the length 40 in The net weight is 203 pounds.

Gorton Graduating Attachment

A graduating attachment for use with Gorton engraving machines or other similar machines has just been placed on the market by the Geo. Gorton Machine Co., Racine, Wis. The attachment consists of a cast-iron base on which is located a sliding head, the head being propelled past the cutter by means of a cam mechanism. The work is held on a draw-bolt through the head, bushings being provided to accommodate any size hole in the work. Adjustment is provided for the dimension between the lines, and a knockout pawl operating in connection with a ratchet wheel provides for graduating sections of a circle. The head swivels and is graduated so that the cutter can operate on surfaces at any angle up to 90 degrees.

The work is fed past the cutter by means of a cam that contacts with a roller which is attached to the head, the roller being kept in contact with the cam by means of a heavy coil spring under the base of the attachment. The cam is revolved through a gear and pinion by means of a hand crank on the pinion shaft. The lengths of the lines are determined



GORTON GRADUATING ATTACHMENT

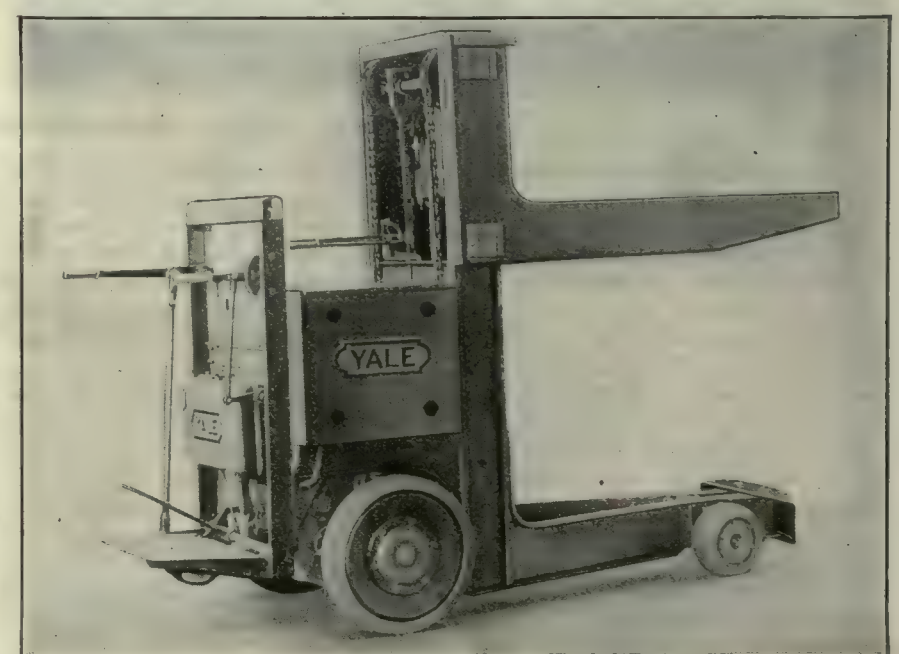
by the heights of the cam points, and as many points are required as there are variations in the lengths of the lines desired. The cam shown on the attachment in the illustration has five points, four points of the same height and one higher than the rest, thus producing four lines of equal length and a fifth line that is longer than the others. The ratchet wheel is also easily changed and wheels having any desired number of divisions can be supplied with the attachment.

Yale Model K-22 Elevating Platform Truck

The Yale & Towne Manufacturing Co., Stamford, Conn., is now marketing an elevating platform truck which has been designated the Yale Model K-22. This truck combines the advantages of a self-loading transportation unit with the ability to do high lifting, stacking or tiering.

The main longitudinal frame is made in one piece of pressed steel and the stability of the truck is increased by keeping the center of gravity as low as possible. The lifting mechanism is of the triple spur-geared reduction type, electrically driven. Simple and safe operation is insured through electrical braking with mechanical auxiliary lowering-speed control, and automatic upper and lower limit stops. The steel chain and sheaves are heat-treated.

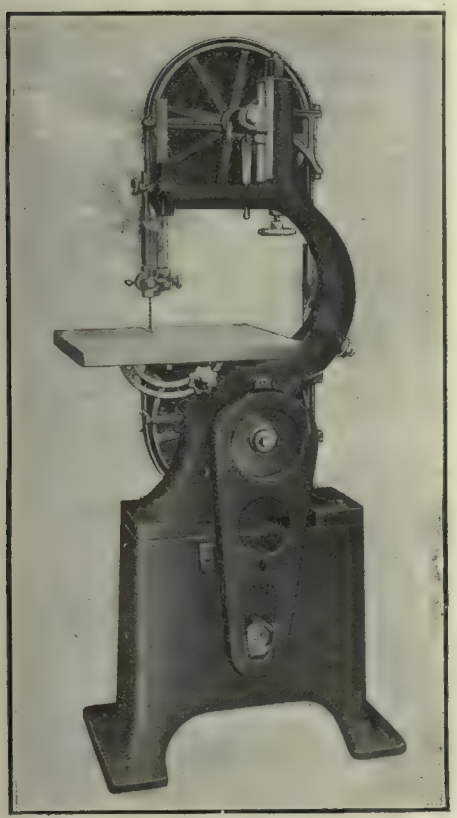
The spur-gear unit power axle used on other trucks of this series is used on this truck and the control is of the standard type. The majority of the individual parts and sub-assemblies are interchangeable with other models of the series.



YALE MODEL K-22 ELEVATING PLATFORM TRUCK

Bauer & Pease Band Sawing Machine

A band sawing machine for use in pattern shops and other woodworking shops has been placed on the market by Bauer & Pease, 314 Douglas St., N. W., Grand Rapids, Mich. The machine is of the usual vertical construction and is intended for use in sawing any kind of wood parts within the capacity of the machine, which is 16 inches.



BAUER & PEASE BAND SAWING MACHINE

The base and column of the machine are of cast iron, cored and machined. The wheels and table are also of cast iron, the wheels being machined, balanced and rubber-faced. The wheels are 16 in. in diam., and run at a speed of 750 r.p.m. The table is 18x20 in. and is so arranged that it can be tilted to any angle up to 45 deg., and locked in the desired position. The rocker on which the table is mounted is built into the column of the machine, so that the table can be held rigidly. All journals run in ball bearings and an anti-friction guide is provided for the saw. The maximum dimension under the guide is 7½ inches.

Power is supplied to the machine through a ½-hp., 110- or 220-volt motor, mounted on a swinging frame within the base of the machine. An endless belt is provided and covered with a guard and the motor is completely protected from dirt or shavings. Aluminum guards are also provided for the band wheels and saw. The machine is entirely self-contained and is provided with casters, so that it can be moved about to suit the work. The floor space required is 18x30 in., and the weight of the machine complete with motor is 350 pounds.

Yale Industrial Truck

The Yale & Towne Manufacturing Co., Stamford, Conn., is now marketing an industrial truck designated as the Yale Model K-20, which is designed to meet the general requirements of intraplant material movement.

A feature of the design is that the majority of single parts and unit assemblies are standard and interchangeable with all other models of this series of Yale trucks. This is terchangeability leads to economies in truck operation and advantages in operation when several trucks are used in one plant.

The wheels are large and a full spring suspension permits operation over rough surfaces. The truck is driven by the standard spur gear unit power axle, in which heat-treated steel and ball bearings protected from dirt and properly lubricated, are used. The standard Yale controller is installed.

In the manufacture of this truck the effort has been to decrease the number of parts, place them in accessible positions, and group them in self-contained major units.

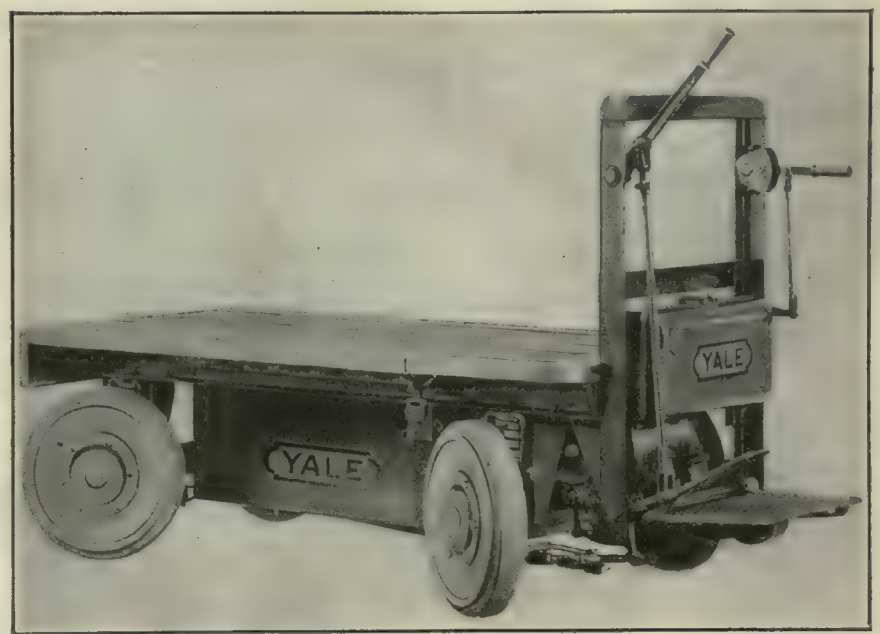
Auxiliary equipment available includes a gravity dump body for handling loose material and an electrically operated swinging boom crane.

"Macalene" Fluid for Hardening Cast Iron

A liquid hardening agent for cast iron is now being marketed by the Macalene Co., Saint Cloud, Minn. The material is known as "Macalene."

For use the fluid is mixed with a suitable quenching oil. If medium hardness is required, the mixture is made with one part of the fluid to 100 parts of oil, and for extreme hardness the ratio is 50 to 75 parts of oil to one part fluid. The metal is heated to a red heat, below the scaling point, and immediately quenched in the solution.

It is stated that the hardness of the metal depends on its temperature and the strength of the solution, so that various degrees of hardness and hardening of parts of a casting can be obtained by proper use of these elements. By reheating a treated casting and allowing it to cool in air the metal may be returned to its original soft state. It is claimed that castings treated with this material will measure 450 on the Brinnel hardness scale and that they resemble high-carbon steel in general properties. The fluid may also be mixed with water but the use of oil is preferred.



YALE INDUSTRIAL TRUCK

Bardons & Oliver Turret Lathe

A recent addition to the line of tools manufactured by Bardons & Oliver, Cleveland, Ohio, consists of a new series of turret lathes which are particularly adapted for machining brass, iron and aluminum or any material that is worked dry. These lathes are built in various sizes, and the 15 x 8-in. lathe with friction-geared head is shown in Fig. 1.

It will be noted from the illustration that the head and bed are cast in one piece, and the leg under the head end is given an exceptional spread on the floor, in an endeavor to reduce vibration. The legs are attached to the bed in such a way that the bed has a three-point bearing. The head is semi-enclosed and is furnished plain or friction-geared as desired. The friction-geared head cone has the same width of face as the plain head cone, and the clutch mechanism is operated by a convenient handle at the front. The friction cones are adjustable for wear by ring nuts on the spindle outside the cone and easily accessible. A set of springs insures quick release of the clutch, and the back gears can be thrown out when continuous operation on open belt is desired.

The spindle is forged from high carbon steel and ground to size. The spindle nose has an external thread and two straight bearings at either end of the thread for holding chucks, face plates, etc., squarely on the end of the spindle. Special noses will be made if desired.

Screw or lever cross feed for the cut-off rest slide is furnished at the option of the customer. The cross motion is regulated by accessible stop screws at front and rear and

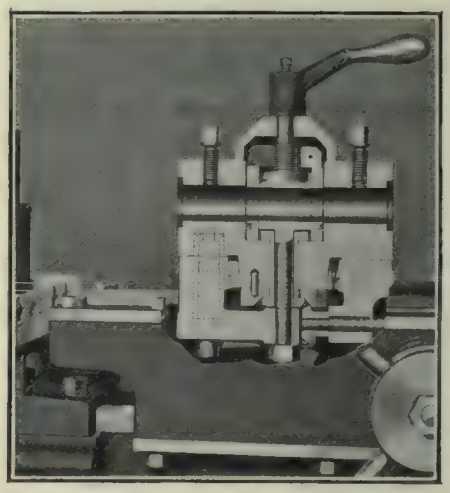


FIG. 2—BARDONS & OLIVER TURRET ARRANGEMENT

the screw feed is provided with a micrometer dial in addition. Longitudinal adjustment is effected through a micrometer dial, and the saddle is guided entirely by the front way, which is made sufficiently wide. Cut-off tool posts in four styles, plain round, round with base, square and open side, are offered at the option of the purchaser.

The hexagonal turret is mounted on a turret slide which has longitudinal motion only, and the turret is revolved automatically by the backward movement of the slide. The turret slide bearing extends beyond the front end of the saddle, thereby supporting the slide through practically all of the usual working travel, and permitting the bearing to be brought close to the cut-off slide. The turret lock bolt is located in the front end of the turret slide and works into hardened and ground taper bushings, located as near the outer edge of the turret as practicable, as shown in Fig. 2.

The turret is provided with holes to hold tools with shanks, and tools with flange or base can be bolted to each face. The turret stud has a hole through it in line with the hole through the spindle and is used for clamping the turret only. The thrust of the cut is taken by a taper projection on the bottom of the turret which fits an adjustable split ring in the turret slide. The nut and spool in the turret center holds the turret on its seat on the slide.

Independent stops are provided for each face of the turret and the revolving type of stop screw carrier is used. An automatic chuck of special design, and arranged to allow for slight variations in diameter of work to be held, is furnished if desired. Machines equipped with the automatic chuck are regularly furnished with chuck hood and collet for one size of bar stock. Other sizes of collets can be furnished, including the hinged extra capacity type.

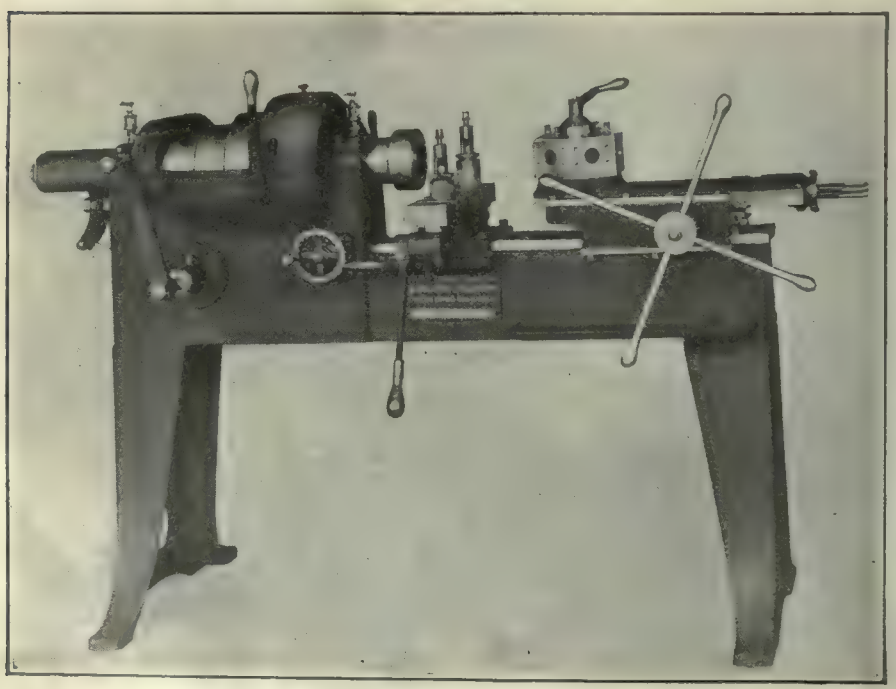


FIG. 1—BARDONS & OLIVER TURRET LATHE

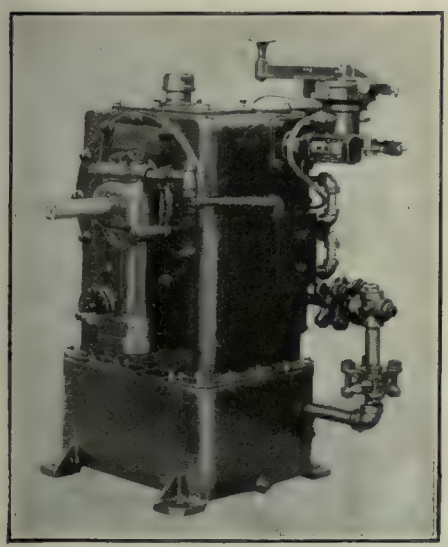
Oilgear Type W Pump

A pump designed especially for hydraulic presses and similar service has been recently placed on the market by the Oilgear Co., 60 27th St., Milwaukee, Wis. This is a compact variable delivery pump and is designated as the "Type W." The design and construction of the essential parts of the pump are similar to those of like equipment manufactured by this company and described on pages 271 and 395, Vol. 55, of the *American Machinist*.

The type W pump differs from the previous pumps in the assembly of plungers and crossheads, since the plungers are now closely coupled to the crossheads. In this way a suction action is provided which makes it unnecessary to depend on a large auxiliary gear pump. The type W has a small gear pump to keep the

running parts well lubricated and to operate the control cylinder.

The hydraulic control for regulating the stroke of the main pump consists of a double-acting hydraulic cylinder and a piston which is attached to the stroke-changing arm by a cross yoke and two links. These are so arranged that a heavy spring holds the pins at all times against one side of their bearings in the links, cross yoke and arm, thereby preventing any play in the joints. Oil pressure to the control cylinder is regulated by a small balanced piston valve that admits oil to one end of the cylinder and at the same time allows it to flow from the opposite



OILGEAR TYPE W PUMP

end. This construction provides a hydraulic dashpot which holds the arm rigid in any position.

The oil is delivered from the ports through the passages in the main pintle down through one of the two passages provided in the casting which forms the arm on which the pump unit rotates. When oil is flowing down through one passage it is being drawn up through the other. The direction of flow in these passages depends on the direction of flow of oil from the pump. The oil passages in the arm communicate with suitable passages in the lower pintle and these in turn with the delivery and intake pipes. An automatic two-way valve insures the proper direction of flow of oil to and from the pump.

The amount of oil delivered to the press cylinder is controlled by means of a single handle or lever attached to the stroke-changing mechanism through a hydraulically operated control cylinder. It is stated that the flow of oil is steady and free from pulsations; that the pump responds instantly and smoothly to the operation of the control handle; and that this instantaneous response applies both to varying the amount of oil delivered and to reversing the direction of delivery.

The maximum capacity of the pump is 3,060 cu.in. per min. and the maximum working pressure is 1,000 lb. per sq. inch.

Madison Adjustable Taper Reamer

A tool for boring and reaming taper holes, known as the Madison adjustable taper reamer, has recently been placed on the market by the Madison Mfg. Co., Spring and Elton Sts., Muskegon, Mich.

The tool consists of a machine steel shank and a set of two taper cutter blades, locked together. The blades are of high-speed steel, carefully tempered, and are ground to the angle required to produce the desired taper. One of the blades is tapped and the other is slotted and counterbored for the head of a short screw, as shown at *A* in the illustration. This arrangement allows for an expansion of $\frac{1}{4}$ in. on the one-inch blades, the adjustment obtainable on the larger sizes corresponding to the size of the blade. The cutters can

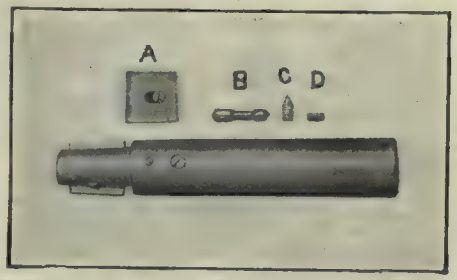


FIG. 1—MADISON ADJUSTABLE TAPER REAMER

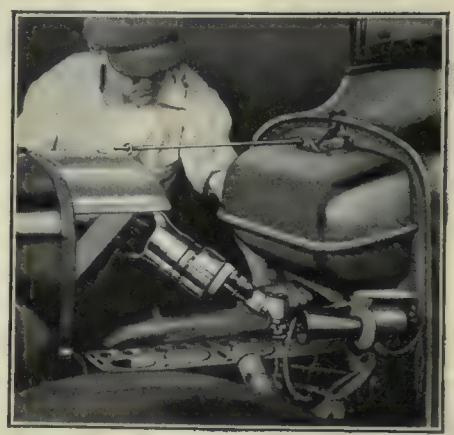
be locked in the slot by means of the pin *B*, which is located back of the cutter-slot. The front end of the pin enters a recess in the rear of the cutter, and the rear end of the pin is tapered to correspond with the taper on the lower end of the set screw *C*. Screwing the set screw *C* into the shank forces the pin *B* ahead into the recess in the rear of the cutter and regulates the amount of float, or locks the cutter in place, as desired. When set for floating, the cutter cannot fall out of the shank. The small set screw *D* locks the pin in position after being set. The cutter should be allowed to float on the finishing cut, thereby taking care of any misalignment in the machine spindle.

Petersen "Double-Action" Valve Grinder

A valve grinder which imparts a combined rotary and oscillating motion to the valve has recently been placed on the market by the A. H. Petersen Mfg. Co., Milwaukee, Wis.

The combined motion is produced by a special gear arrangement which duplicates the motion obtained by experts using hand-operated tools. The machine is light and compact and an offset attachment is furnished which permits access to all valves. The accompanying illustration shows the grinder in use and fitted with the offset attachment.

All types of valves can be handled by means of the attachments furnished with the machine. Three lengths of driver spindles which slip into the chuck are provided and each



PETERSEN "DOUBLE-ACTION" VALVE GRINDER

spindle will take any of the various driver blades. The blades are designed for proper contact with various types of valves. For grinding Buick valves a special hook attachment is furnished, and for this work it is preferable to mount the grinder on a special bench base, holding the valve cage in the hand.

The motor of the machine will operate on a.c. or d.c. circuits and the chuck revolves at approximately 15 r.p.m., making 275 oscillations in the same time. It is claimed that valves can be ground more quickly and that results are better than with hand-operated tools.

The overall length of the tool is 12 in. and the weight is 6 lb. Pinions and shafts are made from alloy steel, heat treated, and bronze and ball-thrust bearings are used. The body is polished aluminum, and eight feet of rubber-covered attachment cord with a metal-capped separable plug are furnished.

Practical Trade "Missionary Work" in South America

"NOTWITHSTANDING the long and firmly established policy of the Bureau of Foreign and Domestic Commerce to refrain from predicting the course of future demand in foreign markets, we wish to suggest the likelihood of an early and substantial increase in the Argentine demand for United States brass products," states an editorial in *Commerce Reports*, published by the Department of Commerce.

"Within the next decade the men who are now learning the rudiments of modern industrial theory and practice at the Argentine National Industrial School in Buenos Aires will be taking their places in the mills, packing plants, power houses, refineries, and factories of Argentina, and assuming the duties and responsibilities invariably attached to the building of industries in a young country. Possibly in less than ten years the first effects of the teaching now being received by these young men will begin to be felt in national industry.

"If one man is now studying textile machinery with a British loom for a model, it is more than likely that later on, when he has become an engineer in a woolen mill he will show a certain preference for the type of loom from which he obtained his first knowledge of weaving. Another man who has studied internal-combustion engines with the aid of working models of an American gasoline motor will probably prefer such a motor to the makes of other countries when he is called on to specify in ordering motors for an Argentine factory. A third may become accustomed to a German lathe, a fourth to French instruments of precision, a fifth to a Belgian dynamo, and so on through the classes of the school.

"Price, exchange, deliveries, preferential duties, and a hundred other factors will enter every purchasing problem, but in a great many cases these other factors will balance, or nearly do so, and it is then that the early preference born of experience will, consciously or subconsciously, come into play and influence a decision favorable to the product ksown by the buyer.

Winning Good-Will

"An American brass company in Connecticut recently presented a large and complete set of its samples to the Escuela Industrial de la Nación at Buenos Aires, and, as a result, the men studying at the school—and the countless classes that will follow them—are now to know what American brass products are like. These samples will be examined, handled, weighed, and tested until they will have made an indelible impression (a first impression, probably) on the minds of the persons handling them.

"This idea of 'opening fire' on the potential engineer-buyer while he is still an undergraduate is not a new one. British and German firms have supplied such schools with catalogs, photographs, samples, models, and occasionally actual machinery and machine tools as a step in their gradual, systematic, efficient Latin American campaigning. There have undoubtedly been American firms far-sighted and clear-sighted enough to invest in similar 'long-time pulls,' but astonishingly few instances have come to the attention of the world-wide organization of the Department of Commerce.

"Too often American firms have subordinated the development of a permanent market to immediate sales, and too often American exporters have failed to fit their sales policy and methods to the buying psychology of the Latin American, which demands a gradual building of interest, desire, confidence, rather than a sales argument based primarily on attracting attention and stimulating action."

France as a Consumer and Producer of Machinery

Figures compiled by the Industrial Machinery Division of the Department of Commerce show that France has not been of outstanding importance as a machinery producer for foreign markets, though it has sold a good deal of such machinery abroad. Before the war French exports of industrial machinery varied from $19,165,000 to $41,495,000 in value, and 4.5 per cent to 6.6 per cent of the total international machinery trade of the world. Since the war the French exports have risen to as high as $52,000,000 in value (1920) and to 8.9 per cent of the world's total machinery trade (1919) and in 1920 and 1921 averaged 5½ per cent of the world's total. French machinery exports were valued at $47,063,000, last year.

As a consumer of machinery, in peace times as well as in war, the position of France is far higher than as a machinery producer and exporter.

Before the war the American participation in this trade was not very great. During the war it became very important, but subsequently has again decreased. This decline has in part been due to the participation of Germany in this trade, but as reports indicate that the German manufacturers have now lost the advantage given them by the depreciating mark it would appear that the time has arrived when sales effort in France can again be effective.

American manufacturers have a further advantage that owing to the extensive use of American equipment in France during the war there is a much better recognition of the merits of American designs than was the case formerly. Although it is true that the French tariff is a serious obstacle to the importation of such equipment, it also seems obvious that American manufacturers can secure a larger share of the orders for such equipment as must be imported. In this connection they should be careful to remember the requirements of the French colonies as well as those of France proper.

France is undergoing very important changes which will probably have a great influence upon both the import and the export machinery trade there for a number of years to come. For example, as a result of the Versailles treaty France secured in Alsace Lorraine and elsewhere, plant capacity for the production of 2 million tons of steel per year over and above that which she held in pre-war days. There appears to be reason for believing that in her own domestic market she will not be able to absorb this increased production, but that it will be necessary for the French to dispose of this 2,000,000 tons of steel per year in foreign markets.

This increased capacity will almost certainly require the use of more machinery in order that this steel may be handled in France, and correspondingly there are certain indications that part of this material will, in the future, be exported in the form of machinery.

News Section

Asks for Rigid Power Plant Legislation

A state license law for power plant stationary engineers and a more rigid boiler inspection law were advocated by Prof. A. W. Cole, of the steam engineering department of Purdue University in an address before the Scientech Club of Indianapolis recently, as a means of solving the problems created by the general inefficiency of power plants throughout the state.

In a recent inspection and investigation of power plants and the power plant situation in eleven cities of the state outside of Indianapolis, made under the direction of the engineering extension division of Purdue, Professor Cole said he had found evidence confirming the belief of the university engineering department that power plants generally were inefficient.

Boilers were being fired without consideration of the necessity of fuel conservation, and with power plant executives indifferent to the situation, he said.

"The executives seemed to believe that the trouble it would cause to rectify conditions to get the most utility wasn't worth the time or expense," said Prof. Cole. A similar attitude was apparent among engineers and firemen, he said.

Similar action has been advocated in many of the states and it is expected that some definite action will be taken to see that conditions in power plants generally are improved. Due to unprecedented production during the first six months of the year, it has been impossible to halt activity long enough to make changes, it is claimed.

Eight-Hour Day Assured By Judge Gary

Plans to abolish the twelve-hour day in the steel industry, adopted at a meeting of the directors of the American Iron and Steel Institute at the Metropolitan Club recently, will be pushed forward without unnecessary delay, said Judge Elbert H. Gary, president of the Institute, in a statement following the meeting.

The action taken by the Institute was the culmination of a series of conferences which began late in June after the late President Harding had asked the Institute to pledge that it would abolish the twelve-hour day when conditions of labor warranted that course. The President's request was made on June 18 and on June 27 the directors of the Institute wrote to the President saying they were determined to exert every effort at their command "to secure in the iron and steel industry of this country a total abolition of the twelve-hour day at the earliest time practicable."

Judge Gary's statement follows:

"Following the correspondence between President Harding and the Steel Institute, and as a result of the most painstaking investigation, manufacturers of iron and steel, representing substantially the entire industry of this country, will now begin the total elimination of the twelve-hour day and will progress as rapidly as the supply of labor will permit. It is impossible to say when the changes will be completed. It will depend upon labor conditions at respective plants. There will be no unnecessary delay on the part of anyone.

"Where the hours of employees connected with continuous process are reduced from 12 to 8 hours, their wage rates will be so adjusted as to afford earnings equivalent to a 25 per cent increase in hourly and base rates.

"All other workmen will be on ten hours or less and their present hourly and base rates will be continued, but whenever it is practicable, by promotions or changes in position, the daily earnings will be accordingly adjusted."

Judge Gary has estimated that 60,000 additional men are needed in the steel mills to make the total elimination of the twelve-hour day possible. It is understood that approximately 25 per cent of the 260,000 employees of the United States Steel Corp. are working on the two-shift schedule of twelve hours each. Most of these employees are said to receive 40 cents an hour, or $4.80 for a twelve-hour day. A 25 per cent increase in wages will mean that these employees are to receive 50 cents an hour, or $4 for an eight-hour day. In actual wages they will lose 80 cents a day, but they will gain four hours of leisure.

Baldwin Plants Work at Capacity in July

The Philadelphia plants of the Baldwin Locomotive Works have been working at full capacity throughout most of July. Operations have steadily increased since the early months of the year, expansion being as rapid as development of working force would permit. Business booked during July was somewhat larger than in June and President Vauclain looks for a continuation of this tendency. The company has on its books more than $50,000,000 of unfinished business, or enough to occupy its full capacity for the rest of the year.

Plan Safety Campaign

An intensive safety campaign is to be conducted among the industrial plants of Baltimore by the Baltimore Safety Council. Paul F. Stricker, director of the council, is lining up the plants preparatory to beginning the drive. One of the features of the campaign will be schools of instruction conducted for superintendents, foremen and master mechanics connected with the industrial plants. In addition to this it is planned to hold monthly meetings of engineers and supervisors of safety in industrial plants when they will be addressed by prominent speakers on industrial safety.

Iron Output in Foreign Countries

An estimate of the stock of steel materials in Japan at the end of May, 1923, with comparative figures for the end of April in parentheses, made by the Mitsui Bussan Kaisha, a large commercial firm is quoted in a report to the Department of Commerce as follows: Bars, 36,534 long tons (25,797); plates and sheets, 34,913 (31,545); shapes, 14,262 (13,065); galvanized sheets, 12,326 (13,577); tinplate, 4,493 (4,488); nails, 622 (4,018); wire, 9,920 (8,455); rails, 8,458 (3,526); and other products, 4,761 tons (2,492 tons).

Current reports from Czecho-slovakia received by the Department of Commerce, indicate no important change in the activity of the local iron and steel mills which are continuing to operate around 45 per cent of capacity as for two or three months past, with production on a basis of approximately 850,000 metric tons of steel annually. Of this quantity about 25 per cent is used in the domestic market and the remainder is exported, to Germany in particular. Orders for export are declining and prices, while still unchanged, are showing a soft tendency. It is estimated that orders now on hand will keep the mills occupied until next August.

The Mining, Iron and Machine Association reports that the iron and steel production in Austria for the first quarter of 1923 was as follows: Open hearth pig iron, 71,212 metric tons; foundry pig iron, 21,479 tons; Bessemer steel, 11 tons; Martin steel, 84,520 tons; puddled iron, 87 tons; puddled steel, 187 tons; refined steel, 7,753 tons; finished products—iron bars, 20,811 tons; steel bars, 9,333 tons; girders, 2,958 tons; rails, 5,003 tons; sheet iron, 1,021 tons; sheet steel, 694 tons; and rolled wire, 17,409 tons.

The total production of the mining industry of the Santiago de Cuba consular district in 1922 was 468,340 tons of iron ore (hematite and magnetite) and about 20,000 long tons of manganese ore containing about 30 per cent manganese, from which 4,100 tons of concentrated product were obtained.

Iron and Steel Imports

Imports of iron and steel into the United States for the first half of 1923 totaled 515,805 long tons, an extraordinary amount when one considers that only 125,000 tons, approximately, entered the country in the corresponding period of 1922. It must be remembered in this connection, however, says the Iron and Steel Division of the Department of Commerce, that the boom in iron and steel importation did not begin until the second half of 1922. The past few months have seen a decline in the phenominal importation of pig iron, so that iron and steel imports for June, 1923, amounting to 68,019 tons, are but 12 per cent above the monthly average for last year according to the report.

Satisfactory Business in Cincinnati

The machine tool houses in Cincinnati report that business is about normal for this time of the year. Some of them state that orders are rather scarce at present, but this is only to be expected when the mid-summer lull is taken into consideration. On the other hand there are several large houses that have orders sufficient to keep them running on a normal schedule throughout the month of August. Judging by the slight increase in the amount of business being placed in the Cincinnati market by automotive manufacturers there will be more activity from this source during the next few weeks, although buying in volume by the automotive trades is not expected to begin until next month. Purchases of machine tools by this industry have been rather quiet for the past two months.

One of the encouraging features of the past two weeks has been the receipt of several foreign orders of liberal proportions. A 36-in. lathe is being shipped by one local machine tool house to Brazil. This constitutes the first shipment to this South American country in several years. Another Cincinnati concern is also filling orders for machinery to be sent to England. Here again purchases have not been made for some time in the past.

Glass manufacturers and chemical plants have been doing some buying of machine tools lately. One of the large Cincinnati machine tool companies had the first order for conveying machinery placed with it since the war by a glass manufacturer. This in itself is encouraging as an indication of the trend of business toward expansion. Conveying machinery is enjoying a good business among local plants.

Gear Business Fair

Business on commercial gears is not as active as it has been, although production is fair. Inquiries have dropped off somewhat, but are expected to get better within the next month. Some local companies are buying bevel gearing machines. The Western Electric Co. has been in the market for several special machines.

Railroads are not very active in the purchase of machine tools at present. The Chicago, Burlington & Quincy R.R., and the Pennsylvania R.R. have been making inquiries locally, but have not actually made many purchases. Nickle plate manufacturers are in the market for planers and the American Can Co. is also in the market for equipment. A local gas machine construction company has recently placed a big order for machine tools with a Cincinnati house. Public utilities have been very quiet lately and have done little buying. It is expected that they will not resume purchases of any appreciable size until September.

Business on planers has been quiet with orders coming in in scattered amounts and inquiries but fair. Electric tool houses have been affected by the general falling off of business during the summer months. Milling machines are not in much demand at present.

The outlook for a good business in the Fall is bright. Cincinnati machine tool manufacturers are firmly of the opinion that there will be a healthy increase in their output and in the demand for machine tools with the advent of September and the resumption of operations on a larger scale by numerous industries. The volume of business to date this year has been much larger than in 1922 and the same percentage of increased orders is expected to hold throughout the year.

Railroads have been giving excellent service in delivering material during the past few weeks. All equipment turned out by local manufacturers of machine tools has been delivered on schedule time which is quite a contrast to the condition which existed only a short time ago.

Steel plants in this district are operating to about 75 per cent capacity, and might be able to increase this schedule if they could obtain certain skilled labor. There has been a diminution of new business, but orders are still of fair volume.

Kruttschnitt Speaks on Railroad Conditions

In the opinion of Julius Kruttschnitt, chairman of the Southern Pacific R.R., the year 1923 will stand out in the history of American transportation as marking the renewal of the old railroad pioneering spirit. Mr. Kruttschnitt in part said:

"The co-operation of the railroads with the Government during the period of Federal control and their attempt since to re-establish themselves in spite of enforced rate reductions, coming at a time when wages were on the climb, materials high and traffic irregular, have gradually convinced the public and the press that the chief aim of railroads, after all, is service.

"The strength of the arguments against the railroads has been removed by their performance to date. They have handled an unheard of increase in traffic without a car shortage and even have a surplus of cars. At the same time, in spite of lower rates, they are showing increases in net operating income.

"The Southern Pacific is in the middle of its best year. The net ton-mileage for June and for the first half year was 28 per cent higher than last year.

"Work on the Mexican extension of the road has proceeded satisfactorily. Tracks have been laid fifteen kilometres south of Tepic and there remains six kilometres to grade north of La Quemada before heavy construction in the mountain section can be undertaken. It will probably require from two and a half to three years to complete."

Western Electric Looks For Record Year

The Western Electric Co. expects this will be a record year in production, according to a statement by the company recently. Based upon production figures in hand, the cable departments have broken all previous records. The statement says:

"Thus far this year 11,572,265,000 ft. of copper wire, the communication conductor, have been used in the manufacture of telephone cable. It is estimated that the output for the year will be at least 22 per cent greater than that of 1922. The year's output of telephone receivers is at the rate of 1,750,000, or about 500,000 more than the plant turned out last year."

Bad Order Locomotives Increase

The Class I railroads of the United States had in need or repair on July 15, 11,855 locomotives, or 18.6 per cent of the total number on line. This was an increase of 405 over the total number on July 1, at which time there were 11,450, or 18 per cent.

Of the total number on July 15 last 10,784, or 16.9 per cent were in need of heavy repair. This was an increase of 458 over the number in need of such repair on July 1. There were also on July 15, 1,071 locomotives in need of light repair, which was a decrease of 53 under the number of such locomotives at the beginning of the month.

The railroads on July 15 had 2,437 locomotives in good repair and stored away to meet increased traffic demands later in the year. This was an increase of 256 over the number in storage on July 1.

During the first fifteen days in July 18,290 locomotives were repaired and turned out of the shops.

Good Business Reported By General Electric

The General Electric Co. reports that its bookings last month were larger than in the same month last year. This was despite price reductions in various products made this year. There was a decrease as compared with the preceding months, which averaged over $27,300,000 a month this year, but the electrical business normally faces a seasonal decline in July and August and the recent trade recession added to this somewhat. Officials of the company report that conditions with it are very good and that billings are running at a satisfactory rate.

The directors will meet about the middle of the month for dividend action. The usual quarterly declaration of 2 per cent cash payment and the regular yearly stock dividend of 5 per cent, payable in special ($10 par value) stock are expected.

More Bonds for General Electric Workers

Employees of the General Electric Co. have oversubscribed the first issue of $5,000,000 employee bonds offered by the company. A second issue of $2,500,000 has been announced by President Gerard Swope. The bonds are offered to employees with more than six months' service by the General Electric Employees' Securities Corp., to yield 6 per cent, plus a 2 per cent extra annual dividend.

The first offering was made on Feb. 8. It is believed the new issue will be sufficient to meet the needs of the employees, but if not preference will be given in the order of length of service. No employee is permitted to subscribe to more than $500 in bonds during a single year. Payment may be made in instalments from wages.

Will Buy Locomotives

Authority has been granted to the Elgin, Joliet & Eastern Railway Co. to obligate itself for the purchase of new equipment which is to include fifteen Mikado locomotives, to cost $867,283.35.

New York Enjoys Sudden Sales Revival

Business in the Metropolitan district improved with so much rapidity during the past week that dealers in some instances deferred their vacations until a later period and in one case a prominent dealer was suddenly called back to the city from his holiday by the press of business. Every dealer who was visited during the past week reported an improvement in his sales and also in the number of inquiries. "Better than at any time during the past eight weeks" and, "as good as we did during March and April" were two of the many declarations made.

General industrial buying seems to have been the cause of the sudden spurt in business. While railroads are still buying steadily and textile mills are in the market to a limited degree, the bulk of last week's business was with industrials in no particular line.

The New York Central R.R. is one of the roads that has bought regularly during the past month and indications are that it will continue to be a good customer for some time. Locomotive shops are steady patrons as well as all car shops and kindred lines.

Buying by the automobile shops in the Eastern territory is fair and heavier buying is expected within the next two weeks so that factories will be in the best possible condition for the Fall when it is predicted the record production of the Spring and early Summer will be resumed.

Special machinery is not being ordered to any extent at this time, according to those close to the market. The crane market is dull just now, but that, too, like other branches of the industry expects to see improvement before Sept. 1, when business takes on its normal aspect.

Dealers in used machinery report that sales are a trifle slow but blame the weather rather than any business cause. Garages have been good buyers of rebuilt and reconditioned machinery, it is reported.

Manufacturing plants in and around New York City are working near to capacity and there is no indication of a let-up in production. It is expected that there is enough business to carry most plants over until the Fall business starts.

Canadian Shops Prosper by Railroad Work

Successful flotation by the Dominion Government of $23,000,000 of equipment bonds for the Canadian National R.R. was the outstanding feature of the week ending July 28, as regards the outlook for future orders for railway materials. As Parliament has already appropriated seven millions for the same purpose there will be available for the purchase of locomotives, cars, rails and other equipment, the sum of thirty millions of dollars. The Canadian Pacific R.R. has also embarked upon an extensive plan for betterments and rolling stock, and in addition to orders already in process of filling, has contracted with the Algoma (Ontario) Steel Corp. for the supply of 30,000 tons of steel rails, an order which will keep that plant busy until the end of September.

The strike at the British Empire Steel Corp. works at Sydney, Nova Scotia, has practically collapsed, and the early resumption of output may be expected to influence the iron and steel market which was marked during the week by a drop of one dollar per hundred pounds in the price of pig iron.

In the field of larger engineering enterprises there is every indication of continued activity. Among the new undertakings announced during the week is a power project which will involve the outlay of over thirty million dollars and have considerable effect on the proposed St. Lawrence River power development. According to the application plan laid before the Federal Department of Railways and Canals in Ottawa, the scheme is backed by the National Hydro-Electric Co., Ltd., of Montreal. The proposal is to raise the level of the Carillon dam from 94 ft. to 133 ft.

Renewed interest in the movement to establish steel plants in British Columbia is arousing interest in eastern Canada, as at present the requirements of that province are largely met by importations from the United States. With the development of eastbound traffic in grain from Vancouver via the Panama canal, however, return tonnage at reasonable rates should stimulate larger importations from British sources of supply.

Seasonal Lull Is Felt in Philadelphia

A slackening in the unprecedented buying and manufacturing pace set in the Philadelphia district during the first six months of this year, has occurred. This is attributed to seasonal declines by manufacturing firms, and this theory is borne out by the monthly *Business Review* of the Third Federal Reserve district.

Machine tool manufacturers report the labor situation somewhat easier. There has been a considerable falling off in orders and there is an air of uncertainty among manufacturers as to the future.

The Federal Reserve district's review shows that, although steel is selling fairly well, the unfilled orders of the United States Steel Corp. have decreased. Many other steel companies, however, still have unfilled orders placed some time ago.

Several lines of building materials have felt the decline, and a falling off in building operations is reflected in the showing that the number of building permits has dropped and the value of the contemplated structures has decreased compared to this time a year ago.

That business men expect an active Fall trade is indicated in the freight movement of goods. Freight car loadings for June were far in excess of the normal loadings for this season. A large number of the cars loaded came from mills and shops of Philadelphia manufacturers.

The Federal Reserve report shows the average weekly earnings in the manufacturing industries declined in June from $26.71 to $26.26. It also shows there was an increase in employment, which, taken with the decrease in weekly earnings, indicates an easier labor situation.

Manufacturers of plumbing supplies report that the falling off in orders is attributable to the fact that jobbers bought heavily during the year and are now selling from stock.

Railroads Still Buying in Chicago

The machine tool market in the Chicago district was less active in July than in June and the market is experiencing the mid-summer lull, both inquiries and orders having fallen off. The tendency seems to be to defer purchases until the latter part of the year in the belief that decreased buying will result in purchasing to a better advantage in the Fall than at present.

While the machine tool industry made a good showing during the first half of the year, it is suggested that a greater portion of this purchasing was for replacement and that there was very little buying for purposes of expansion. However, recent inquiries indicate that some consideration is being given to purchases for new projects and expansion. The railroads continue to buy machine tools although not near as heavily as during the early part of the year.

The hot wave, which has made itself felt generally, is affecting consumption of iron and steel. Foundries, which otherwise would be running full are taking only a few heats a week to give their men a little vacation. In spite of this there has been a fair amount of buying for prompt and last half delivery. While small lots continue to be in the majority, a number of buyers, by placing orders for impressive tonnages for shipment throughout the balance of the year, are backing their judgment that the market has about reached the bottom of the present price dip. Chicago mills are in a comfortable position for at least the next two or three months and they anticipate no difficulty in obtaining sufficient tonnage to carry them through the last quarter of the year.

Indiana Business Shows Improvement

The last two weeks have seen some improvement in both the machinery and the machine tool business. The increase has been slight, it is true, but coming as it does during an ordinarily slack time in the business, it would indicate more business for this Fall.

In the first place some activity is to be seen among the automotive factories here and their allied industries. They are buying more tools and inquiries are being received from purchasing agents for specialized machinery, which indicates some fair sized installations during the next few weeks. Manufacturers say the public trend—particularly noticeable this Fall—toward the closed car, has made necessary the revising of their machine and tool departments to some extent. Farm machinery business is quiet, branch managers here say. The condition of the farmer in view of present prices of grain and live stock, is deplorable, and he is buying no new machinery. During the last week developments in the financial affairs of the R. L. Dollings Co. of Indiana, a finance corporation that underwrote the stock issues of a number of industrials and went in the hands of a receiver, forcing some of the industrials to do likewise, have caused considerable worry.

Demand for saw milling machinery is curtailed, officials of E. C. Atkins & Co., state. The business has been excellent, however, for many months and they have no complaints to offer.

Aero Chamber Elects Its Officers

At the annual meeting of the Aeronautical Chamber of Commerce the following were elected to serve on the board of governors for the ensuing year:

Samuel S. Bradley, New York; Charles H. Colvin, Brooklyn; Donald Douglas, Santa Monica, Calif.; Sherman M. Fairchild, New York; Allan Jackson, Chicago, Ill.; E. A. Johnson, Dayton, Ohio; John M. Larsen, New York; Grover C. Loening, New York; F. B. Rentschler, Paterson, N. J.; Frank H. Russell, Garden City, N. Y.; Lawrence B. Sperry, Farmingdale, L. I.; B. D. Thomas, Ithaca, N. Y.; I. M. Uppercu, Keyport, N. J.; Jesse G. Vincent, Detroit, Mich.; and W. C. Young, Akron, Ohio.

Mr. Colvin is general manager of the Pioneer Instrument Co.; Mr. Douglas, president, the Douglas Co.; Mr. Fairchild, president, the Fairchild Aerial Camera Corp.; Mr. Johnson, the Johnson Airplane & Supply Co.; Mr. Jackson, vice-president, the Standard Oil Co. (Indiana); Mr. Larsen, president, the J. L. Aircraft Corp.; Mr. Loening, president, the Leoning Aeronautical Engineering Corp.; Mr. Rentschler, president, the Wright Aeronautical Corp.; Mr. Russell, vice-president, the Curtiss Aeroplane & Motor Corp.; Mr. Bradley, general manager, the Manufacturers Aircraft Association; Mr. Sperry, president, the Lawrence Sperry Aircraft Corp.; Mr. Thomas, chief engineer, the Thomas-Morse Aircraft Corp.; Mr. Uppercu, president, the Aeromarine Plane & Motor Co.; Mr. Vincent, vice-president, the Packard Motor Car Co.; Mr. Young, aeronautics manager, the Goodyear Tire & Rubber Co.

Immediately following the adjournment, the new board of governors met and elected the following officers:

President, Frank H. Russell; First Vive-President, Allan Jackson; Second Vice-President, S. M. Fairchild; Third Vice-President, Donald Douglas; Treasurer, Charles H. Colvin; General Manager and Assistant Treasurer, S. S. Bradley; Secretary, Luther K. Bell; and Assistant Secretary, Owen A. Shannon.

Fine Report by American Locomotive Company

The American Locomotive Co. in its report covering the six months ended June 30, 1923, shows gross earnings of $45,226,526, against $21,722,179 in the last six months of 1922. After allowing for all expenses, interest and taxes, there was reported profits available to the capital stock amounting to $6,972,125. After allowing for regular dividends on preferred stock, the balance available for the new 500,000 shares of common stock, without par value, was equal to $12.19 a share.

Andrew Fletcher, president, in a statement to stockholders, said that the inventory account of materials and supplies, contract work in process and stock locomotives and spare parts on hand June 30, 1923, amounted to $16,169,730, as compared with $15,337,873 on Dec. 31, 1922.

"The excess of current assets over current liabilities June 30, 1923, was $44,097,848 in comparison with $39,692,24- on Dec. 31, 1922, an increase of $4,405,603," he said. "These amounts were obtained after including current liabilities, reserves for United States and Canadian income and profits taxes and reserves for current shrinkage in value of notes listed in current assets. The company on June 30, 1923, had no loans payable and had in its treasury on that date in cash and marketable securities $15,279,205, as compared with $15,078,202 on Dec. 31, 1922. The amount of unfilled business on hand June 30 is sufficient to keep the plants operating at full capacity for the remainder of the year."

Large Earnings Made By U. S. Steel

The statement of earnings of the United States Steel Corp. covering the second quarter of the current year, was the most favorable since the third quarter of 1920, when earnings were the largest of any period since the war. Net earnings totaled $47,858,181, against $34,780,069 in the first quarter of the year; $27,286,945 in the second quarter of last year; and $48,051,540, the record quarter of 1920. After all charges and deductions, there was reported a balance equal to $4.63 a share on the common capital stock outstanding.

Car Loadings Still at High Figure

A new high record for car loadings was established for the week of July 21 with a total of 1,028,927, according to the figures made public by the Car Service Division of the American Railway Association. This exceeds by 7,157 cars the previous record established for the week of June 30. It is also the seventh week this year in which the total loadings have exceeded the million mark. Barring the weeks containing holidays million-car loadings have been maintained consistently for the last nine weeks.

This record makes the third time this year that the highmark of 1,018,539 cars established on Oct. 14, 1920, has been exceeded. Loadings for the week of July 21 also exceeded the corresponding week of last year by 183,379 cars, and the corresponding week of 1921 by 240,893 cars. Compared with the previous week of this year it was an increase of 9,260 cars.

Loadings of merchandise and miscellaneous products, which slumped during the first two weeks of July, increased 7,293, bringing the total for the week to 584,407 cars. Compared with the corresponding week of last year this was an increase of 28,665 cars, and with the corresponding week of 1921 it was an increase of 115,584 cars.

Record loadings for the year 1922 were 1,014,480 cars loaded in the week of Oct. 28, while the highest loadings this year were made during the week of June 30, when 1,021,770 cars were loaded.

Divided into groups the loadings for the week of July 21 indicated increases in grain, forest products, ore loadings and coke, and decreases in live stock and coal, when compared with the report of the previous week.

Live stock loading totaled 32,454 cars; 272 under the preceding week, but an increase of 5,073 over the corresponding week of 1922, while coal loadings were 190,788 cars, a decrease of 3,043, when compared with the week before.

Manufacturers Watching Coal Situation

"Almost overnight the possibility of a coal strike in the anthracite regions has taken on a threatening aspect," says the *Industrial News Survey*. "Apparently reliable reports indicate that the issue in controversy is the 'check-off' system, which is another way of saying the full and complete recognition of the union. The temper of the union representing the miners is indicated by the announcement of its officers that they stand irrevocably committed to collective bargaining, but are unalterably opposed to arbitration in any form. With a spirit of 'no compromise' on both sides, the public interest may again be sacrificed to the special interests of the operators and the miners.

"Industry and the public generally now look to the Federal Coal Commission for a practical interpretation of the dictum laid down in its recent report that 'if, as the Commission believes, the mining of coal is clothed with a public interest, then both sides must—peaceably and voluntarily if they will and under compulsion if they will not—deal with each other in the light of the general welfare of the American people.'

"In the face of those gloomy forebodings of labor difficulties, it is a pleasant task to record another step forward by a prominent employer in cementing the amicable relations which have for years existed between the company and its employees. This is the introduction of guaranteed all-year-round employment in a factory where the employees already enjoy insurance benefits, profit sharing and direct representation on the Board of Directors. The question at once arises, 'Why cannot some of these things be introduced into the coal industry?'"

Allis-Chalmers Sales Increased

The Allis-Chalmers Manufacturing Co. reports sales billed of $6,082,079 in the three months ended June 30, against $4,778,863 in the same period last year. Net profits for the period were $628,418, after expenses and taxes, equal to $1.30 a share on the common stock after allowing for preferred dividends. In the same period last year net profits were $299,796, equal to four cents a share on the common stock.

For the first six months of 1923 sales billed aggregated $11,303,762, against $9,450,465 in the first half of 1922. Net profits were $1,097,108, against $578,529, equal to $1.99 a share on the common stock in the first half of this year.

Wickwire Spencer Nearly Doubles Sales

The Wickwire Spencer Steel Corp. reports sales of $16,300,571 for the six months ended June 30, against $8,761,216 in the same period last year. Total income, after all expenses, and crediting other income, amounted to $2,008,080 against $929,166. After miscellaneous charges, but before depreciation and bond interest, there was reported net profit of $1,506,444 against $230,461 in 1922.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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PRESIDENT HARDING'S death was entirely unexpected. Early in the week his condition caused apprehension, but his recovery seemed assured on Thursday morning and the news of his passing published on Friday morning was a great surprise. The whole nation is bereaved for Mr. Harding was a likable man whose humanity and broad sympathies had greatly endeared him to the American people.

It is, however, unlikely that his sudden death will have any effect upon business. He is the sixth president who has died in office and the Constitution provides so fully for such emergencies that there can be no disarrangement of the machinery of government.

As to Mr. Coolidge all that can now be said is that the business men of the country contemplate his succession with confidence and that his record justifies a belief in his conservatism and good sense. As Governor of Massachusetts he showed himself to be a strong and courageous man, careful of his words, but vigorous in action and no one doubts that as President he will give us a satisfactory administration.

Therefore the "mind of the market" is again turning toward Europe where the situation "seems" to be growing more chaotic. The word "seems" is used advisedly because no one can say in how far the published utterances of European statesmen are designed to affect sentiment rather than to describe facts. It is therefore quite possible that the gravity of the situation has been exaggerated.

But read literally the cables from London indicate that Great Britain will soon part company with France and Belgium in her negotiations with Germany; that Italy is likely to follow the British lead and that a practical dissolution of the Entente Alliance will follow.

As the otherwise unwarranted pessimism which some Americans feel is chiefly due to the fear of a political debacle in Europe a careful study of the facts and possibilities overseas is in order.

In such a study the first question that suggests itself is: Can war in the immediate or proximate future be the result of a break between Great Britain and France?

To this question nearly everyone will answer No. The British do not intend to fight. They are courageous, but they are also sane. Germany has neither arms nor the means for making them and the financial condition of France is such that she could not raise the money to pay for a war even if the men to fight it were obtainable, which is doubtful.

Admitting the utter improbability of war, the next two questions that suggest themselves are:

(1) How else can a way be found out of the present European *impassee;* and,

(2) If such a way out is not speedily found what will be the effect upon American business?

Answering the second question first it may be said that conditions in Europe are already so bad that they cannot get much worse and that since it is impossible for the economic level to fall below zero, we have not much to fear from a prolongation of the present uncertainty. We have Asia, Africa, South America, Holland, Scandinavia, Spain, Switzerland, Italy and the whole of the British Empire to trade with, and even if France and Germany insist upon committing commercial suicide, we shall not lose much for our business with them is already dwindling and their competitors will speedily take their places.

Therefore the 'mind of the market' is again turning toward Europe where the situation 'seems' to be growing more chaotic. The word 'seems' is used advisedly because no one can say in how far the public utterances of European statesmen are designed to affect sentiment rather than to describe facts. It is therefore quite possible that the gravity of the situation has been exaggerated."

It is in the answer to this second question that the way by which the present *impasse* will be ended is indicated. That way is the way that will be opened by the pressure of economic compulsion.

The German mark is already worthless and one of the consequences is that the German people are starving because their money will buy nothing. The inevitable result will be a change of Government in Germany either by revolution or otherwise and an offer to settle that France will have to accept.

If she refuses any reasonable proposal the franc which is already worth less than at any time previously will speedily follow the German mark to nothingness and leave the French people in a grave condition financially.

This somewhat extended examination of European conditions and eventualities has been attempted because it is chiefly by the fear of what may happen abroad that American enterprise and business are restrained today. Except for the President's death and the slight interruption that it may cause, the domestic outlook is about as impeccable as it ever gets to be.

Of the first essential to prosperity, bank credit, we are assured an abundance by a Federal Reserve ratio which stood at 77.3 per cent last Thursday. Railroad earnings are excellent and the traffic as indicated by the car loadings is the largest on record.

The retail stores nearly all report a gain in sales and the increase in the mail order business is phenomenal.

Seasonal fluctuations in the commodity markets have been recorded but, conditions are entirely normal and cotton has advanced sharply on a government report that was much below what has been expected.

Even wheat has been firmer and corn has advanced. But despite all this merchants are hyper-cautious and investors are scared because they fear that something that will destroy American prosperity may happen in Europe.

When we consider what happened in Europe from 1914 to 1919 and its effect upon this country this fear would seem to be unwarranted. It is in the hope of allaying this fear and re-inspiring the faith in ourselves and civilization that has made us prosperous in the past that the foregoing has been written. Our government is functioning perfectly in the emergency caused by the death of its beloved chief magistrate. Our economic position is entirely sound and the will to develop the opportunities it offers is the only thing needed to assure national prosperity and happiness.

Inland Steel Reports Good Profit

The Inland Steel Co., for the six months ended June 30, 1923, reports net profits, after all expenses, of $3,530,493. Net income, after depreciation and taxes, amounted to $2,459,635, from which common and preferred dividends were paid, leaving a surplus of $1,291,821.

The board of directors declared the regular dividend of 62½ cents a share on the common stock and the regular dividend of 1¾ per cent on the preferred stock. The common dividend is payable Sept. 1 to stockholders of record Aug. 15, and the preferred dividend is payable Oct. 1 to stockholders of record Sept. 15.

New Westinghouse Plant Nears Completion

Rapid progress is being made at the Sharon, Pa., plant of the Westinghouse Electric & Manufacturing Co. to get it ready for making transformers. The company has closed contracts for much of the machinery and tools needed for the work, and is making an effort to begin operations about Oct. 1. About 1,000 men will be employed when the plant starts, but eventually the number will be increased to 3,000 it is stated.

Increase in Trade with South America

A remarkable increase in the trade of the United States with South America for the fiscal year ending June 30, 1923, compared with the similar period of 1921-22, is shown in figures issued recently by Dr. Julius Klein, director of the Bureau of Foreign and Domestic Commerce of the Department of Commerce. Total trade—exports and imports—amounted to $739,427,154 this year against $479,710,139 last year—showing an increase of 55 per cent.

According to Director Klein, the figures demonstrate impressively certain facts which have become increasingly evident in our Latin American commerce. European competition in those markets, in spite of advantages through depreciated currency quotations, is making no serious inroads upon our position. The power of invested capital as a determinant of trade currents is clearly indicated; our heavy investments, through American loans and new enterprises, have emphatically proved to Latin America the confidence of our bankers and merchants in her economic future. They have also stimulated the shipment of American equipment—electrical machinery, telephone apparatus, railway supplies, etc., for these new undertakings. Our increased imports are, of course, an indication both of settlement of interest charges on these loans and of the great demands for raw materials for the expanding of all kinds of industry of this country.

Both exports and imports shared in this gratifying showing, according to Director Klein. Exports to South America increased 35 per cent, or from $190,812,070 in 1922 to $258,684,390 in 1923. An even more startling increase is noticed in our imports from that region. Our purchases this year amounted to $470,842,764, as compared with $288,897,069 during 1921-22, which is a jump of 63 per cent. The percentage of increase in total trade with South America was greater than with any other trade region excepting Oceania.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb....	$0.0337	$0.034	$0.0263
Cold finished shafting.....	per lb....	0.0428	0.042	0.034
Brass rods.....	per lb....	0.1825	0.1825	0.1650
Solder (½ and ½)	per lb....	0.276	0.2862	0.228
Cotton waste...	per lb....	0.1231	0.1231	0.101
Washers, cast iron (½ in.)...	per 100 lb.	4.66	4.66	3.83
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100...	3.08	3.08	3.11
Lard cutting oil	per gal...	0.575	0.575	0.575
Machine oil....	per gal...	0.349	0.349	0.36
Belting, leather, medium.....	off list....	37%	37%	46⅔%
Machine bolts up to 1x30 in.	off list....	44¼%	44¼%	63%

Train Control System Proves Successful

"Extremely encouraging results" were reported by the Train Control Committee of the Pensylvania R.R. following a year's trial under practical operating conditions of a new automatic control system on a fifty-mile stretch of track on the tracks between Lewiston Junction and Sunbury, Pa.

The system had been in operation throughout the entire Lewiston branch since July 11, officials said, and the movements of all trains, freight and passenger, had been subject to its control. The control system is a combination of electrical, pneumatic and mechanical devices applied both to the track and to the locomotives. These devices automatically slow down, or, when required, bring to a complete stop, any train which approaches too closely to another on the same track, whether going in the same or opposite directions, or when switches are improperly left open.

Under the new control system the track is electrified to carry alternating current, and locomotives are equipped with electrical apparatus which, without actually touching the rail, picks up the current from the track by induction. The power thus derived performs two functions—operates cab signals, electric bulbs, three in number, and air brakes when trains are coming together, when proper speed might be exceeded, or when a train approaches an open switch. These functions are performed, according to the committee's report, "without any action being required on the part of the engineer or fireman."

Railroads Preparing for Fall Traffic

In the August issue of *Commerce Monthly*, the National Bank of Commerce in New York states that unless unfavorable factors interpose, the continuation of present conditions of industrial prosperity throughout the country will go far toward assuring prosperity for the railroads.

"The improvement in the condition of the railroads of the United States which was apparent in the early months of last year, but which was prematurely strangled by the coal and rail strikes seems at last to have begun in real earnest. The ratio of operating expense of operating revenue has been gotten within reasonable bounds and business and industrial recovery has created a tremendous volume of traffic. Car loadings of revenue freight during the first six months of 1923 were nearly 12 per cent greater than in the same period of 1920. During the week of June 30 loadings were 3,000 cars above the record for a single week previously established in the Fall of 1920. The American Railway Association estimates that freight loadings during the Fall of 1923 will reach as high as 1,080,000 cars per week, more than 60,000 above any previous record.

"The outstanding factor in the situation is the comparative ease with which this extraordinarily large volume of traffic has been handled. Traffic congestion has been at a minimum and in spite of an unusually large percentage of bad-order cars and locomotives resulting from the strike of railroad shopmen last Summer the large shortage of freight cars which was a problem last Autumn has been pared down until at present a fair surplus exists. The proportion of locomotives in need of repair is being continually reduced."

Preparations have been made in anticipation of a heavy crop movement in the Fall which makes that season the heaviest traffic season of the year. Continuing the bank says:

"It is estimated that these precautions, and the receipt of the large number of freight cars on order to be delivered Oct. 1 will enable the railroads to care for the enormous volume of traffic expected.

"The earnings of the railroads have kept pace with increasing car loadings. Their gross operating revenues for the first five months of 1923 amounted to over $3,550,000,000 more than 13 per cent higher than the previous record for the period established in 1920. This was in spite of the fact that reductions in freight rates during the past year made voluntarily by the roads or at the instance of the Interstate Commerce Commission have in the aggregate been considerable. For the first five months of the year the average investment was 5.69 per cent. There is better than a fair possibility that the standard return of 5.75 per cent allowed the roads by the Act of 1920 will be earned this year for the first time.

"Economy of operation has not been at the expense of maintenance. In the first five months of 1923 a larger sum was expended for maintenance of way and structures and of equipment than in the corresponding period of any preceding year with the exception of 1920. Although the roads expect to spend in total more than a billion dollars during 1923 on equipment, improvements and developments, this amount will be capitalized rather than charged to operating expenses."

Ford's Railroad Shows Remarkable Gain

The Detroit, Toledo & Ironton R.R. again showed a remarkable earning statement for June. Despite the fact that the gross income of the railroad for June was only $874,559, against $904,632 in the same month of last year, the net operating income was $216,188, against $123,409 in the same month of last year, an increase of approximately 75 per cent.

The greatest saving was made in the operating expenses. The June statement even surpasses that of May, when the road earned $170,961, or $46,000 less than June. Estimates were made at that time that the road would earn a total of $1,500,000 this year, or more than the railroad originally cost Ford, it was said.

Personals

C. B. SHEPARD, formerly of the Shepard Art Metal Co., which was recently purchased by the Ternstedt Manufacturing Co., Detroit, has entered the business of automobile door handle manufacturing at 2900 Hart St., Detroit.

F. H. MURRY, formerly connected with the Detroit office of the New Britain Machine Co., New Britain, Conn., is now located in Chicago at 202 South State St., and will handle the firm's business in the Chicago territory.

JOHN MANGLE has been appointed Chicago representative for the Pure Carbon Co., Wellsville, N. Y. His headquarters will be at 184 West Washington St., Chicago.

H. L. ERLICHER, formerly assistant to the general purchasing agent of the General Electric Co., Schenectady, N. Y., has been appointed assistant general purchasing agent.

MAJOR R. W. CHANDLER, manager of the truck division of the Yale & Towne Manufacturing Co., Stamford, Conn., sailed recently for an extensive trip through England, France, Belgium, Denmark, Sweden, Norway and Holland. While abroad he will further the interest of his company, especially its electric storage battery industrial truck department.

A. E. THIFFAULT and RAYMOND I. CASPERS will have charge of the newly opened Chicago office of the Surplus Steel Exchange, Inc., New York. The office is located at 2257 Oakdale Ave., and will transact business for the states of Illinois, Minnesota, Wisconsin, Iowa, Missouri and Indiana.

J. H. CROSSLEY of the Metropolitan-Vickers Electrical Co., Manchester, England, is in the United States studying industrial heating developments which he hopes to apply to conditions in his own country.

LOUIS R. KRUGER has resigned as mechanical engineer with the Chrobaltic Tool Co., Michigan City, Ind., and has accepted the position of general superintendent and mechanical engineer with the Cruver-Peters Co., Chicago.

H. J. EDWARDS has been appointed works manager of the B. F. Stearns Co., maker of the Stearns-Knight motor cars, Cleveland.

CHRISTOPHER J. MEYER, president of the Evinrude Motor Co. of Milwaukee, will sail from New York on Sept. 5 for Europe, to visit the branch factory at Munich, Germany, and for travel in France, Spain, Belgium, Denmark and the British Isles.

ALFRED KAUFFMANN, vice-president of the Link-Belt Co. and general manager of its Indianapolis plants, was elected a director of the Fletcher Savings & Trust Co., Indianapolis, recently.

GEORGE S. WINDERS has resigned as house manager and assistant-treasurer of the Van Camp Hardware & Iron Co., Indianapolis. HARRY C. BALLARD, formerly superintendent of the company, has been appointed to succeed Mr. Winders as house manager.

B. B. QUILLEN, president and general manager of the Cincinnati Planer Co., Cincinnati, is now on a business and pleasure trip to Alaska.

A. B. BREEZE, vice-president of the Cincinnati Ball Crank Co., Cincinnati, has tendered his resignation. His plans for the future have not been announced.

J. M. PFKORSE has been appointed superintendent of the Cincinnati Ball Crank Co. Mr. Pfkorse was formerly with the Wagner Electric Co. and the Borg & Beck Co.

BRIGADIER-GENERAL J. W. JOYES has been appointed Assistant Chief of Ordnance, succeeding to the vacancy created by the death of the late Brigadier-General William S. Peirce.

Obituary

AUGUST W. HOLLAND, aged 64 years, superintendent of the Graves & Marshall Boiler Works, Dayton, Ohio, died recently as the result of a stroke of paralysis. Mr. Holland had been with the company for the past 37 years, starting as a helper.

WILLIAM E. CANNING, superintendent of the Long Island R.R., aged 56 years, died recently at his home, Jamaica, L. I. He had been with the railroad since he was 15 years old.

A. H. JONES, head of the Jones Machinery Co., of Atlanta, Ga., distributors of machinery and supplies in the Southern field, died recently at his home in Atlanta at the age of 55 years. Mr. Jones was well known throughout the Southeast as an electrical engineer, serving for some time as superintendent of the Greensboro Electric Co., of Greensboro, N. C., before he came to Atlanta four years ago and established the Jones Machinery Co.

EDWARD VAN WINKLE, one of the pioneer machinery manufacturers of the Southern field, died the latter part of July at a private sanatorium in Atlanta, Ga., at the age of 82 years. He was formerly president of the Van Winkle Gin & Machinery Co., of Atlanta, Ga., extensive manufacturers of cotton mill and gin machinery and equipment, the name of the company being changed to the Murray Co. on Mr. Van Winkle's retirement some time ago. The business was established in Atlanta shortly after the Civil War.

HERBERT F. TOPP, head of Herbert F. Topp & Co., Cincinnati, pig iron dealers is dead. Mr. Topp was formerly connected with the Dayton Coal & Iron Co. and later became a partner in the New York firm of Crocker Brothers. Last January Mr. Topp left this firm to start the company which bears his name.

CAPT. ABONIJAH BRUSH ELLIOTT, civil war veteran and retired Chicago manufacturer, died recently at his home in Chicago at the age of 80 years. Capt. Elliott was born in Clayton, N. Y., on Feb. 27, 1843. He came to Chicago in 1890 and founded the firm of Jerome & Elliott, manufacturers of metallic packing.

R. L. MEIXELL, secretary of the Coats Machine Tool Co., New York, died recently at his home in that city.

Business Items

The Wisconsin Parts Co., Oshkosh, Wis., manufacturing axles for heavy duty vehicles, tractors and railroad coaches, has acquired the entire axle business of the Savage Arms Corp., Sharon, Pa., and Utica, N. Y. The purchase includes the entire inventory, dies, tools, patterns, patents and designs for front and rear axles. This will be consolidated with the Oshkosh works at once.

The Brainerd Foundry Co. has been organized at Brainerd, Minn., by E. O. Webb, Clyde E. Parker and Fred E. Kinsmiller, to manufacture gray iron castings. Construction work is now under way on a new foundry and cupola, to be ready to start operations about Oct. 1 or 15, it is reported.

Construction began early this month on the new $200,000 plant to be built at Jacksonville, Fla., by the Florida Machine & Foundry Works, F. G. Russell, Sr., head of the company, advising that the plant will comprise four units, and be the first in the state of Florida to produce steel castings. The equipment includes an electric furnace up to three tons capacity, which has been purchased from the Pittsburg Electric Furnace Corp. A separate building will house the company's machine shops, which will be equipped throughout with new machinery.

A Southern warehouse and general offices are to be opened in Atlanta, Ga., this month by the McKenna Brass & Manufacturing Co., Inc., of Pittsburgh, Pa., according to an announcement by E. C. Bastible, general sales manager. The Atlanta plant will be located at 483 Whitehall St., and will also do some manufacturing.

The Reliance Pump & Machine Co., recently incorporated, has taken over the three-story building at 120 South Calvert St., Baltimore, Md., and established a plant for the manufacture of an automobile pump, according to an announcement by the Industrial Bureau of the Board of Trade. C. Braxton Dallam is president of the new concern, and H. C. Dougall, secretary and treasurer.

The General Electric Co. announces the opening early this month of a general warehouse in Atlanta, Ga., the largest electrical warehouse and service station in the Southeast, with a capacity of 64,000 square feet of floor space. The Atlanta offices will handle the company's southeastern trade.

The annual convention of the sales organization of the Wolverine Brass Works, Grand Rapids, Mich., was held at the factory recently. L. A. Cornelius, president of the works, presided at all sessions.

The bureau of awards of the Brazilian Centennial Exposition has notified the Union Manufacturing Co., New Britain, Conn., that it has won the gold medal for the chucks exhibited recently.

The Hanna Stoker Co., Cincinnati, has moved into its new plant at Brotherton Road and the Pennsylvania R.R., Cincinnati. The new plant has production facilities of over $1,000,000 per annum.

Germany's Problem with Labor

Higher wages will mean higher prices for machine tools and less chance of selling in foreign countries—Manufacturers saved by labor's lack of strike funds

By Our Berlin Correspondent

THROUGH the adoption of sliding wages intended to stabilize the intrinsic value of wage payments business life enters into a new phase fraught with consequences, which are best signified by the almost desperate opposition which the machine building industry, in fact the industry in its entirety, had made since this scheme first loomed up several years ago. Up until now wages have been adjusted by tariff agreements concluded between the labor unions and employer's associations of the respective lines of industry for establishments within a certain district. Such agreements as a rule require lengthy negotiations usually ending in an appeal to the court of arbitration which again takes some time to find judgment.

In times of rapid shrinkage of the purchasing power of money such dilatory procedure makes a settlement obsolete before it has been accomplished. New claims are forthcoming before their predecessors are dealt with. The advantages of such protracted adjustments to the industry are obvious. It provides them with a time of grace during which wages are still paid at the old rates for some time after increases have been demanded. It is no rare occurrence that in such intervals wages drop to from 10 to 15 per cent of their pre-war equivalent. On the other hand, it has been the cause of continuous dissatisfaction in the labor element which, if the latter remained silent, has found expression in a lower rate of efficiency.

Although many manufacturers are inclined to recognize only the advantages of the present system, its disadvantages can hardly be overlooked, especially in times when conditions are so sharply pronounced that dissatisfaction assumes the extent of an unrest. Probably at no period during post-war time was the unrest caused by the wage question stronger than at the present. The comparative quietness is purely deceptive. Two important causes have kept the smouldering unrest under control, the consideration of the national plight and the fact that the strike funds of the unions have been seriously depleted by the rapid money depreciation. Had they been invested in securities of permanent value, the course of events would have been different and probably quite dramatic.

No Money for Strikes

As an illustration may be mentioned the recent strike of the Berlin metal workers, as the whole group of labor employed in the machine building and kindred industries is called. The German union of metal workers numbering over two million members could not support the 250,000 men concerned in Berlin in a strike of even short duration. The strike was declared against a specified number of works only with an aggregate complement of 80,000 men. The spreading of the strike beyond its planned confinements has brought it to a premature termination.

Local strikes that flared up in all parts of the country, were quenched for the reason mentioned. In many works the men have resorted to obstructionist tactics, impeding work by deliberate slackness. The rate of production drooped sharply, a serious item especially in respect to the output of basic products. The situation assumed a dangerous aspect and a number of increases granted in quick succession has failed to alleviate it.

Under such circumstances the conviction was growing and slowly maturing, assisted by a good deal of official persuasion brought to bear in the interest of the situation in the Ruhr that a stabilization of wages can no longer be prevented. The central organization of the German industry decided to agree to it on principle, but in the negotiations following considerable difficulties arose on the road to a practicable solution of the problem. A wide difference of opinion separated both parties to the contest. The agreement upon basic rates was a hard problem and still more so the key of progression.

> "The unions want no fixed basic rates, but demand that they be adjusted by agreement as heretofore. Moreover, they do not want them to be keyed to any gold basis but to the cost of living. By this settlement which may be transient in details, but doubtless is permanent in principle, the German manufacturers will be faced with an entirely new situation which in all its bearings can hardly be foreseen. It is clear that if wages are paid on a sliding scale, prices of coal, iron and steel that have been kept under control are bound to follow."

In the former respect the unions have made a very important concession, by admitting in principle, that in view of the state of efficiency in the works and the difficult marketing conditions the industry is unable to pay the pre-war equivalent of wages. The manufacturers' organizations were of the opinion that a bomb-proof arrangement should be built upon this concession, saving them from all anxiety with regard to foreign competition now and in the future. Their plan was to establish certain basic wage rates, which in consideration of the lower efficiency of labor and other elements in the labor situation, affecting cost of production should be well under the pre-war rates. This done, they would be willing to pay these wages even on an absolute gold basis, suggesting that the government should publish in short intervals an official rate of disparity, similarly as is done in the case of the import duty. This scheme, which the men themselves would doubtless gladly have accepted individually, allowing them as it does to compute their weekly income in advance with a certain amount of exactness has been violently opposed by the unions which were obviously in fear of becoming eliminated as a wage regulating factor.

The unions want no fixed basic rates, but demand that they be adjusted by agreement as heretofore. Moreover they do not want them to be keyed to any gold basis, but to the cost of living. This scheme the employers found inacceptable. They were open to concessions with regard to flexible basic rates, but not as regards the latter contention, fearing that the index of living cost might at times rise above the mark rate. This they maintained would surely happen in the event of an improvement of the mark rate, thereby counteracting its duration. An agreement on this point being out of the question for the present and times pressing a settlement of a temporary nature has been reached, which essentially leaves the methods of wage regulations unchanged, but introduces as a new factor the weekly adjustment of the rates prevailing to "changes in the value of the currency." The wording of this new clause in the official "directions for the adjustment of wages" just issued evidently leaves the question open and subject to further barter by which of the two scales, the gold standard or living cost the changes in the value of money will be measured. The temporary nature of this settlement is accentuated by the fact that it can be cancelled by fortnightly notice. In the case of a change in the basic rates such cancellation can even be demanded immediately. It is evidently in the mind of the contracting parties to set the scheme afloat somehow and form the ultimate decisions while moving along.

Higher Cost of Living

By this settlement which may be transient in details, but doubtless is permanent in principle, the German manufacturers will be faced with an entirely new situation, which in all its bearings can hardly be foreseen. It is clear that if wages are paid on a sliding scale, prices for coal, iron and steel that have been kept under control are bound to follow.

The time, when a rapid downslide of the mark rate reduced not only the cost of labor but created an extraordinarily cheap market for material, will not recur. The purchase of material will be lifted out of the realm of speculation, to a basis of comparative stability, which no doubt will cut deep into the extra gains of such manufacturers, who on the strength of ample means could squeeze every opportunity to the last drop of profit. Some confusion will reign at first on account of the multitude of scales employed in sliding prices from which doubtless a uniform scale must emerge which can only be the gold standard. This course of developments is commonly expected. In fact it is clearly indicated by past events.

The country has of late made large strides toward the gold standard under

the leading of a movement for the "preservation of substance." Certain industries, especially those strongly dependent on imported raw material have clandestinely adopted it. Public loans issued on a gold basis have been the signal to a more open practice. The only obstacle to general adoption is the resistance of the government exercised on behalf of control of wages and basic prices and of course also on behalf of the paper mark itself. Under the weight of sliding wages the barrier must break down, thereby throwing open the road to the gold standard.

The immediate effects of sliding wages upon machine building are depicted as follows: A good deal will depend on the ratio to pre-war wages that will result. Up until now, wages adjustments showed a clear tendency to employ a ratio of about 50 per cent of pre-war wages as a basic factor. The actual ratio has at times been considerably lower; at others, however, higher in correspondence with exchange fluctuations. The average of the last twelve months appears, on the strength of a superficial calculation to have been in the neighborhood of 30 per cent.

It is maintained that in view of the present output per head a wage ratio of 50 per cent to pre-war parity would equal pre-war cost of labor. With regard to material power and sundry expenses it is anticipated that their prices will in the future be regulated by the world market. At an assumed rate of 50 per cent of pre-war wages machine building industry would be working approximately under pre-war conditions as far as labor is concerned and at world market prices with regard to material. In respect to the personnel an adjustment similar to that introduced for manual labor is coming into force with the difference, however, that monthly salaries will be adjusted and paid semi-monthly.

Considering other largely increased items of overhead, the price of machinery will exceed pre-war prices by from 10 per cent to 30 per cent as diverging opinions will have it.

In view of the generally higher price level a sufficient margin would even then be left on the export market for certain lines of machine building, but in others, where prices have already largely overstepped pre-war prices like for instance, in the automobile industry, great difficulties will arise with regard to the export business.

On the domestic market, the existing import restrictions are considered sufficient protection for the present. The most serious side of the impending settlement is, no doubt, that it is expected to create permanent conditions for several years at least, from which there is no way back. It seems hardly possible that it can be changed before the mark rate itself is stabilized without causing a serious upheaval. Machine building lines which will feel the squeeze of stabilized wages will be compelled to look for compensation of higher cost elsewhere, that is to economy and labor saving a development which others, foremost among them the machine tool industry, are already waiting for with much expectancy.

Wage Earners Enjoying Prosperity

Contrary to general belief, the American wage earner in 1923 is better off than during the so-called "peak" period of 1920, according to conclusions reached by the National Industrial Conference Board as a result of researches into wages and the cost of living in plants employing more than 600,000 men.

As a result of its study the board finds that the "weighted" or comparative excess of rising wages over rising living costs was between 17 and 18 per cent greater in May, 1923, than in June, 1920, with the figure of the last prewar month, June, 1914, as a basis.

"For the last few months," according to a statement of the board, just issued, "wages have been rising. Many plants have announced increases of 10 per cent, 15 per cent and even more. How much of this is net gain to the wage earner, and how much merely compensates him for increased living costs, are important questions for consideration. In order to measure the effects of the fluctuations of the cost of living upon earnings, a figure known as 'real' earnings is developed by dividing the index number of hourly or weekly earnings by the index number of the cost of living.

"Thus by discounting the effect of fluctuations in the cost of living, the purchasing value of money earnings for different periods may be determined. The most recent compilation of data by the National Industrial Conference Board, comprising returns from plants employing more than 600,000 wage earners, bring out some interesting facts regarding real earnings.

"It is generally believed that at the peak of high wages in 1920 the wage earner was in a more advantageous position than he had occupied for a long time and more advantageous than he has occupied since that time. It is true that wages were at their highest levels in 1920, but the cost of living was also at that time high."

Employment Is Firm in New York State

No indications of serious dullness in industry have yet appeared in New York State and employment in manufacturing receded less than 1 per cent in July, according to the report of Industrial Commissioner Bernard L. Shientag, issued recently.

About half of the industry divisions in the State added to their forces this month and half of them let some of their workers go, he said. Most of the decreases were due to the usual Summer slackening, as in the glass and silverware and jewelry industries. An important decrease in the cotton and cotton finishing industries was due to dull business conditions. This industry has been operating night shifts until this month.

The important automobile industry showed a net reduction this month, although many of the plants added more employees. The steel mills were less active, but report good business in prospect for the third quarter.

The possibility of a decline in building has not yet reached serious proportions, partly, it was stated, because of the downward tendency in the price of materials. The industries making builders' supplies remain very active and the manufacture of railroad equipment continues its high level of employment.

The metal industries remain in about the same position as in recent months. Strikes caused reductions in the structural iron industry and in the manufacture of castings. The brass and copper industry was somewhat less active. Vacations accounted for the reduction in the cutlery establishments. Employment rose in the manufacture of cash registers and typewriters. The machinery factories remained active and those making electrical equipment added workers.

May Automotive Exports Show Decline

May did not show a clearly defined trend in automotive exports, although the total value of shipments of American automotive products—$17,092,041—represents a decrease of slightly over 3 per cent from the April total, according to *Commerce Reports* published by the Department of Commerce.

A decrease of slightly over 6 per cent in the number of passenger cars exported—the decrease in value was negligible—coincides with an increase in truck shipments of 14 per cent—the value of which, however, was slightly below the April figure.

In Canada the same tendencies were manifest—a decrease of over one-fifth on the number of cars exported as against truck exports almost one-third larger than in the previous month.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Centrifugal pumps for hydraulic mining. Santo Domingo, Dominican Republic. Purchase. Reference No. 7320.

The Commercial Indian Agency of Lahore, Punjab, India, is desirous of representing machine tool and machinery makers of America in India.

Forthcoming Meetings

The Supply Association of the American Railway Tool Foreman's Association. Hotel Sherman, Chicago, Ill., Aug. 29, 30 and 31. Eleventh annual convention. Herbert S. White, Cleveland Twist Drill Co., 9 North Jefferson St., Chicago, Ill., secretary and treasurer.

New Haven Branch of the American Society of Mechanical Engineers. Third annual machine tool exhibit Sept. 18, 19, 20 and 21. Mason Laboratory, New Haven, Conn. A. C. Jewett, chairman.

Association of Iron and Steel Electrical Engineers. Iron and steel exposition, Buffalo, Sept. 24 to 28. John F. Kelly, secretary, Association of Iron & Steel Electrical Engineers, 708 Empire Building, Pittsburgh, Pa.

American Society for Steel Treating. Annual convention at Pittsburgh in connection with the International Steel Exposition, Oct. 8, 9, 10, 11 and 12. W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio, national secretary.

Society of Automotive Engineers. Production meeting at Cleveland, Ohio, Oct. 25 and 26. Headquarters, 29 West 39th St., New York City.

American Management Association. October 29, 30, and 31, Hotel Astor, New York City.

New and Enlarged Shops

Machine Tools Wanted

Kan., Great Bend—Brown-Moffat Motor Co., 1205 Kansas Ave. (garage), J. F. Brown, Purch. Agt.—grinder for automobile cylinders.

Kan., Great Bend—J. H. Courtney (blacksmith)—large power steel drill press.

Kan., Great Bend—G. A. Duncan (garage)—power cylinder grinder (used).

Kan., Great Bend—G. Nash, 2537 Bway. (machine shop)—power drill press and power metal lathe (used preferred), also emery stand, belting, hangers, shafting and pulleys.

Kan., Hoisington—B. Whaelen (machine shop)—power metal lathe, power drill press, emery stand, belting, hangers, pulleys, shafting, belting and hand tools.

Kan., Hoisington—C. C. Whitecraft, (blacksmith)—power metal lathe, pipe threading machine, and power steam hammer.

Md., Baltimore—Baltimore & Ohio R.R.—24, 28 and 32 in. shapers, 44 in. vertical boring mill, 12 in. centering machine, electric 1 ton hoist, two 5 in. twist drill machines, 36 in. upright drill machine, one 20 in. x 10 ft. and two 36 in. x 18 ft. engine lathes, hack saw, three 24 in. x 12 ft. lathes, 20 in. drill press and two No. 1 grinding and polishing machines.

Md., Baltimore—C. W. Sylvester, Dir. of Vocational Training, Lafayette and Madison Aves.—lathes up to 18 in., boring machines, complete machine shop equipment, machines of small sizes, complete woodworking machinery of small sizes and all machinery and tools for use in vocational Depts. of Elementary and High Schools.

N. Y., Buffalo—C. A. Bliss, 249 14th St.—equipment for auto service station, also two 1,000 gal. gasoline tanks and pumps for proposed service station at 304 Hampshire St.

N. Y., Buffalo—Downing St. Garage, 80-90 South Park Ave.—auto service station equipment.

N. Y., Jamestown—Rathbun Mfg. Co., Inc., Rose Alley, (manufacturer of wireless outfits)—1 automatic screw machine No. 0, Brown & Sharp.

N. Y., Salamanca—F. Forness, Main St.—complete garage and service station equipment, to replace that which was recently destroyed by fire.

N. Y., Salamanca—J. E. Wells, Main St.—garage and service station equipment to replace that which was recently destroyed by fire.

Pa., Pittsburgh — Pennsylvania R.R., Pennsylvania Sta., W. R. Phelps, Purch. Agt.—14 engine lathes, crank planers, shapers, drill presses, drill grinders, wet tool grinders and radical drills for Altoona shops.

Pa., Sayre—Casper & Miner, Lockport St., J. Casper, Purch. Agt.—complete equipment for garage and service station.

W. Va., Huntington—A. C. Love Co.—one 25 to 30 in. swing lathe, with very short bed, 2 or 3 ft. between centers (used).

Wis., Livingston—Kemnitzer & Holmes, F. Kemnitzer, Purch. Agt.—auto repair machinery, drill press, chain hoist, storage tanks, pumps and small tools.

Wis., Racine—F. Applegate, 1043 Washington St.—auto repair machinery, drill press, pumps, tanks and small tools.

Que., Montreal—Castings & Supplies, Ltd., c/o C. R. McKensie, 792 Dorchester St. W.—equipment for manufacturing foundry and machine shop supplies.

Que., Montreal—A. Lacroix, 16 Bonsecours St.—lathe, drill and polishing machine.

Que., Shawinigan Falls—Garage Universal Co., Ltd., Place du Marche—equipment for automobile repair shop.

Que., Three Rivers—C. E. Marchand, 13 St. Marguerite St.—garage and repair shop equipment.

Machinery Wanted

Kan., Great Bend—Great Bend Hardware & Implement Co., (tin shop) J. Whitney, Purch. Agt.—tinners brake.

Kan., Great Bend—Morrison Constr. Co., (planing mill)—power sander.

Kan., Hoisington — Hoisington Dispatch, (newspaper and job printing)—power metal saw and trimmer, (used preferred).

Kan., Wichita—Wichita Publishing Co., 333 North Market St.—D. A. Resing, Purch. Agt.—power magazine press, power paper cutter, linotype, belting, hangers, bearings, pulleys and shafting.

Ky., Louisville—U. S. Engineer, P. O. Box 72—machine supplies including 120 high speed drills, hoist, Morse taper shank (various sizes), 15 brass castings, 2 steel ratchet wheels, 1,000 ft. 1½ and 1¾ in. wire rope, and 100 ft. 1 in. dredge chain.

Ky., Louisville—United States Foil Co., 2934 Grand Ave.—foundry equipment for new proposed $20,000 foundry.

Mo., Kansas City—Midwest Electric Welding Co., 112 East 18th St.—portable crane, capacity 6,000 lb., not over 8 ft.

N. Y., Bolivar—Forness Oil Co., Inc., (oil drillers)—E. W. Cady, Purch. Agt.—oil drilling outfits and machinery.

N. Y., Buffalo—L. L. Humig, 268 Virginia St.—equipment for small bakery at 2149 Fillmore Ave.

N. Y., Buffalo—M. Maday, 1760 Genesee St.—equipment for wagon works.

N. Y., Niagara Falls—J. Mullane, Erie Ave. (gasoline and supply station)—2,000 gal. gasoline tank and station equipment.

N. Y., Niagara Falls—O. Rich, Riverway and Niagara Sts., (gasoline stations and auto supplies)—1,500 gal gasoline tank; also equipment.

N. Y., Olean — The Pennsylvania R.R., E. P. Huston, Master Mechanic — motor driven ash handling equipment to replace that which was destroyed by fire.

N. Y., Salamanca—Wright & Moore (grist mill)—A. Wright, Purch. Agt.—complete equipment for new grist mill.

N. C., Greensboro — Carolina Steel & Iron Co.—one 1½ in. cap. electric drill for heavy work, not to exceed 50 or 60 lbs. in weight.

N. C., Hickory—Yeager Mfg. Co., (manufacturer of dining room furniture), M. Yeager, Secy. and Treas.—double trim saw, (good condition).

O., Sharon—Ohio River Edison Co., c/o Pennsylvania-Ohio Power & Light Co.—cranes for power plant and coal yard at Toronto, Ohio.

Pa., Pittsburgh—Carnegie Steel Co., Carnegie Bldg., C. N. Miller, Jr, Purch. Agt.—2 locomotive cranes for Bellaire and Mingo Jct., O., also 7½ ton whirler crane for river dock, Mingo Jct., O.

Va., Prince George—J. E. Cousins, Jr.—well drilling machine, well drilling tools, and 8 hp. gas or kerosene engine.

Wash., Seattle—Pacific Steamship Company, L. C. Smith Bldg.—electrically operated, cargo handling equipment for proposed ocean shipping terminals to cost between $3,000,000 and $4,000,000.

Wis., Appleton—Northern Boiler & Structural Iron Co., E. Kottke, Mgr.—one 10 ton electrically operated crane and one 5 ton hand operated crane.

Wis., Milwaukee—Milwaukee Steel Fdry. Co., 127 South Water St.—additional steel foundry equipment for proposed 1 story addition.

Que., Montreal—Loyal Oil Co., Ltd., 112 St. James St., F. Marchand, Pres.—refining equipment for petroleum oils and by-products.

Que., Montreal — M. A. Pratt, Ltd., 38 Notre Dame St. W., A. Pratt, Purch. Agt.—complete machinery equipment for the manufacture of pianos and gramaphones.

Que., Montreal—Quebec Liquor Comn., P. O. Box 1800, G. A. Simard, Pres.—complete bottling plant for Quebec City.

Que., Montreal — Sources Montreal — Viauville, Ltd., 388 Bleury St., O. M. Manseau, Purch. Agt.—complete bottling equipment for mineral, aerated and other waters.

Que., St. Malthieu de Caxton—A. Melacon (blacksmith)—forge, borer and other equipment.

Que., Shawinigan Falls—Barie & Frere, A. Barie, Purch. Agt.—additional sash and door manufacturing equipment.

Que., Three Rivers—Miller Brass Fdry., Ltd., 25 Hertel St.—additional equipment for foundry.

Metal Working Shops

Calif, Los Angeles — Unger & Watson c/o Milwaukee Building Co., Wright Callendar Bldg., awarded the contract for the construction of a 4 story, 90 x 275 ft. garage and loft building on Figueroa St. Estimated cost $250,000.

Conn., Waterbury — The Bristol Co., Platts Bridge, (recording instruments) awarded the contract for the construction of an additional story to present 1 story 47 x 100 ft. factory. Estimated cost $40,000.

Ill., Chicago—Stewart Warner Speedometer Corp., Lincoln and George Sts., awarded the contract for the construction of a 6 story, 141 x 217 ft. addition to its factory. Estimated cost $750,000. Noted July 5.

Mo., St. Louis—Buick Auto Mfg. Co., Flint, Mich., awarded the contract for the construction of a 1 story, 22 x 38 ft. addition to its auto manufacturing plant at Natural Bridge. Estimated cost $10,000.

Mo., St. Louis—The Trade Realty & Investment Co., 111 North 7th St., awarded the contract for the construction of a 2 story, 100 x 124 ft. garage on Washington Ave. Estimated cost $55,000 Noted May 24.

O., Cleveland Heights (Warrenville P. O.)—M. J. Bender, 5510 Woodland Ave., Cleveland, awarded the contract for the construction of a 4 story garage, Manfield and Noble Sts., here. Estimated cost $40,000.

O., Euclid—F. F. Spieth, 343 East Scarborough Rd., Cleveland Heights, awarded the contract for the construction of a 1 story, 40 x 100 ft., commercial building and garage, here. Estimated cost $40,000. Noted July 12.

Pa., Dubois—Miles & Co. awarded the contract for the construction of a 1 story, 50 x 80 ft. garage. Estimated cost $40,000.

Pa., Phila.—The Apex Machine Co., 2801 West Susquehanna St., awarded the contract for the construction of a 1 story machine shop on Stenton and Wyoming Sts. Estimated cost $35,000. Noted May 3.

Pa., Phila.—The Budd Wheel Co., 23rd and Westmoreland Sts., awarded the contract for the construction of a 1 story addition.

Pa., Pittsburgh—C. J. Allen, c/o City Bank, 6112 Penn Ave., awarded the contract for the construction of a 2 story, 66 x 200 ft. garage on Denny and Mifflin Sts. Estimated cost $90,000.

Wis., Madison—French Battery & Carbon Co., c/o A. O. Olman, 1133 Rutledge St., awarded the contract for the construction of a 2 story 60 x 150 ft. factory unit and warehouse on Winnebago St.

Ont., Hamilton—Canadian Westinghouse Co., Traders Bank Bldg., Toronto, awarded the contract for the construction of a 3 story, 80 x 200 ft. electric manufacturing plant on Aberdeen Ave. Estimated cost $200,000. This is the first building of an extensive program, estimated to cost $1,250,000. Noted June 21.

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Making Pistons for the Wright Engine

BY FRED H. COLVIN
Editor, *American Machinist*

The third article—Cleaning the castings—Boring, facing and grooving fixtures for drilling and boring pin holes—Grinding the outside—Water testing and rolling the face

THE PISTONS used in the Wright aeronautical engine are of the solid skirt aluminum type, the details being shown in Fig. 34. They are cast in individual molds, as shown in Fig. 35. Some of the sand cores may be seen on the rack in the rear, and it will be noted that the cores for the piston-pin holes are produced by the steel pins shown in place in the molds. The temperature of the metal is very carefully tested by pyrometer before pouring, in order to secure sound castings of the proper quality.

After the sand is shaken out and the gates sawed off, the pistons go to what is called the "shimmy" machine shown in Fig. 36. Here two rows of six pistons each are clamped between the planks shown, the lower plank *A*, being attached to angles at each end, which are provided with trunnions *B*, mounted in the bearing as shown. Above the trunnions is a crankshaft *C* running the whole length of the planks and supported in inverted hangers on the floor. The inner ends of the angles are connected by rods, from which connecting rods go to the crankshaft shown above the planks.

Running the crankshaft at a fairly rapid speed, produces a short-stroke, jumping motion, which effectually jars or "shimmies" the sand loose from the piston castings. The pistons to be seen in front of this machine show the gates and the two risers which do much toward insuring clean and solid castings. It will be noted that a center projection is cast on the piston head for use in the machining operations which follow.

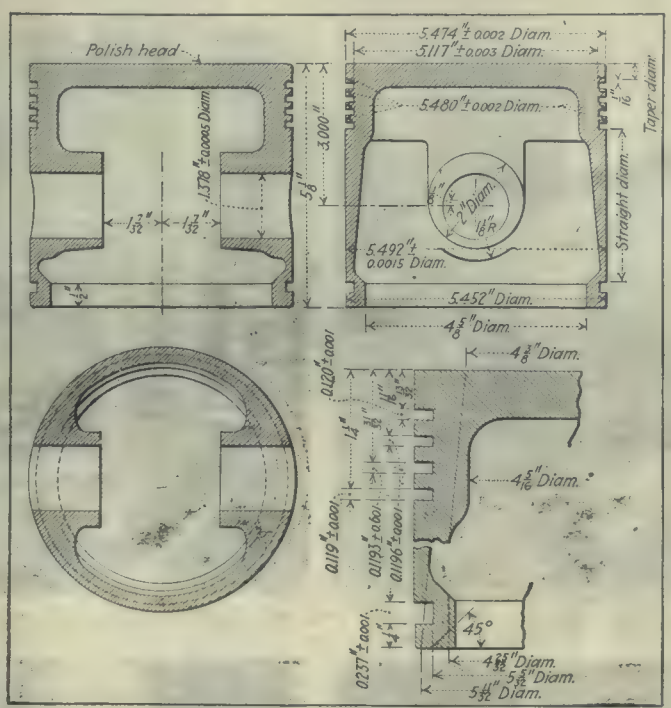


FIG. 34—DETAILS OF THE PISTON

Outline of Operations

Rough face open end	Finish turn and groove
Bore open end	Rough and finish grind
Drill piston pin hole	Finish head
Rough turn face and groove	Water test to 160 lb.
Water test to 160 lb.	Roll top if necessary
Mill inside bosses	Rough and finish bore pin
Anneal to 600 deg. F.	Rough and finish bore pin hole
Face open end	Weigh and lighten if needed
Cut off end boss	

Before describing the machining operations, it will be well to examine the design of the piston itself, details of which are shown in Fig. 34. This illustration gives the main dimensions, and shows the construction of the piston with its grooves for the four narrow rings at the top and a wider or wiping ring at the bottom. It also shows the varying diameters of the piston, the portion above the upper ring being 5.474 in., the three lands 5.480 in. and the diameter at the straight part, 5.492 in., while the diameter below the wiper ring is reduced to 5.452 in. The tolerances are also shown in each case, except that of the bottom diameter.

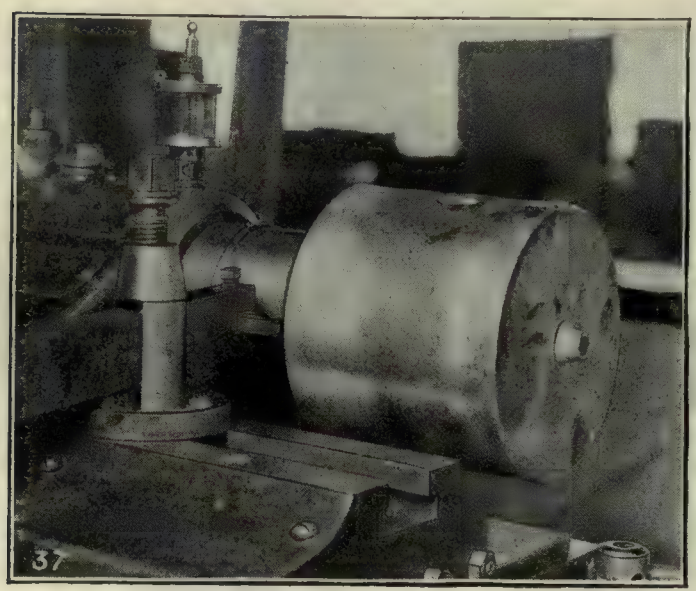
It will be noted that the piston-pin boss or hub is ⅛ in. out of center instead of being concentric, thus adding to the strength above the pin so that it can better resist the impact of the explosion.

The first machining operation is to rough turn and bore the open end of the skirt on a Porter-Cable lathe, as shown in Fig. 37. The piston is held on an air operated expansion mandrel, and the illustration shows how the tool is held for boring the skirt. The open end is bored to 4.609 in., with a minus tolerance of 0.001 in., and the end is chamfered to 45 deg. The





FIG. 35—CASTING ALUMINUM PISTONS. FIG. 36—CLEANING IN THE SHIMMYING MACHINE



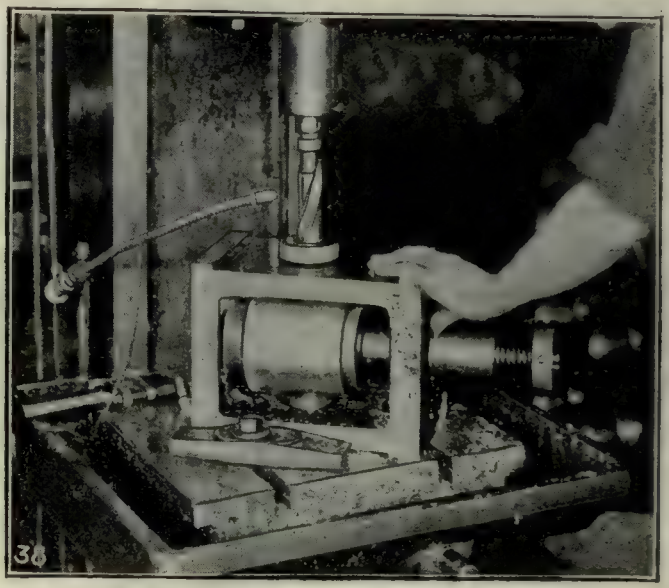
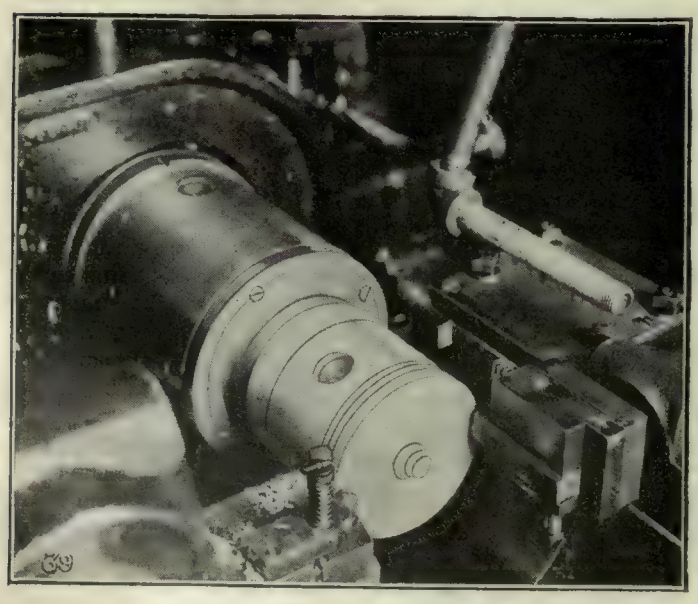


FIG. 37—BORING AND FACING OPEN END. FIG. 38—ROUGH DRILLING PISTON PIN HOLES



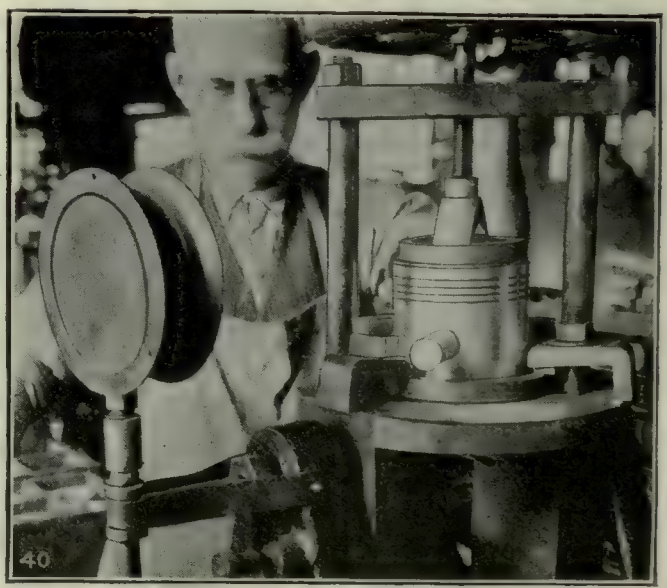


FIG. 39—ROUGH TURNING AND GROOVING. FIG. 40—TESTING WITH WATER PRESSURE

small tolerance allowed in the roughing operation is because the open end is used for locating the piston in future operations.

The piston then goes to the single-spindle drilling machine shown in Fig. 38, where the pin hole is drilled through with a 1$\frac{3}{32}$ in. drill and the alignment of the hole checked. It is important that the spring equalizer on the fixture work freely against the piston-pin hub, as otherwise the pin holes may not be central with the boss. Then the piston goes to the Pratt & Whitney automatic piston-machine, shown in Fig. 39, the piston being held by the pin hole as shown. Here the outside diameter is rough turned to 5.452 in. with a plus or minus tolerance of 0.005 in. and the piston ring grooves are also roughed out.

In rough cutting the grooves, an equal amount of stock is allowed on each side for finish grooving.

Next comes the water testing, as shown in Fig. 40. 160 lb. pressure is used in order to insure the casting being absolutely tight. The testing stand is very compact and enables the operator to handle the pistons easily and to apply the pressure in a convenient manner. It is, of course, necessary to hold the piston firmly in place and to fill the piston-pin holes with the plug as shown, in order to hold the high pressure applied.

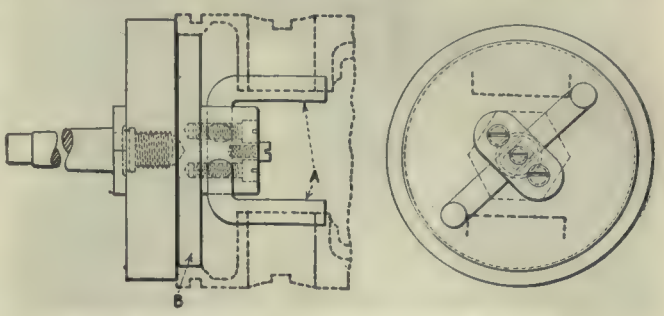
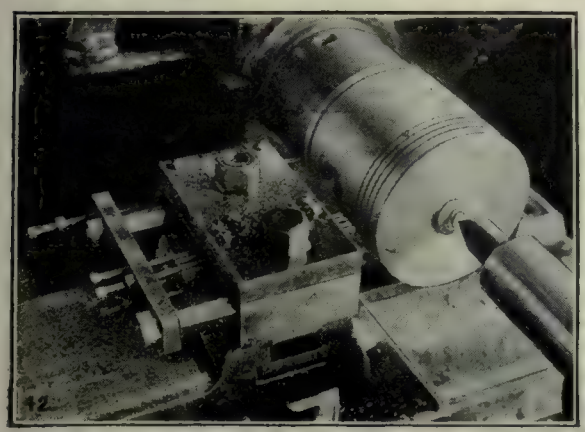
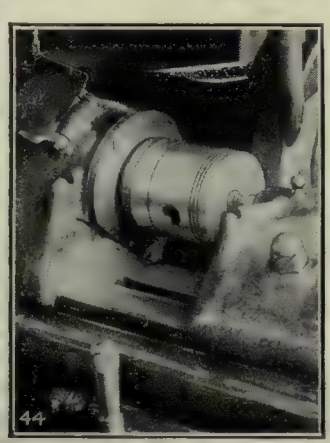


FIG. 43—DRIVER FOR GRINDING PISTONS





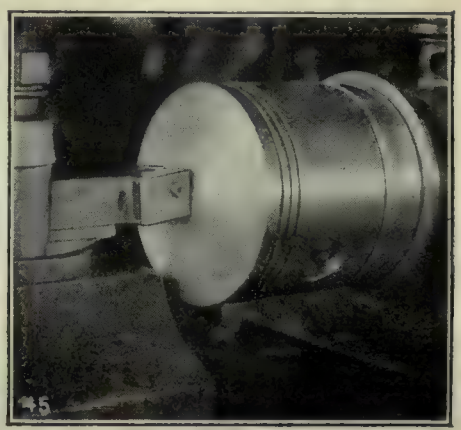


FIG. 42—FINISH GROOVING. FIG. 44—GRINDING THE PISTONS. FIG. 45—ROLLING FACE TO CLOSE PORES

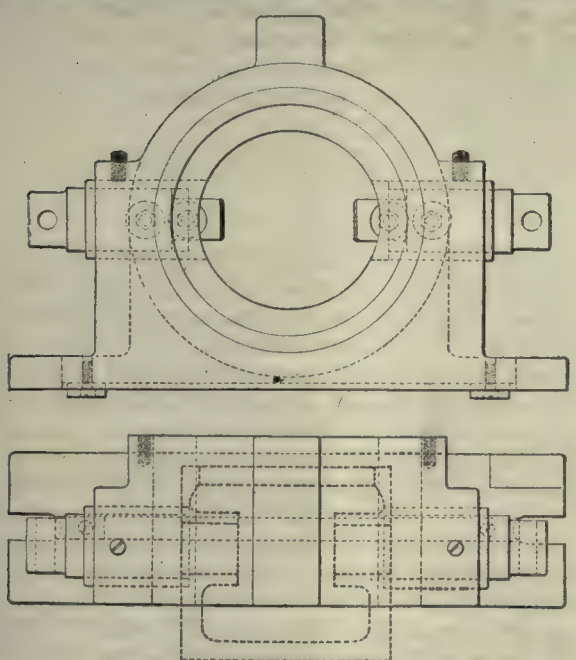


FIG. 41—FIXTURE FOR MILLING INSIDE OF BOSSES

The ends of the piston-pin bosses are finished on a hand milling-machine, using the fixture shown in Fig. 41. This fixture locates the piston by means of plugs which fit into the pin hole on each side and centers the bosses so that the finished faces will be square with the pin hole. An end mill 1$\frac{1}{4}$ in. in diameter is used, stops being provided to control the movement of the table in each direction, so as to leave a space of 2$\frac{7}{8}$ in. between the bosses, equally spaced each side of the center. The milling is done by a vertical movement of the table, carrying the bosses past the milling cutter which projects inside the piston.

The piston is next annealed by heating to 600 deg. F. and cooling in air, the same as is done with the cylinder-block casting. Then the open end is faced and finish bored on a Porter-Cable lathe, and the outer corner slightly rounded. The boss on the end is next faced off, the piston being held on a face-plate adapter, and a small center is drilled and countersunk in the usual manner. The head must not be concave more than $\frac{1}{32}$ in. The piston is then finish grooved, using the tool block shown in Fig. 42, which also shows the convenient adjusting screws behind each sutting tool.

Rough and finish grinding are done on a Landis plain grinding machine, using the special adapter shown in Fig. 43 for driving the pistons. The construction of this adapter is clearly shown, and the outline of the piston shows how the prongs of the driver *A*, contact with the pin bosses while the piston is centered by the plate *B* fitting the inside of the skirt. The outer end of the piston is supported by a small center, as shown in Fig. 44. In both rough and finish grinding operations a wheel 14 in. in diameter by 2 in. face, and having a 5-in. hole is used. The wheel is of the crystolon vitrified type, grain 40 and grade J, the speed being from 5,500 to 6,000 ft. per min. The work speed may vary from 120 to 180 surface-ft. per min. A lubricant composed

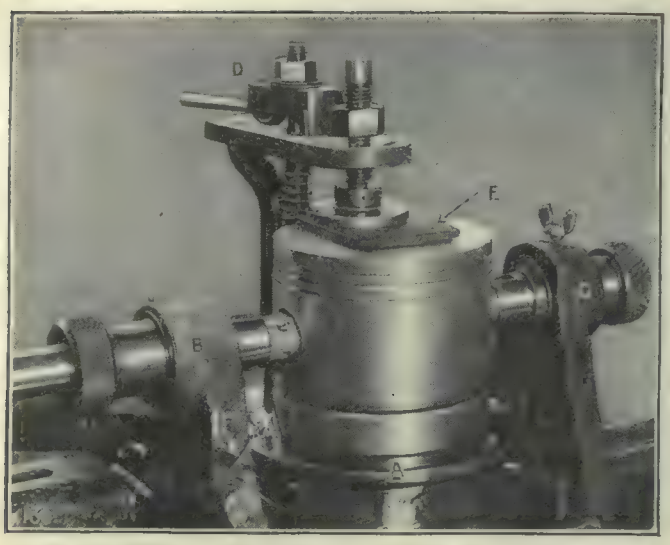


FIG. 46—FINISH BORING PISTON PIN HOLES

of half kerosene and half lard oil has been found very satisfactory. The tolerance for roundness is 0.002 in.

Another water test of 160 lb. pressure is given, and should any leakage develop, the top of the piston is rolled to compress the metal and so close the pores, as shown in Fig. 45. The piston is afterwards polished and retested to insure its being perfectly tight.

The piston-pin hole is rough and finish bored on a Willard engine lathe, using the fixture shown in Fig. 46, which is mounted directly on the carriage saddle. The hole is rough bored to 1.368 and finish bored to 1.378. A tolerance of plus or minus 0.001 in. is allowed in the rough boring, and plus or minus 0.0005 in. in the finish boring. In both operations the hole must be kept parallel with the axis within 0.003 in. in its own length.

As will be seen, the skirt of the piston is centered and held on the plate *A*, the position of the hole being located by suitable pins at each side of the fixture, the uprights for supporting them being shown at *B* and *C*. The piston is clamped in place by a somewhat unusual cam arrangement, as can be seen at *D*, a leather pad *E* being used to prevent marring the face by the clamping surface. It will also be noted that the actual clamping is done by a large disk, which distributes the pressure over a considerable area, and so greatly reduces the tendency of springing the piston head. The locating pins are removed and the two holes in the uprights *B* and *C* are used to guide the boring bars, and so insure the alignment of the two holes.



FIG. 47—WEIGHING AND STAMPING PISTONS

The piston is then cleaned, using kerosene and compressed air, after which it is weighed and the weight stamped on it, as shown in Fig. 47. The weights of the pistons are limited to between 4.25 and 4.50 lb. If it is necessary to lighten any pistons, it can be done by removing metal from certain points, but the weight must be kept between the limits mentioned. The pistons are also sorted into sets by weight. A thorough inspection follows, after which they are delivered to finished stock, being protected by wax paper before being placed in their containers.

Discouraging Absentees

BY FRANK V. FAULHABER

The habit of some employees of staying out, or "taking a day off," without notice can be the cause of a great deal of annoyance to the foreman, who is obliged to wait around until the middle of the forenoon to make sure that the man is not coming in, and then make a readjustment of his working force to compensate for the unexpected absence. One foreman of my acquaintance had a scheme of his own for combating such delinquencies.

Whenever a man who had previously been absent for a day and had excused his defection the next morning by saying that he was "sick," again failed to show up, the foreman would make it a point to visit that man's home at some time during the day to show his solicitude for the employee's physical welfare. Usually the good spouse would be surprised. "Why, no! she would exclaim, "John isn't sick. He went to work this morning as usual. Do you suppose anything could have happened to him?"

The foreman didn't "suppose" anything of the kind, and when the man came in the next morning no excuses or explanations were needed—or offered.

Egyptian Market for American Steel Products

America's share in the iron and steel trade of Egypt has been built up since the war to such an extent that a permanent position in this line is assured, says G. E. Phoebus, of the Iron and Steel Division of the Department of Commerce. The consumption of iron and steel products by Egypt has been steadily increasing. All such products must be imported.

The year 1922 witnessed an uphill struggle for British steel manufacturers in their efforts to maintain their influence with Egyptian purchasers, according to the British Commercial Agent for Egypt, who claims that competitors of the low currency countries held tremendous advantages. Belgium was the principal source of supply in 1922, far outstripping Germany which came next. The United States was third from a standpoint of quantity, shipments from the United Kingdom weighing considerably less although valued higher. The fact that the United States has been able to maintain its volume of trade in this market at a time when Continental nations held unusual price advantages, should be of great satisfaction to American steel exporters.

It Pays to Replace—

How a Shop Saved by Replacing Old Shop Equipment with New Equipment

By F. E. NORTH
Rate Department, General Electric Co., Schenectady, N. Y.

This article won the third prize of $50

THE wisdom of replacing old and obsolete machinery with modern equipment was amply illustrated in a shop where I worked several years ago. This shop installed a modern Gisholt boring and turning mill, having about 68-in. capacity. Within a short time this machine was taking care of all the work formerly done on two old machines, a boring mill and a pulley lathe, and about half of the work then done on an engine lathe, beside considerable other work.

The pulley lathe was operated by a mechanic who also had charge of another lathe, but it is safe to say that the operator of the Gisholt mill was doing the work of at least two men under the old arrangement and better and more accurate work at that.

Formerly it was a long and tedious task to bore a round and parallel hole on the old boring mill and it was an exceedingly difficult one to bore two or more holes alike. With the new machine duplicate parts were machined with quickness and ease. Where, for instance, in finishing a pulley it was necessary to bore it on one machine, and turn and face it on another, it was finished in one setting on the Gisholt.

There are many reasons why old machinery should be replaced by modern equipment, among them the following: The quickness, accuracy and ease of operation; the operator's ability to rapidly place cutting tools in any desired position; the convenient arrangement of both speed and feed changes; all with less physical exertion on the part of the operator.

Output of Small Tools Affected

The shops with old machine tools cannot get full value from the small tools, such as milling cutters and twist drills, that they buy, because their machines will not stand up under the high speeds and heavy cuts of which these small tools are capable. Modern tools permit the simultaneous use of two or more cutting tools. They also generally effect a saving in belting, and eliminate the time ordinarily lost on account of the slipping and relacing of belts.

The lubrication of modern machine tools does not depend so much on the care and thoughtfulness of the operator as in the case of the old machines. Lubrication on many machines today is automatic and continuous, eliminates the waste of delay occasioned by overheated bearings, and relieves the operator of the necessity of constant attention to oiling.

The floor space and power saved by modern machines are also considerable factors in their favor.

The shop which saved money by replacing old machine tools with modern was the E. D. Jones & Sons Co., Pittsfield, Mass., which has installed quite a number of machine tools since the time referred to, all of which have greatly increased production. The above statements can be verified by the superintendent.

Nothing stands still; if we do not go forward, we must go backward. This is just as true of the machine shop as of anything else.

This article won a $10 prize

By E. C. O'Dowd
Machinist, Hamilton Sons Car Co., Newark, Ohio

The Hamilton shops build and repair all kinds of rolling stock, with a forging department as a specialty. They were built in two rows, with a moving platform on six rails between them. All of the space between the shops had to be kept clean, of course.

Now the old platform has been taken out and replaced by a double-hook, 20-ton overhead electric crane, built by the Erie Steel Construction Co., of Erie, Pa., equipped with a Cutler-Hammer magnet. Everything that can be so handled is unloaded from the cars by means of the crane, and it is used for cleaning up the scrap in the yard. With the crane, two men can do the work that a dozen were formerly required to handle. It picks up a box car as though it were a toy. The main bay is now filled with iron and steel stock, which, although heavy, is easily unloaded, handled, and gotten at when wanted.

Another valuable change was the replacement of an old single-stage air compressor by a three-stage compressor, with condenser, built by the Bury Compressor Co., Erie, Pa., direct driven by an a.c. motor. The old compressor pumped about as much water as air, but the new one cuts out about all the water. This means a great deal in freezing weather, with air hammers.

All of the motors in the plant have been changed from d.c. to a.c., because the a.c. current, bought in this city, is cheaper than either a.c. or d.c. made with the old corliss engines. There is no rheostat, brush or commutator trouble. The motors were made by Robbins & Myers, General Electric, and Allis-Chalmers.

The toolroom and machine shop also have been changed. The old friction-clutch shaper has been replaced with a 24-in. Kelly crank shaper made in Xenia,

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In the contest, which closed July 5, nine prizes were given for articles telling how a shop saved by replacing old shop equipments with new equipment. Additional articles will be printed in forthcoming issues.

Ohio. It has a positive stroke, and an adjustable knee in front, which makes it more rigid. With this and a spiral bull wheel it increases the output of the machine to twice that of the old shaper. The eight speeds on the Kelly, to three on the old shaper, are also an advantage on hard stock such as chrome nickel, carbon, and vanadium steel.

We have two grinders to grind threading dies and reamers formerly ground on an old emery wheel. With the new grinder the threading dies and reamers cut more uniformly and do not have one or two teeth or flutes do all the work. These machines were built by the Modern Tool Co., Erie, Pennsylvania. We also have a grinder for grinding milling cutters built by the Woods Engineering Co., Alliance, Ohio. These cutters formerly were ground on a common emery wheel and not ground true. A few of the teeth did all the cutting. As ground on the new machines, they are uniform and each tooth cuts the same amount. There is no chatter such as we had before.

New Lathe Replaces Old

The old 18-in. lathe has been replaced with a new 18-in. machine, built by the Monarch Machine Tool Co., Sidney, Ohio. On the new lathe we have only one belt. With a threading dial no more is needed, but with the old lathe we had to have a reverse belt. In place of the wagon load of change gears around the lathe, all we have to do is to change three knobs and the machine is set up for the thread we want. In repairing, set-up time is the whole job, and the quicker the set-up the more time and money saved.

There are no more belts laced by hand. We use a Peerless belt lacer built by the Peerless Belt Lacing Machine Co., Philadelphia, Pa.

The old hack saw has been replaced by a Racine high-speed hack saw with compound pump. It will cut off a piece while the old one is getting started.

The old single-head bolt threader was replaced by a triple-head bolt threader built by the Acme Machinery Co., Cleveland, Ohio. Now one man runs three heads in the place of one, increasing production to three times what it was.

We formerly tapped nuts on the drill press. Now we have an Acme nut tapper, with six spindles run by one man. The old carbon drills have been discarded and high-speed drills have taken their places, with more than half again increase in production. We use Morse, Union, and National twist drills.

All the pipe that was threaded by hand is now threaded on a pipe threader built by the Williams Tool Corp., Erie, Pa. One man does more work than two men did before, and does it with less exertion.

The old man who used to file saws in the mill doesn't file them any more, but grinds them, two at a time, and then has time for other work. The circular saw grinder is made by the Machinery Co. of America, Big Rapids, Mich., and the band saws are ground on a machine made by Baldwin, Tuthill & Bolten, Grand Rapids, Mich. All the old man has to do is to get the machines set and then let them run until the saws are sharp.

We have about 175 air hammers and air motors of different makes but the latest thing is a hammer to drive spikes, built by the Dayton Pneumatic Tool Co., Dayton, Ohio. It is easier on the man and a man can do more work.

We have also in our plant six Carbo-Hydrogen outfits that save time and money. We cut carbon steel up to 8 in. square in about five minutes. It would be hard for us to do without these burning outfits. We use acetylene for welding. It saves on reclaiming broken parts on machines in the plant.

The new punch press that we have is equipped with a special head with three sizes of punches arranged for the selected size to drop into working position when a pin is pulled, saving the time of changing punches. This machine has a deep throat for wide stock. It is built by the Beatty Machine & Manufacturing Co., Hammond, Indiana.

In our forging department we have had small forging machines, but we now have a 3-in. Ajax machine, which does work that a blacksmith can't, and does it easily at that. Some work is completed in one operation, and other work requires two, three and even four operations. A day's run on a 3-in. Ajax would cover up a blacksmith for a week. This machine can make almost any forging.

All of the machines I have mentioned are new. I haven't said anything about the old equipment. Of course it is not as much out of date as some of the machines that were replaced. I think that a machine is like the dog, everyone having its day, and I think that if a man wants to make money he must buy late machines. I once worked on a planer, said to be 50 years old. It still ran, but it couldn't compete with the later types.

This article won a $10 prize

By Axel Halvorsen
McCormick Bros. Co., Albany, Indiana

IN LOOKING through the Shop Equipment News, of the *American Machinist*, some time last year, we saw the announcement of a new style telescoping tiering machine manufactured by the Economy Engineering Co., of Chicago. After investigation we purchased a machine of 750-lb. capacity. This machine has proved a great labor saver for us although we use it very little for tiering boxes and the like.

The telescoping feature of the machine enabled us to move it from one department to another and use it for moving heavy dies from die-storage rooms to punch presses. Likewise in changing bolster plates on the larger presses it eliminates the help of one or two men. In removing heavy flywheels from punch presses the tiering machine eliminates the necessity of rigging up a chain hoist and saves the work of two to three men.

Before getting the tiering machine a hinged platform on casters was used in making repairs on line shafts, installing pulleys, repairing or installing overhead wiring and other work. This platform, a makeshift at best, took up a great deal of floor space and was always in the way. Now the machine is run to the job and overhead repairs are quickly and safely made. In short, the tiering machine has done away with the clumsy platform and eliminated the dangers of working from a ladder.

In installing or removing electric motors, which in our plant are hung near the ceiling, the tiering machine can be used very economically. One man can, with this machine, accomplish as much as could three men working without it, on work of this sort. On the whole the tiering machine has proved a very good investment and we were glad to dispense with our old makeshifts.

Development of Machine Tools in New England

By GUY HUBBARD

The third article—First steamboat on the Connecticut river antedated Fulton's "Clermont"—Morey's account of his experiments with steamboats—The gun-stock lathe

WHILE experimenting with his engine Captain Morey, who was at the time running a ferry between Orford and Fairlee, became convinced that it could be applied as a motive power for boats and he set about building a larger engine of the same type for this purpose. The larger engine was of the two-cylinder type, it being composed of two of the revolving engines, set at right angles to each other upon horizontal shafts at each side of an oblong, wood-fired boiler. This power plant was set up in a twenty-foot skiff having a paddle wheel mounted on a framework at the bow, so as to pull the boat along. At each end of the paddle-wheel shaft were rough sprockets fitted with ordinary log chains, and these sprockets were connected by chains to the valve disks of the double engine, upon which were mounted similar sprockets. This device furnished the transmission and served to link the power plant together, keeping the engines "on quadrature." In Fig. 13 is shown an outline of the boat and its power plant.

One Sunday morning in the Spring of 1793 (the time when the people were at "meeting" being chosen to avoid the jeers of a crowd in case of failure) Captain Morey launched his steamboat at his ferry landing at Orford and with one assistant to steer, while he himself managed the engine, they steamed up the Connecticut for several miles above Orford and safely returned, making about four miles an hour against a quite rapid current. This was fourteen years before the first trip of Fulton's "Clermont" upon the Hudson. Captain Morey was granted his first patent for his mode of applying a steam engine to a boat in 1795 and this patent, which bears the signature of President George Washington, is preserved at the New Hampshire Historical Society at Concord. See Fig. 14.

The successful operation by Captain Morey of his later and larger stern wheel steamboats, is cited by Bishop in his "History of American Manufacturers" as among the notable engineering events of the years 1794 and 1797 respectively and Prof. R. H. Thurston, in his "Life of Fulton," gives credence to the claims of Morey but by far the most complete account of these early steamboat experiments was written by Captain Morey himself in the form of a letter, which is preserved among the records of the New York Legislature. When, in the year 1818, Chancellor Robert R. Livingston petitioned the Legislature for a grant, in behalf of himself and Robert Fulton, to the exclusive right for the navigation by steamboats of the waters of that state, William A. Duer, one of the most influential members, presented the following letter from Morey and none of his statements were denied. The effect of Morey's work upon Fulton's later success I will leave to the judgment of the readers:

Orford, N. H.,
Oct. 31, 1818.

Wm. A. Duer, Esq.

Sir—

In answer to your inquiries relative to my experiments with steamboats, many years ago at New York, I will state the facts as briefly as possible.

As nearly as I can recollect, it was as early as 1790 that I turned my attention to improving the steam engine, and in applying it to the purpose of propelling boats. I began my experiments in this vicinity, on the Connecticut River. When my arrangements were sufficiently matured for exhibition, I went to New York and built a boat, and during three successive summers tried many experiments in modifying the engine and in propelling. Sickness in my family calling me home, I had the boat brought to Hartford, as a more convenient place, and there I ran her in the presence of many persons.

The next season, having made sundry improvement in the engine, I went again to New York, and applied the power to a wheel in the stern, by which the boat was impelled at the rate of about five miles an hour. I invited the attention of Chancellor Livingston, and he with Judge Livingston, Edward Livingston, Mr. Stevens (Col. John Stevens later a noted steamboat inventor) and others went with me in the boat from the ferry as far as Green-

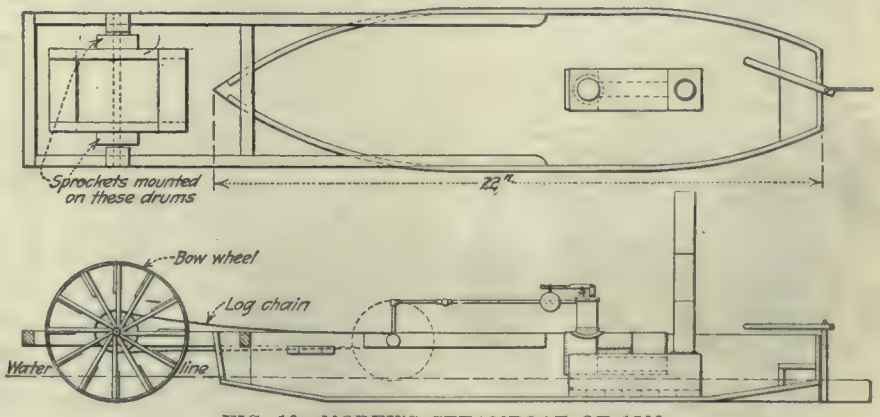


FIG. 13—MOREY'S STEAMBOAT OF 1793
(Drawn from contemporary descriptions)

For the author's forthcoming book. All rights reserved.

wich and back, and they expressed great satisfaction at her performance, and with the engine.

Chancellor Livingston requested me to continue my endeavors to devise a better mode of propelling, and I continued my experiments through the summer, encouraged by his promise, which was to give me a considerable sum, provided I succeeded in making the boat run eight miles an hour. He offered me at that time, for what I had done, seven thousand dollars for the patent rights on the North River and to Amboy; but I did not deem that sufficient and no bargain was made. I never received anything from him.

Being desirous of devising a more effectual mode of propelling, I continued my exertions, and, as it had been sickly in New York, I went to Bordentown, on the Delaware, in June, 1797, and there constructed a steamboat, and there devised the plan of propelling by means of two wheels, one on each side. The shaft ran across the boat, with a crank in the middle, worked from the beam of the engine with a shackle bar (commonly so-called); which mode is, in principle, the same as that now used in the large steamboats. I found that my wheels answered the purpose very well, and better than any other mode that I had tried, and the boat was openly exhibited in Philadelphia.

From that time I considered every obstacle removed, and no difficulty remaining or impediment existing in the construction of steamboats on a large scale, and I took out patents for my improvements. The notoriety of these successful experiments enabled me to make very advantageous arrangements with Dr. Allison (Burgess Allison, an influential man of that day) and others to carry steamboats into effectual operation; but a series of misfortunes to him and to others concerned, soon deprived them of the means of prosecuting this design, defeating their purpose, and disappointed my expectations, but I did not wholly relinquish the pursuit, from time to time devising improvements in the engine.

I recollect to have had repeated conversations with Chancellor Livingston and Fulton on the subject. The Chancellor once visited me at this place, and at his request and expense I went once to see him at Clermont.

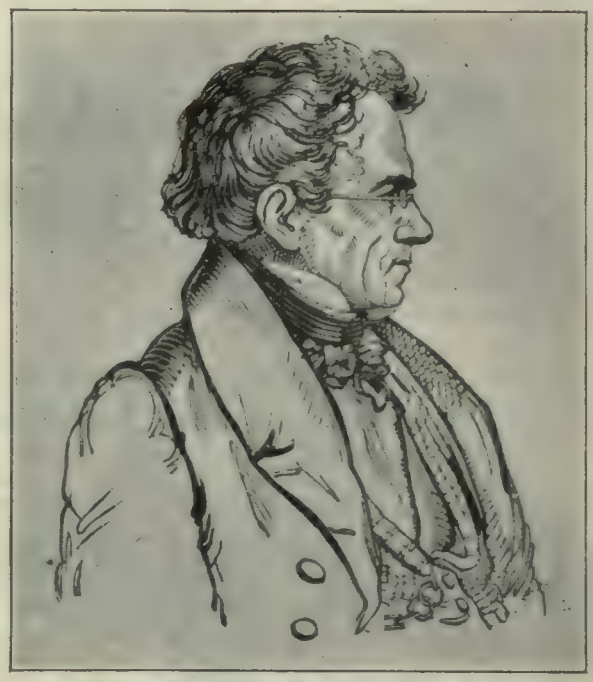


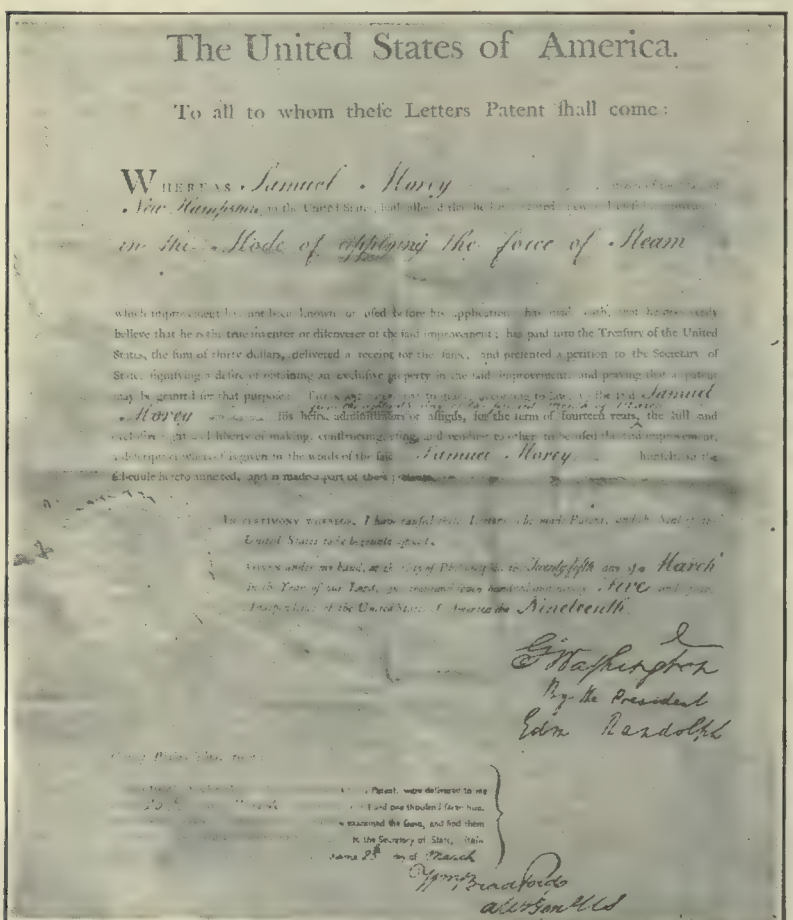
FIG. 15—PORTRAIT OF THOMAS BLANCHARD
(From a wood cut made in 1839. From Howe's "Emminent Mechanics")

I never had any doubt but that I had a right to take out a patent for the application of two wheels to a steamboat, and have often told Mr. Livingston and Mr. Fulton that I had. To the latter, I once asserted this right on board his steamboat with him; nor could I ever see the propriety or justice of Chancellor Livingston having an exclusive right to steamboats in the State of New York merely on account of the suspension of the efforts of Fitch & Company, when it was perfectly familiar to him that at much labor and expense, and the employment of years devoted to this pursuit, I had actually succeeded, so that nothing was wanted to carry this mode of navigation into effect but pecuniary means; especially when it is considered that I actually held patents relating to the subject at that time, and of which the Legislature of New York do not seem to have been informed.

I have often made passages in steamboats, and do not see in their construction any new principle; and it seems to me peculiarly hard that the originator of these improvements by which Messrs. Livingston and Fulton were enabled, principally, to succeed, should have had his rights overlooked, and himself excluded from the use of them on the very waters where many of his experiments were made.

I am, etc.,

SAMUEL MOREY.



The United States of America.

To all to whom these Letters Patent shall come:

WHEREAS Samuel Morey
New Hampshire in the United States, hath alleged that he has invented a new and useful improvement
in the Mode of applying the force of Steam

which improvement has not been known or used before his application, has made oath, that he verily believe that he is the true inventor or discoverer of the said improvement; has paid into the Treasury of the United States, the sum of thirty dollars, delivered a receipt for the same, and presented a petition to the Secretary of State, signifying a desire of obtaining an exclusive property in the said improvement, and praying that a patent may be granted for that purpose. These are therefore to grant, according to the said Samuel Morey his heirs, administrators or assigns, for the term of fourteen years, the full and exclusive right and liberty of making, constructing, using, and vending to others to be used the said improvement, a description whereof is given in the words of the said Samuel Morey hereunto annexed, and is made a part of these presents.

In testimony whereof, I have caused these Letters to be made Patent, and the Seal of the United States to be hereunto affixed.

Given under my hand, at the City of Philadelphia, the twenty-fifth day of March in the Year of our Lord, one thousand seven hundred and ninety five and of the Independence of the United States of America the Nineteenth.

G. Washington
By the President
Edm Randolph

Patent, were delivered to me
and one thousand three hun-
examined the laws, and find them
to the Secretary of State, Wash-
this 28th day of March
Wm Bradford
Attorney Genl

Courtesy of New Hampshire Historical Society

FIG. 14—MOREY ENGINE PATENT OF 1795

Samuel Morey was later associated with the firm of Rush & Muhlenburg of Philadelphia (James Rush and David Muhlenburg, sons-in-law of Oliver Evans and proprietors of his works) and in connection with them built some sort of an internal combustion engine. He obtained numerous patents besides those on the steamboat, one dated Jan. 19, 1819, covering a steam cannon. In 1820 he built another and larger steamboat on Fairlee Lake (now called Lake Morey in honor of the inventor). This boat, supposed to contain the original engine of 1793 was mysteriously

We have

sunk in 1821, it is said by enemies, and to this day is somewhere in the mud at the bottom of the lake. During the latter part of his life, Captain Morey made his home at Fairlee, Vt., across the river from Orford, and he died there in 1843.

Steamboats which antedate Fulton's "Clermont" are known to be several and these as well as Morey's did much to inspire and to help Fulton. William Henry of Lancaster County, Pa., built and operated a steamboat in 1763 and Robert Fulton, as a boy, was well acquainted

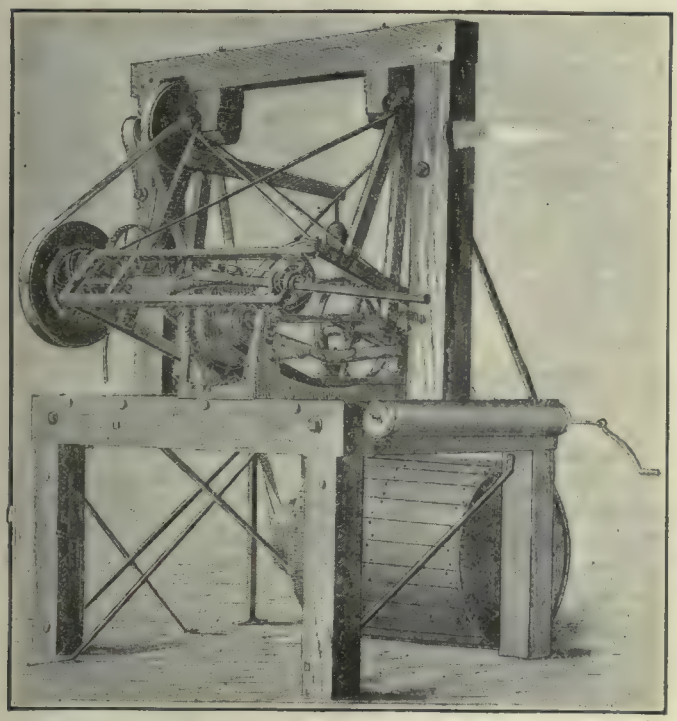


FIG. 16—BLANCHARD GUN-STOCK LATHE. BUILT ABOUT 1820 AND NOW IN THE MUSEUM OF SPRINGFIELD ARMORY
(From U. S. Census Report of 1880)

with him and his work. John Fitch, a friend of Henry's, built and operated a steamboat on the Delaware in 1786, which inspired Col. John Stevens of Hoboken to build his successful steamboats in 1802 and 1804. William Symington, an ingenious Scotch mechanic, built and successfully operated an iron steamboat on the Forth and Clyde Canal in 1788 and it is a well known fact that in May 1804, Robert Fulton was a passenger on Symington's third and highly developed steamboat, the "Charlotte Dundas," consulting with Symington and taking numerous notes and sketches of the mechanism and its operation. Robert Fulton, with the help of the wealthy and influential Chancellor Livingston, certainly was a great improver of steamboats and together they brought them into general use under the protection of a sweeping monopoly granted by the State of New York. Among the several inventors, upon whose work Robert Fulton's success was unquestinably founded, the "back woodsman" (Samuel Morey) certainly deserves a place of honor.

It is not strange that after having been the scene of the trials of some of the earliest steamboats, the Connecticut River should have been looked upon as a promising field for their use. The flatboats were fearfully slow, especially upstream, because the current was generally swift and the winding course and high banks of the upper river made the wind erratic and uncertain, so steamboats were early suggested as a remedy. Windsor, being by that time one of the largest towns upon the upper reaches of the river, became a center of steamboat movement and in 1924 the Connecticut River Co. was incorporated there for the purpose of further improving the channel of the Connecticut so that steamboats might navigate it. This company called into consultation no less personages than Governor Dewitt Clinton of Erie Canal fame and his chief engineer Holmes Hutchinson, both of whom recommended the complete canalization of the river by building dams with locks at suitable points to cover all rapids and shoals with back water. In 1827, Governor Clinton was received at Windsor with considerable ceremony and at that time examined and became interested in a pioneer Windsor invention to be described later on.

Canal too Costly

The elaborate canalization project of Governor Clinton and Holmes Hutchinson was too costly for the company to fully carry out and it remained for that picturesque inventor, Thomas Blanchard, to solve the problem in a different way and to initiate steamboat navigation to Windsor. Thomas Blanchard, whose portrait may be seen, in Fig. 15, was born at Sutton, Worcester County, Mass., June 24, 1788 and began his long inventive career as a boy of thirteen by constructing an apple-paring machine which made him a favorite at all the local "paring bees" and which is widely manufactured in almost its original form to this day. He earned a place as one of Henry Howe's eleven "Eminent American Mechanics" who had lived up to the year 1839, by his invention in 1820 of the Blanchard "Gun Stock" or "Copying Lathe," Fig. 16, now in universal use in rapidly duplicating gunstocks, shoe lasts, axe handles, other crooked and irregular objects, and even statuary, automatically. Blanchard seems to have had an eye for publicity and business ability far beyond most inventors and when numerous "pirates" attacked his patents on the "Copying Lathe," he not only beat them in suits, but went to Washington, and with the able help of Daniel Webster, succeeded in getting a third term on his patent. While seeking this

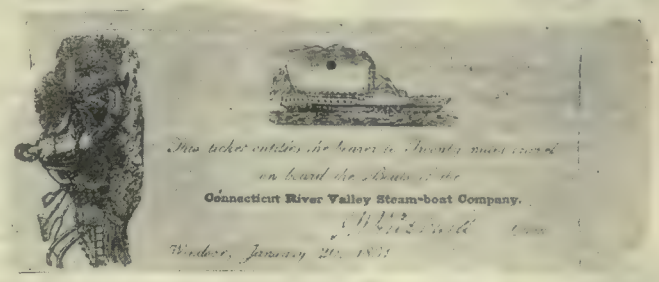


FIG. 17—TICKET FOR PASSAGE ON UPPER CONNECTICUT RIVER STEAMBOATS

second renewal he operated one of his lathes in the basement of the Capitol, turning out oaken busts of Clay, Calhoun and Webster. This had much to do with his success and Rufus Choate of Boston, who opposed him, said "Blanchard has 'turned the heads' of these Congressmen, so we need not wonder at his victory."

In 1826, when a company at Hartford was attempting to build a canal about the Enfield Falls, a rapid two miles long near Windsor, Conn., Blanchard, who was then engaged in improving the machinery at the Springfield Armory, determined to build a steamboat which would

stem these rapids. With this object in view he carefully figured the power required and conducted experiments by which he discovered that a wheel set far astern was the secret of success in swift water work. As a result of these researches, Blanchard in 1828 constructed the steamboat "Vermont," eighty feet long, fourteen feet wide and drawing but fifteen inches of water when fully loaded. This boat, provided with an improved two-cylinder horizontal engine built of wrought iron and developing one hundred and twenty horse power from very high pressure steam, ascended the Enfield Falls with ease. About this time the Connecticut River Valley Steamboat Co. was being organized at Windsor and to promote its project, Thomas Blanchard started northward with the "Vermont" in the Fall of 1829. What followed is quaintly described in the following extract taken from the *Vermont Republican and American Yeoman* of Windsor, under date of Oct. 17, 1829.

"The Steam-boat 'Vermont,' Captain Blanchard, arrived here on Monday evening last, and was most cordially welcomed to our waters, by our fellow citizens, as was demonstrated by the firing of cannon and the ringing of bells, on that evening and the following morning. As a further expression of the kindly feelings of the citizens of Windsor toward Capt. Thomas Blanchard and of their best wishes for the success of his patriotick enterprise, he was invited to a publick dinner. On Wednesday a party of between sixty and seventy ladies, gentlemen and young persons, made an excursion up and down the river in the 'Vermont' of some 35 or 40 miles; starting about 10 A. M. and returning to their respective homes before sun-set, without any accident, or encountering the least obstruction to steamboat navigation, and are highly gratified, we believe, with the opportunity afforded for so pleasant and healthful a recreation. We were before assured by those who had witnessed the movements of the 'Vermont,' and are confirmed in his assurance by our own observation during the above excursion, that this boat is well adapted to the river navigation. She stemmed the most rapid current between this and Sugar River bar, apparently, if we may so speak, without effort. It was the intention of Capt. Blanchard to have proceeded up the river as far as Haverhill or Wells River, this Fall; but it was found on examination, that the lock at Queechee Falls was too narrow to admit the boat, and he has therefore concluded to return to Hartford the first of the next week. We are informed that a regular line of steam-boats will commence running in the ensuing Spring, between Hartford, Ct. and Springfield, Ms. and that efforts will be made to extend it farther up the river. We trust the inhabitants of the Connecticut River Valley will feel the importance of rendering these enterprising individuals every assistance in their power. That the river will, at some future day, be the channel of extensive commerce between the interior, and the sea board, we believe *certain;* and that it might become as effectually so, with due efforts, in *two* as in *twenty* years to come, we have scarce less reason to doubt."

A fac-simile of a ticket for passage on the boats of the Connecticut River Steamboat Co., is shown in Fig. 17.

This optimistic prediction was not destined to fulfillment, for the reason that within the next few years, the advent of railroads (of which Blanchard was one of the earliest ardent advocates) made the further canalization of the upper Connecticut unprofitable. In its natural condition it was not suited to efficient navigation. After building and for a time operating six small steamboats, one of which, the "John Ledyard" in 1831, actually made the passage from Springfield, Mass. to Wells River, the Connecticut River Steamboat Co. went out of business in 1833. Thomas Blanchard applied his swiftwater steamboats with great success upon the Ohio River and his type of boat came into general use upon the western rivers. In later life he was a noted expert in patent cases and became wealthy from his work and from his inventions. He died at Boston on April 16, 1864.

From that time forward the navigation steadily degenerated from steamboats to flat boats, from flat boats to "Boxes" (log plank rafts carrying goods) and from rafts to "log drives." It has only been within the last ten years that these picturesque drives have been discontinued—one of the last and largest having contained 60,000,000 ft. of spruce logs, which came down from the Connecticut Lakes to Holyoke in 1912. The dams and canals originally built for navigation served as a great impetus to manufacturing by being converted to power purposes. Today these hydraulic works at Windsor Locks, Holyoke, Bellows Falls and Wilder, supply power directly to some of the largest pulp and paper mills in the world, and from their hydro-electric plants to other industries all over New England, so that the canalization was far from being wasted effort in spite of the abandonment of its original purpose.

Conditions in the German Machine Industry

The machine industry suffered severely in 1922 from the effects of Germany's economic disintegration, according to the annual report of the Verein Deutscher Maschinenbau-Anstalten, summarized in the Industrie- und Handels-Zeitung of June 8, and related in this country by *Commerce Reports*, published by the Department of Commerce.

The association estimates that the present production of the industry, in weight, is only half that of the pre-war period. Among the greatest difficulties that have hampered operation are the condition of Germany's currency and the resulting capital shortage, the eight-hour day, excessive over-time wages, labor disputes, unsatisfactory supply of materials, injudicious taxation, and the import restrictions of foreign countries.

These difficulties have forced many hitherto unorganized manufacturers to associate, and as a result the number of organizations in the industry rose at the end of 1922 to 143, comprising 1,150 concerns, with between 500,000 and 600,000 workmen, about 90 per cent of the producing power of the entire industry.

Supplies of raw and semi-manufactured materials apparently gave a great deal of trouble to the industry in the past year. Some factories were able to obtain but 30 per cent of the material needed, the shortage of bar iron and thin plates being particularly acute. Frequent changes in iron prices led to complete disorganization of quotations in the industry and necessitated a general agreement on uniform prices so far as practicable.

The domestic demand, upon which the industry largely relied, declined during the year, and manufacturers were forced to depend to an increased degree on export sales. The export supplements required by the Government embarrassed the industry considerably in its efforts to increase foreign sales and pressure has been exerted by the central association with some success to have them reduced. Manufacturers are generally adopting the practice of invoicing export sales in foreign currency. It is estimated that 80 per cent of the foreign sales of 1922 were made in this way.

Present-Day British Lathe Design

BY HUBERT BENTLEY

The cause for the embodying of new features—Three types of headstock in use—Improvements in tailstock —Provisions for feed changes and reverse motions

DURING the period of slackness which has been spread over the machine-tool trade in Great Britain in the last two years, many firms have taken the opportunity of overhauling their existing machine-tool designs. In several cases previous models have been displaced by tools embodying the very latest features. Taking the case of lathes, the leading manufacturers have marketed productions embodying features proved advisable by experiences gained during the war and in the immediate post-war boom. Former models have been abandoned and the tools now being produced will probably represent the fashion for the next few years, so far as the general lathe design is concerned.

Considering the new sliding, surfacing and screw-cutting lathes lately constructed by some of the principal lathe-building firms in Great Britain, it cannot be stated that any very remarkable departures have been made, but rather, the designs appear to embody a series of minor improvements; these generally affecting lathes of 6, 8, 10 and 12-in. centers. The quality of finish and well-rounded appearance of the new models leaves little to be desired.

Stronger beds with increased bearing surface for the carriage allow for the performance of still heavier duty. The embodiment of square guiding edges and the narrow guide principle, is now recognized practice and facilitates the easy movement of the carriage. The gap with its removable half gap piece still retains its hold on British lathe design and without doubt adds greatly to its utility. In the best practice cabinets have been adopted for some time to support the beds. The gradual movement inwards from the extreme ends of these supporting cabinets is interesting to note. In one case this applies to the cabinet at the headstock end only, bringing it well under the gap and where it is most required. In other designs, both cabinets are brought closer together, thereby reducing the span. Today, full advantage is taken of these cabinets for storing such parts as the change wheels.

THE PERIOD of slackness in the machine tool trade during the past two years has resulted in an overhauling of existing machine tool designs with the result, that former models have been abandoned and newer types produced that will probably represent the fashion for the next few years.

The lathes lately constructed represent no remarkable departures from former types but they embody a series of minor improvements such as stronger beds, increased bearing surfaces for the carriages to provide for heavy duty, adaption of inward moving cabinets, improvements in headstocks and tailstocks, and new types of feed gear boxes which consist of gears giving reverse motion as well as feed changes.

The most striking features of the lathes are the increased range of utility and the handiness of operation.

Coming to the driving headstocks, in each of the lathes under review, there is a choice of three types of headstock which may be embodied. The cone-driven type, however, retains its popularity but there is also a demand for the friction clutch-driven headstock and the variable speed type, as well as for the all-geared headstock. Four speed cones of ample diameter and width, with one or two variously arranged gear reductions and giving a range of 8 to 12 spindle speeds, appear at the moment the most favored. The single-speed countershaft is adopted as standard practice. As in former lathes the substantial hollow steel spindle with the end thrust taken on ball thrust washers is retained in the present productions. Plain parallel bearings with ample provision in the way of lubrication are adopted for the spindle. The day of the ball-bearing headstock has evidently not yet arrived. The pleasing effect of the gear guards for the headstock and other parts of these lathes is a noticeable feature. In the friction clutch type head, a three-speed cone and double back gears is usual, giving nine spindle speeds. The spindle is driven by a lever-operated toggle friction clutch either direct from the cone or through the two sets of gears, which are moved on the back shaft by a lever, to get the desired ratio. By means of the clutch, the change from geared to direct drive may be made without stopping the lathe or it may be used to stop the spindle instead of shifting the belt on the countershaft. This is an invaluable feature on chuck work, as the chuck can be moved or "inched" around, by a touch on the clutch lever, to bring the screws into position. The features of the almost totally enclosed variable speed fast headstock, which receives its motion from fast and loose pulleys and transmits the same to the spindle by means of variable speed cones and two gear ratios are already well-known.

The all-geared single pulley type head can be supplied with sprocket wheel in place of the pulley when a motor drive is required. The drive is taken by a single

pulley running at a constant speed and connected and disconnected to its shaft by a friction clutch. As the action of disconnecting applies a brake, a minimum of time is lost waiting for the lathe to stop. A combination of hardened steel sliding gears and friction clutches operated by levers at the front of the headstock gives 12 to 16 spindle speeds. Careful provision is made for the lubrication of all necessary parts and in one well known make, ball bearings are fitted to the shafts throughout to minimize friction losses. Simplicity and foolproofness are significant points in these headstocks and many useful features have been introduced from automobile practice.

Special attention is now paid to the location of the driving headstock. In one well-known lathe, after the final tests have been carried out and adjustments made by the screws between the bed shears, solid pieces are fitted between the lugs on the head and the shears and then screwed fast in position. Should the headstock be removed at any time it is not necessary to disturb these pieces and the head goes back exactly in the same place. In another design, a non-adjustable alignment strip is fitted to prevent tinkering with the center alignment, which is the cause of the inaccuracy of much of the work machined on the lathe. The alignment strip is secured to the front edge of the bed.

Improvements in Tailstock

The tailstock with its "set-over" motion for slight tapers is retained. The advantages of the solid spindle and screw passing through the barrel appear to be generally appreciated for the lathes above 8 in. centers while for smaller sizes the smaller diameter screw working inside the spindle is preferred. Split barrels died some time ago and the bolt and pad method is now generally adopted for clamping the spindle. Improved arrangements for facilitating the correct alignment of the tailstock are also now available, so that binding the same to the bed automatically aligns the tailstock center with the fast headstock center.

The ordinary tool rest and swivel slide and the 4-tool turret are still in favor and little alteration has been made in this direction. The apron mechanisms are now very compact while possessing two substantial bearings for each shaft. Quick engagement of the respective feeds is made, in combination with a drop out worm gear and foolproof arrangements are fitted to avoid breakages. Every facility is provided for quickly assembling and dismantling these aprons and the gearing may be readily inspected when desired. Steel wheels are adopted practically throughout for the aprons and gearboxes. Dial screw thread indicators are fitted to facilitate the cutting of screw threads. The adjustment for wear on the saddle is by taper gibs while conveniently placed locking bolts allow the carriage to be made secure in any position. Provision is made in these lathes, for the addition of a taper turning attachment at the rear of the carriage, should the lathe be required for turning long tapers.

The new feed gear boxes embody the nests of gears for giving the changes of feed as well as the reversing motion. The reverse is such that it can be used when cutting odd pitches in which case the lead screw nut is not withdrawn at the end of the cut. The screw is reversed until the tool is back at the starting point and the screw again reversed, thus keeping the nut in the correct thread. Four changes are adopted and obtainable by a single lever movement. Provision can be made when desired for the addition of a fine feed gear box for machining work requiring fine feeds, and in this case an extra range of four feeds is then available. With the standard gear box, four feeds are obtained and four different threads may be cut in combination with the change wheels which are neatly enclosed by a handy cover. An index plate indicates the feeds as well as the change wheels required for standard pitches. A reduced number of change wheels cover all requirements in combination with the gear box.

Method of Cutting Coarse Pitch Screws

Provision is made for the cutting of coarse pitch screws by coupling up one of the headstock shafts with the leading screw so that while the ordinary gear box may be used to cut threads from 40 to 1 per in., with the coarse pitch mechanism in action, threads of 1 to 18 in. lead and more may be cut.

Where it is desired to use these lathes for manufacturing, a stop rod on the bed allows the sliding feed to be tripped, forming a dead stop after tripping. In a similar manner cross stops may be fitted on the surfacing slide. For safety, a slip coupling is fitted on the feed shaft and arranged to slip in the event of a run in or an abnormal cut, without breaking the feed gears.

Suds pump, piping and tray, along with the usual steady rest, faceplate, driverplate, change wheels and countershaft, the latter in some cases with ball bearing hangers and a brake arrangement, go to complete the equipment of these lathes, in which probably the most striking features are the increased range of utility and the handiness of operation.

Why the Expert?—Discussion

By J. Madden

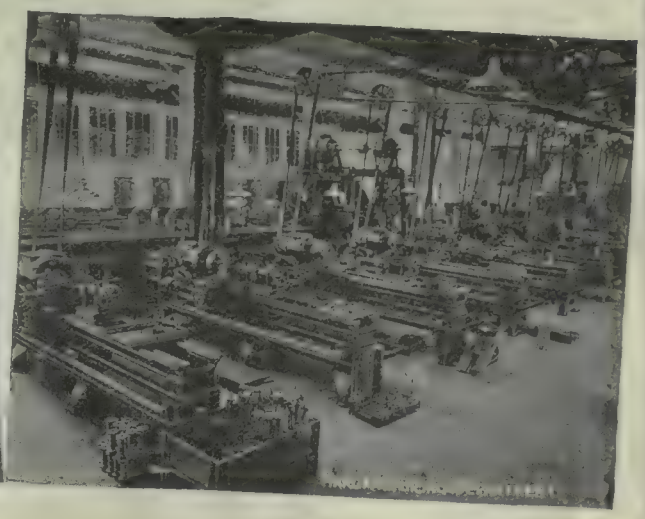
I think that the author of the story under the title given above, page 165, Vol. 59 of *American Machinist*, has been the victim of bad luck. He says that he has come into contact with dozens of cases where companies have sent out untrained trouble-shooters, only recently out of college.

His story has the attraction of not being of the popular variety, where the youth of innocent appearance puts to shame the veteran mechanics in saving the situation, whatever it may be, by using knowledge and a brain trained to think instead of relying wholly upon past experience.

Nevertheless, there must be comparatively few companies willing to trust their trouble jobs, upon which in fact their reputation depends, to cubs just out of school. The system of shop schools for college graduates has long been in existence and is growing in favor. One of their strong points is that a man has to know what he is doing to get by. No one will discount the value of experience, but we must admit that the white-collar trouble shooter (generally a college man) has certain advantages that the "dyed-in-the-wool mechanic" does not possess.

There should be a happy medium, and there are signs that the day is not far distant when there will be available in every large manufacturing plant a group of men trained technically as well as by experience. Our schools and universities have recognized the need for them and they are now in production.





Where Machine Tools are Made



LODGE & SHIPLEY MACHINE TOOL CO.
ESTABLISHED 1893





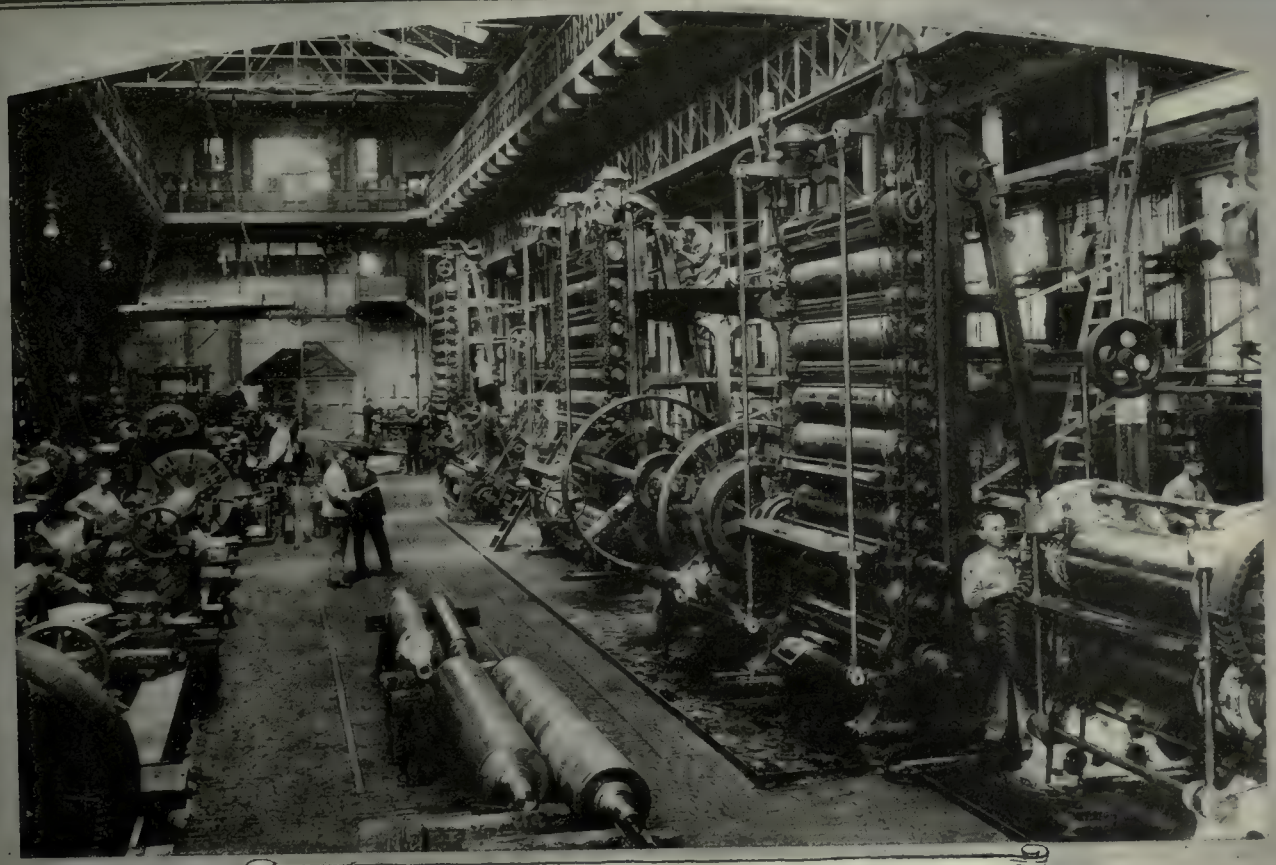




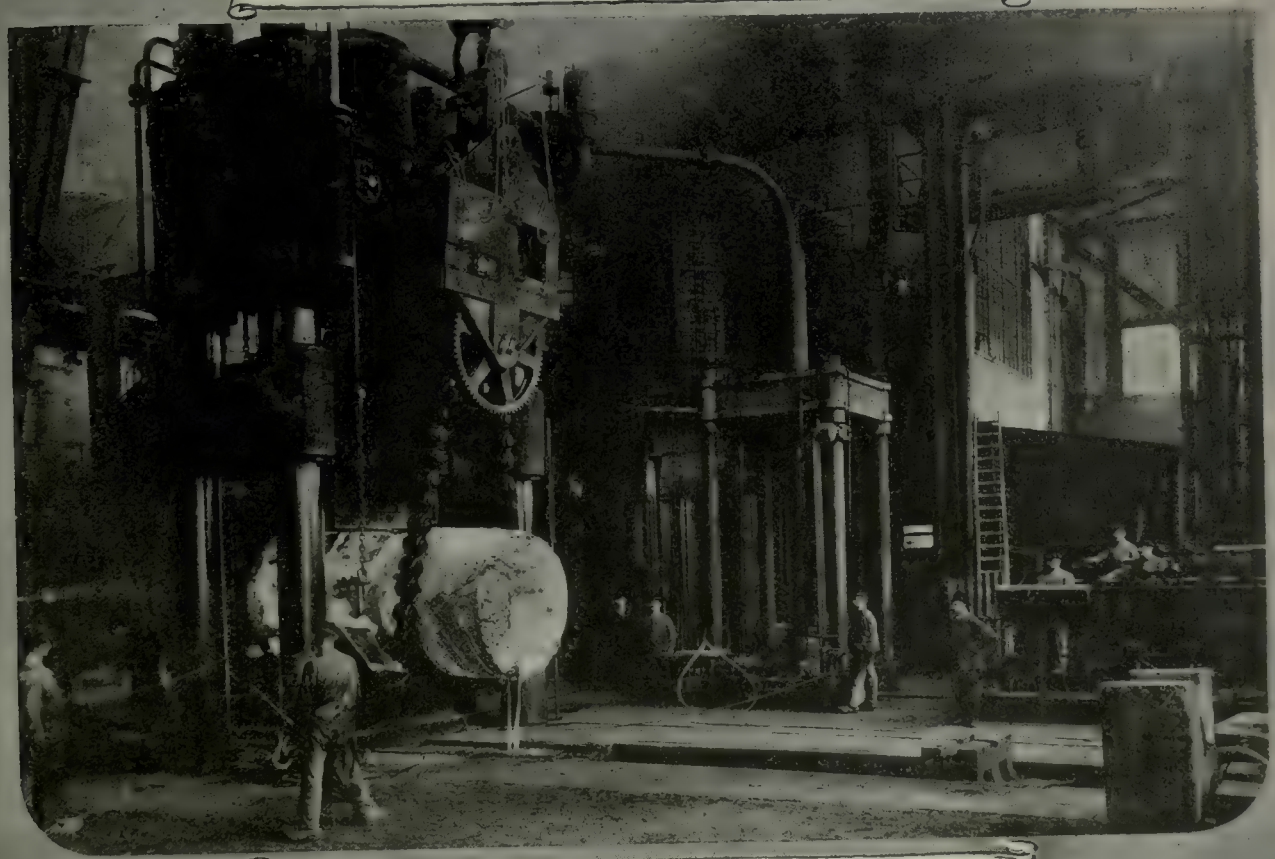
The Foundry at the Krupp Works in Essen. Note the handling equipment.



A big ingot suspended above the soaking pit in the Krupp Works



Erecting roll stands at Krupp's.
An indication of German Industrial Activity.



Hydraulic forging of heavy units in the Essen works of one of Germany's "trusts".





THE SERVICE~PROGRESS SPECIAL

An Educational Train *of the* New York Central which recently toured New York State

1 The DeWitt Clinton the New York Central's first train

2 An exhibit picturing the railroads' place in tax statistics

3 A car devoted to pictures and models showing the evolution of the locomotive from 1803 to date

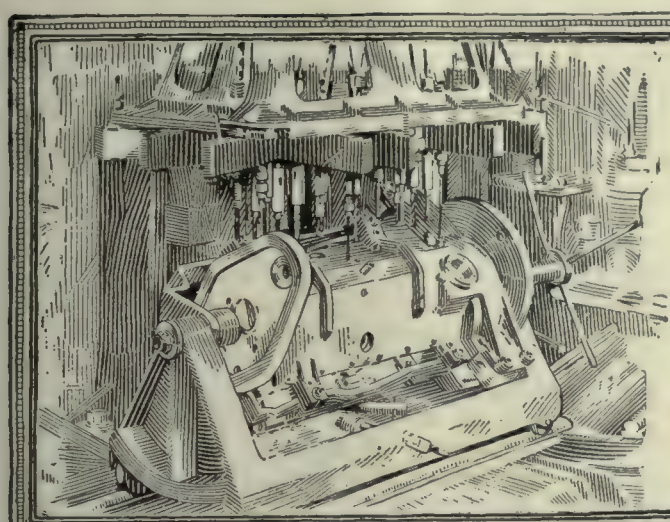


4 The complete train pulled by a "Mikado" freight locomotive of remarkable power

5 Engine 999 of the Empire State Express, holder of the world's locomotive speed record of 112½ miles per hour







Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Design of inspection gages continued—Treatment of some difficult problems—Concentricity gages—Value of indicating gages—Applying the principles

IT IS obvious that all of the gaging problems which may come up from time to time in general engineering work cannot be taken up and discussed separately, as space would not permit. However, it is our aim to show as many examples which require a different kind of treatment as we are able to do. Each problem which the tool engineer encounters must be treated as a separate matter and gages made to suit the condition. A careful analysis of the problem will often show points of similarity between one piece of work and another which has previously been gaged. The same methods which have successfully been used in one case can often be applied in another of a similar kind.

We have pointed out a few of the most common cases which require indicating and inspection gages or fixtures, but the example shown in Fig. 554 is radically different from anything previously dealt with. The work *A* is a bronze casting of a peculiar shape and one which required considerable ingenuity in the design of production tools. The entire casting is about 6 in. high and the two bosses *B* and *C* are carried on a thin web *D*. Both sides of these bosses are machined and the slot *E* is eccentric to the hole *F*, as shown at *G*. This eccentricity is important and must be gaged carefully, as the tolerances are very small. The distance *H* from the center of the hole *F* to the center of the hole *K* is also important, and the distance *L* must be held within a tolerance of 0.001 in. It can be seen that the most difficult part of this gaging problem consists in determining the eccentricity of the slot *E* with the hole *F*, and a principle was used for this purpose entirely different from anything which has previously been mentioned.

The type of testing fixture used for this work is shown in Fig. 555. The base of the fixture *A* is of cast iron, and it has a pocket at *B* in which the work *C* is seated. The flange portion *D*, however, rests on the finished boss surrounding the pocket. The center location of the work is made on the plug *E*. When the piece is set in position the operator pushes forward the clamp *F*, which rests on the top of the boss *G*. As he tightens the thumbscrew *H*, sufficient pressure is brought to bear to hold the work firmly. By referring to the previous illustration, it will be noted that the slot between the bosses on the work is eccentric to the hole. Therefore, some means of straightening out the slot when setting it up must be found in order to make sure that it is located correctly.

The operator, therefore, tightens the screw *H* only enough to make certain of location, but not enough to prevent the piece from turning. The shaft *K* passes through the two bushings *L* and *M*, and the end is squared up at *N* so that it is a trifle larger across the corners than the slot in which it enters. The position of the squared-up member is clearly shown by the small

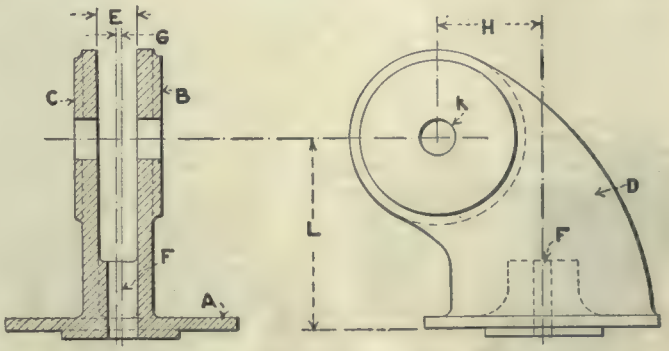


FIG. 554—EXAMPLE OF A DIFFICULT GAGING PROBLEM

diagram at *O*. When the operator turns the knurled knob *P*, this action causes the squared end of the shaft to revolve and thus straightens out the slot and brings it into its correct position. After this the thumbscrew *H* on the clamp can be tightened to make it secure.

It must be remembered that the eccentricity of the slot to the hole has been previously determined and that the only function of this squared-up shaft is to straighten it out in the fixture and get it in the correct position. It might be possible to locate it in the fixture on a central plug and also on a locating block of the same size as the slot, but in all probability there would be considerable difficulty in getting the work in and out of the fixture, as the parts would need to fit each other very accurately.

The work has now been located properly in the testing fixture, and we are to determine the accuracy of the central hole with the points indicated in Fig. 554. To obtain the correct height and alignment of the hole

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we pass through it an accurately ground bar *Q*. This bar is made long in order to multiply any errors in alignment. On each side of the fixture there are brackets *R* and *S*, and in them a shaft *T* is fixed. An indicator *U* is mounted on a casting *V*, which has a small counterbalance *W* at the other end. The casting *V* is a sliding fit on the shaft *T*, and the operator moves it along toward the ends of the bar *Q* in making the test. The indicator has previously been set to zero by means of a "master," so that any variations in the alignment and in the vertical position of the bar *Q* are very easily determined by a glance at the indicator.

The twist of the shaft *Q* is determined in a similar manner by an indicator *X* mounted on a counterbalanced casting *Y*. This casting is a sliding fit on the bar *Z* so that it can be moved backward and forward in making the test. This indicator also must be set to zero by means of a master before attempting to gage the work. The small counterbalances placed opposite the two indicators are so proportioned that they will keep the indicators raised and out of the way when locating the work in the fixture or removing it.

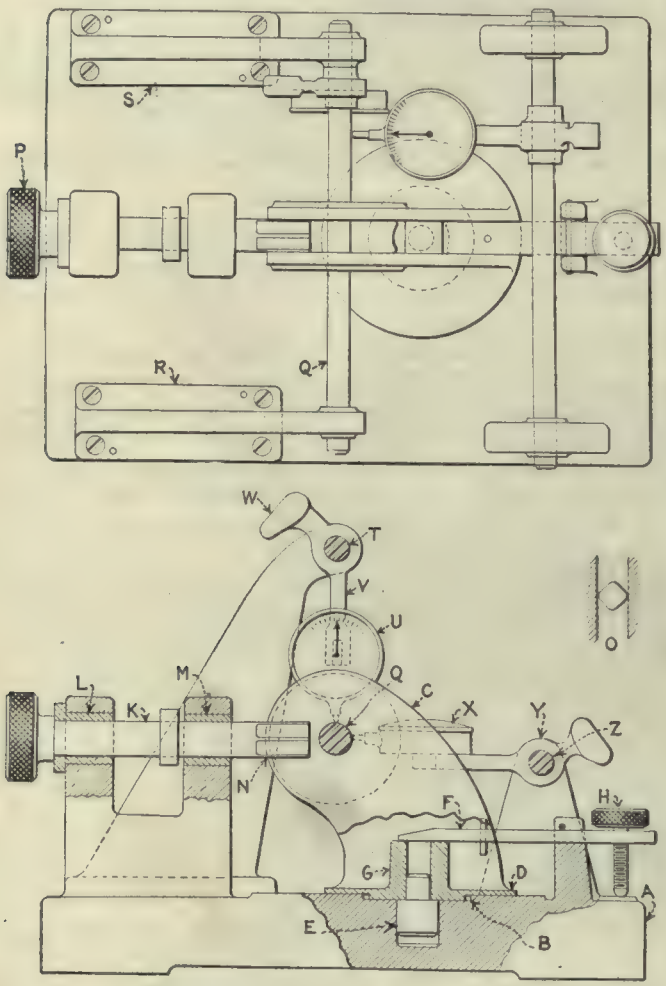


FIG. 555—TESTING FIXTURE FOR DIFFICULT PIECE OF WORK

There are other methods which can be used to test this piece of work by using movable gages of the go and no-go variety in somewhat similar fashion to those shown on the cam testing fixture in the previous article. These gages would be all right for determining the height of the bar *Q*. Other means, however, would be necessary to determine whether there were any twists in the bar. It might be possible to find out the variations in this regard by using feelers between certain fixed points and the bar. A method of this kind would probably be somewhat slower than that shown, although it would undoubtedly be cheaper.

When making an indicating gage a great deal depends upon the number of pieces which are to be gaged and the accuracy required. The type of gage shown here is somewhat expensive and might not be warranted when only a few pieces were to be machined. The designer should always take these matters into consideration before designing a gage, in order that the costs of making it will not be excessive when considered in proportion to the number of pieces tested.

In gaging the concentricity of cylindrical surfaces there are a number of methods which can be used. A great deal depends upon the number of pieces which are to be gaged and the shop equipment which is available. The construction of the piece and the various points of importance are also factors in determining the method of gaging. For example, we may consider a simple piece of work having a hole in the center and a flange or rim 4 or 5 in. in diameter, and it may be necessary to test the running of the outside diameter with the hole. If a simple problem like this is encountered it is a very easy matter to force the piece on an arbor and hold the arbor on centers in a lathe, using a dial indicator to make sure that it runs truly.

If another piece of work is considered that has no centers which can be easily used for testing purposes, some method must be provided by means of which the work can be held and revolved while testing. It does not always follow that because an inside and an outside surface are machined at the same time, they will be perfectly concentric; but occasionally work which is held so that both operations are done at the same time can be tested by means of an indicator while in the machine, in order to make sure of the concentricity. It is generally the case, however, that the final inspection demands another test before it is certain that no errors in machining have been made.

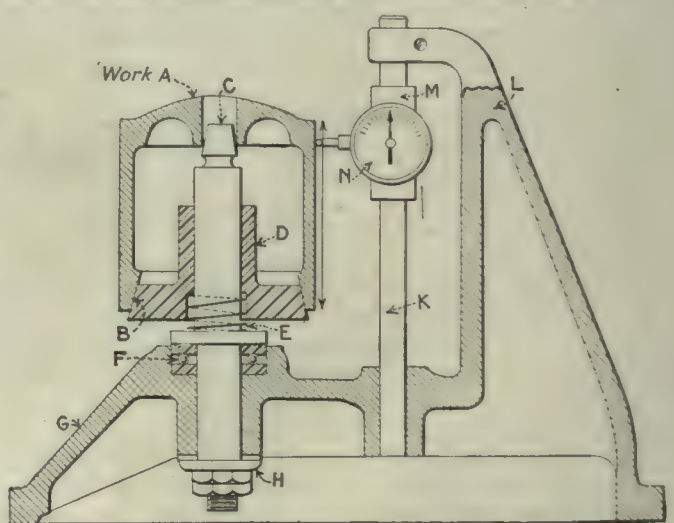


FIG. 556—CONCENTRICITY INDICATING GAGE

Flywheels, clutches, pulleys, gears and other running parts often require a test for concentricity, but many of these parts do not necessitate any great amount of special equipment. When an extraordinary case is found which cannot be tested by any of the methods mentioned, a special testing device must be made to suit

the particular condition encountered. An example which illustrates principles that may be found useful for work of this kind is shown in Fig. 556. The work *A* is a casting which has been machined all over the outside surfaces, in the small hole at the top and in the angular portion *B*. The requirements of the work are that the outside shall be concentric with the tapered portion and the end hole. It might be possible to set up this piece of work on a spindle having a conical surface, use a center in the end hole and test the piece on an engine lathe. The production, however, being large, would require the continued "tying up" of an engine lathe for this purpose, which is hardly warranted. A testing fixture therefore seems advisable.

The base of the fixture *G* is of cast iron and contains a center plug which rests on a ball thrust bearing *F*. The shaft is held in place by a collar and nuts at *H*, and so fitted that it is free to revolve. The upper end of this plug is pointed at *C* so that it enters the end hole in the casting. The conical sleeve *D* is a sliding fit on the plug, and is held up by a coil spring *E* which barely overcomes the weight of the sleeve. When the piece *A* is placed in position ready for testing, the pointed portion of the plug *C* enters the upper hole and the conical bushing *D* makes contact in the tapered portion, but does not lift the casting away from its seat on the end of the plug.

The shaft *K* is vertically mounted and held in the base casting in some suitable manner. The upper portion *L* may be a part of the base casting or a separate extension from it, according to the designer's fancy. A special clamp *M* is used to hold the indicator *N*, and the clamp is so made that it is a sliding fit on the rod *K*. In testing the work the indicator is moved up and down by the operator while the work *A* is being revolved, and in this manner any variations in the concentricity can be readily detected by fluctuations in the indicator point.

Labor Problems of the British Machine Builder

By Albert Clegg

SO FAR as Great Britain is concerned it is not strictly correct to refer to the present state of almost hopeless stagnation as fluctuation, since, apart from the all-too-brief boom which succeeded the armistice, conditions have gone from bad to worse with little apparent prospect of any immediate improvement. It is extremely doubtful if the British machine tool industry is working at anything like one-third capacity, for there are quite a few firms who are practically shut down, while a majority of the remainder are carrying on under an almost insupportable load of financial difficulty which is every day becoming more and more acute.

America, on the other hand, seems to have recovered with surprising rapidity, but even she does not appear to be yet able to absorb the maximum production of her own machine tool makers, though most other trades appear to be experiencing more or less of a boom. So far as general engineering is concerned, America is right up against a problem which has been agitating some of our British employers for some time, and that is the decreasing supply of skilled men. But whereas you are feeling the shortage already, it is with us more a question as to what will happen when trade recovers.

The men having been so long on short time or idle, it is not to be wondered that they are leaving the business whenever an opportunity arises. All kinds of one-man businesses are being taken up in the effort to make ends meet. There are practically no lads being apprenticed to the trade to make good the normal losses in man-power, so that the outlook for the future, when the long-looked-for trade revival comes along, is the reverse of promising. Speaking from memory, I believe the standard rate of pay for skilled engineers is 54 shillings a week, short of $14, and even this low rate cannot attract sufficient business to keep half the skilled men in the country fully employed. Can one blame the men for getting into other trades, or can one blame parents for refraining from putting their lads to such a poorly paid job? Street-car conductors, road-sweepers, and many other classes of unskilled labor, can all earn bigger pay, and one cannot, therefore, logically expect anything else but a labor shortage. It is almost inevitable.

Some time ago, I was informed by a British machine tool maker that he had been very much surprised at the number of his men who had gone into other businesses and other jobs outside the engineering trade. His trade had taken a turn for the better, after having been almost non-existent for many months, and he had written some of his old employees asking them to start work again. The response rather staggered him since only one man out of every four wished to resume. The rest had either started business on their own account or had found some other more remunerative job than machine tool making promised to be. This man's works are even now only running at something under half capacity, and yet he feels the effects of a shortage. What would be the position if every machine tool firm in the country were fully employed. There would be a very acute shortage which would continue until the remuneration became sufficiently attractive to encourage a fresh supply of apprentices, and until these apprentices had served the necessary length of time, four or five years, at least.

We can, therefore, make up our minds to accept the inevitable. For at least four years after trade recovers the shortage of skilled men will become more and more pronounced, because, while, during this period there will continue to be the normal shrinkage due to death, retirement, and so on, there cannot, in the ordinary course of events, be any fresh influx of skilled labor until the end of that time, and even then, the supply will only be a comparatively raw contingent, with most of its wisdom teeth still uncut. It seems to me that for the next ten years at least, the supply of skilled engineers will be somewhat restricted, the consequence of which will be that machine tool prices, wages, and the values of other incidentals intimately associated with skilled engineering labor, will rise. All sections of the industry, individually and collectively, will then stand a possible chance of getting a little of their own back.

For those who can last out, there is a good time coming. The pendulum of trade will swing back and the survivors, both employer and employed, will reap the benefit of the operation of the economic law of supply and demand.

Welding High-Speed Tool Steel to Ordinary Shanks

By W. J. Seibert
Erie Works, General Electric Co.

From the *Journal* of the American Welding Society

During the past few years there has been a great deal of discussion as to the production and conservation of small tool equipment, yet few concerns realize the saving which can be effected by the use of resistance welding, especially in the production of tools for lathes, planers and shapers.

We are at present using about 200 lb. of steel tools per week; under normal conditions we will probably be making up twice this quantity. Formerly the entire tool was made of high-speed steel, but at present, with the use of butt welders, nearly all of the tools are made by welding a section of high-speed steel to a carbon shank which reduces the cost considerably. We have three Thompson welders at present, used in welding several hundred types and shapes of tools.

The tool section to be welded is generally ground straight on the end, and the high-speed section which is to be welded on this shank is cut to the proper angle to give the necessary rake to the tool. We have several types of jaws which were made up for holding the various shapes, each operator having personal ideas as to the method of operation and, as a rule, devising his own type of jaw.

In welding the tools it is necessary to have both the high-speed section and the shank fairly free from scale, inasmuch as it is essential to have good contact between the copper jaws and the work. The selection of the proper heat is generally a matter of experience with each particular type of steel. After selecting the proper heat, the two sections are brought together under firm pressure and allowed to heat to a point of incandescence. If the shank and high-speed section do not come up to a uniform temperature, the current is shut off for a few seconds, allowing both portions to reach the same degree by transfer of heat from the hotter piece. The current is again applied, and when sufficiently heated, the work is forced together under very strong pressure. This is a modification of the flash-weld method in which the pieces to be welded are brought together very lightly, establishing an arc which heats the ends to the welding point in a very short time. Pressure is then applied, forcing the pieces together and forming a good weld.

Scale Is Forced Out

Due to the fact that the metal is in practically a molten state, parts of both the shank and high-speed section are forced out and form a fin. This action allows the molecular structure of the two sections to come in intimate contact and any oxide or scale which might have been entrapped between the two sections is forced out, leaving perfectly clean metal in contact. We have found that this method is preferable to the older method of heating the sections to a white heat and then squeezing them together under high pressure, as this latter method frequently developed flaws in the welding.

For the tool of average size, that is, a shank about $\frac{3}{4}$x1$\frac{1}{2}$ in. section, we allow a $\frac{5}{8}$-in. projection between the jaws for the high-speed section, and allow 75 per cent of the distance for the carbon; this distance, of course, is varied for larger tools, allowing greater projection. It requires approximately 2$\frac{1}{2}$ min. to clamp the two sections in the machine, weld and then place in the annealing furnace.

The heat treatment to which these tools are subjected is of vital importance, it being necessary to place them in a muffle-type furnace immediately on removing from the machine, and before they cool to any appreciable extent. This furnace is run at a temperature of 825 deg. C. for about two hours after the last tool has been placed in the furnace, and then the heat is shut off and the furnace is allowed to cool overnight. In a well-insulated furnace, the tools will be at a temperature of about 200 deg. C. in the morning, and can be removed at that temperature. The tools are snagged or rough ground, heated to 875 deg. C. and quenched in No. 2 Houghton oil, and then ground and hardened by the usual high-speed method. The method we are using is to heat the tool to 1,300 deg. C., then quenching in molten lead at 600 deg. C.

Many Uses of Resistance Welder

The resistance welder can be adapted for use in welding drills, taps, small armature shafts and in fact any section which can be handled in the jaws. We are saving considerable money by welding extra-length shanks on drills and taps.

We have, for the past four years, been welding bandsaws for use in the pattern shop on wood-working machines, and also the bandsaws adapted for sawing metals. It can readily be realized that considerable money can be saved by welding the saws instead of brazing them, as in brazing it is necessary to scarf the saw for a considerable distance. The saw is ground off square at the ends, then placed in the jaws of the welder with approximately $\frac{3}{32}$-in. projection from each jaw. The ends are brought up to temperature and forced together under sufficient pressure to squeeze considerable metal from the weld. Before the saw is removed from the welder the jaws are moved back about $\frac{1}{4}$ in., then light heat is applied two or three times for about two seconds each time, thus annealing the weld and removing any strains which might cause fracture. The saw is then ground to a uniform thickness on an ordinary grinder. It is unusual to have the saws returned broken at the weld.

Tool Costs Reduced

The cost of current used in welding is really the smallest item, as a $\frac{3}{8}$x1$\frac{1}{4}$-in. tool can be welded with a current consumption of approximately 0.3 kw.-hr., the cost of which, when compared with the cost of the steel, is really insignificant. Odd-shaped tools can be produced very readily, it being necessary only to make jaws adapted to the shape, the expense of which, when compared to the cost of forging a tool, leaves a balance greatly in favor of the welding method.

Any factory using more than 50 lb. of tools per week can use a welder to good advantage, to say nothing of the production work to which it might be adaptable.

A careful check has been kept on the cost of welding these tools, and this past year we have had a net saving of 70c. per lb., after figuring in the extra cost of snagging, heat treating, etc., which when figured on a 50-lb.-per-week basis means a saving of $1,820 per year. From these figures it can readily be seen that the resistance welder is not only a great convenience, but also a real money-making proposition.

Automotive Service Methods and Equipment

By HOWARD CAMPBELL
Western Editor, *American Machinist*

Conclusion of eighteenth article — More Cadillac service station tools—Indexing feature for grinding reamers—Tire-removing press—How generators are tested—Other tools

THE TOOL shown in Fig. 13 is an index head used for grinding Martell reamers. On the back of the head a shank is turned with a taper corresponding to the taper in the spindle of the grinding machine into which it fits. The head is made with 24 notches so that practically any division required can be obtained. The tail of the dog which drives the reamer consists of a short section of bar steel, the end of which is held between setscrews through two lugs on the grinding head as shown. When the reamer is

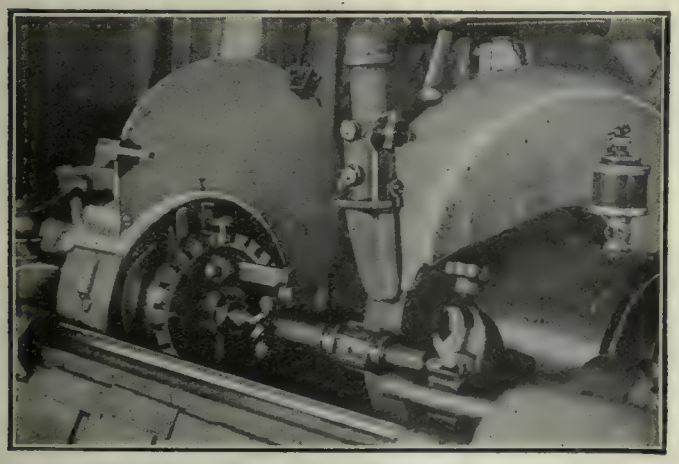


FIG. 13—GRINDING A MARTELL REAMER

clamped in position for grinding, these setscrews are not released until all the blades have been ground. Then the screws are adjusted to turn the reamer around far enough so that a 6-deg. clearance can be ground on the back of each blade. These screws make it possible to grind any amount of clearance or any degree of backoff on the reamer blades, and equal divisions are obtained without any difficulty.

A machine for punching rivet holes in Raybestos bands and also for heading the rivets is shown in Fig. 14. This machine eliminates the possibility of distorting the brake bands by hammering, as the job is usually done, and saves approximately 1¾ hr. labor on each set of brake drums that are refitted with Raybestos. When a hammer is used, the brake band always has to be straightened afterward, with the result that the original symmetry of the band is never obtained, and the job looks as bad as it is. The heading die is made so that the heads of the rivets will be cupped, thus preventing any wear from coming on the rivets until the lining is nearly worn off.

The piece shown at *A*, Fig. 15, is a spring bushing and the rest of the paraphernalia with which it is connected is a tool for removing worn spring bushings and installing new ones in their places. To remove a bushing from a spring, the long screw which extends through the center of the tool is put through the bushing from the outside and then the small nut *C* is screwed on at the inner end of the bushing. The piece *B*, which is hollow to receive the bushing, is braced against the spring over the outer end of the bushing and the screw is drawn through the hole by turning the nut *D*, the screw bringing the bushing with it as it comes. A wrench can be applied to the square head on the right-hand end of the screw so as to keep the screw from turning when the nut is turned.

When assembling a new bushing to the spring, the screw is inserted through the hole from the outside, the bushing is put on over the screw and then the nut *C* is screwed onto the end of the screw and power is applied as before.

After the bushing has been pulled into place, it must be reamed to size, which is done with the reamer shown lying on the bench. The reamer is ¾ in. in diameter with eight blades on a left-hand spiral. A pilot on the end of the reamer centers the tool and makes it easy

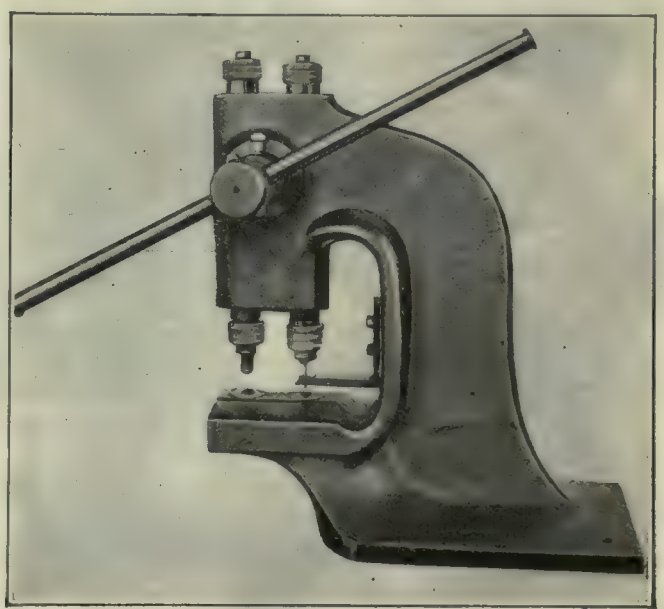


FIG. 14—BRAKE BAND PUNCHING AND RIVETING MACHINE

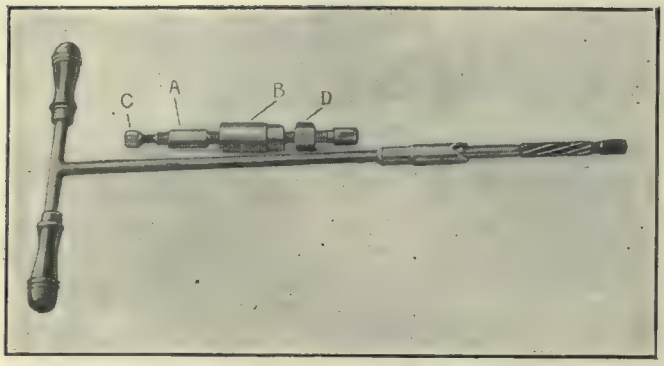


FIG. 15—SPRING BUSHING ASSEMBLING TOOL AND REAMER

to start the reamer through the hole. The reamer handle is long enough so that it extends out beyond the fenders and wheel and thus can be easily operated. The reamer is driven by means of a pin through the shank, the pin extending on both sides of the shank far enough so that the ends engage in the two slots of a ratchet in the end of the reamer handle.

Those who are familiar with the multiple disk clutch



FIG. 16—CLUTCH ASSEMBLY TOOL

used in the Cadillac car will understand the operation of the tool shown in Fig. 16, although there was no clutch available for demonstration purposes at the time the photograph was taken. This is a tool for assembling the clutch, and is designed to hold the spring while the plates are being assembled. The hub of the clutch spring is placed over the pilot in the base of the fixture, and also over the pilot on the end of the screw, after the plates are in position. Turning the screw down

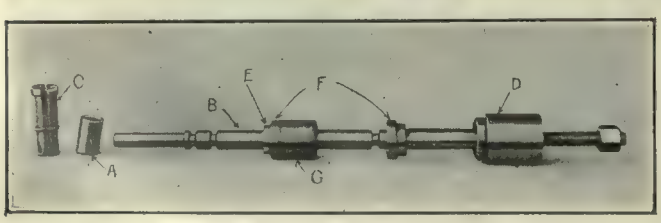


FIG. 17—TOOL FOR REPLACING CAMSHAFT BUSHINGS

compresses the spring and holds it while the plates are being bolted together.

A tool for installing and removing camshaft bushings in crankcases is shown in Fig. 17. To assemble a rear camshaft bushing *A* in place, the shaft *B* is put through the camshaft bearing holes, then the split bushing *C* it put into the camshaft bushing and expanded so that it can be slipped over the small end of the shaft, where it is held in position by a pin through the split bushing

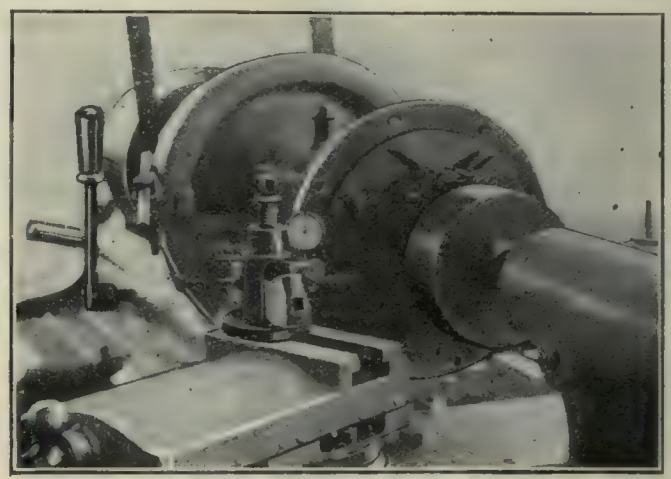


FIG. 18—INDICATING A DIFFERENTIAL MOUNTING

and through a hole in the shaft. The shoulder on the piece *D* fits into the recess for the front camshaft bearing and the nut shown at the right hand end of the shaft is screwed against piece *D*, drawing the shaft through the piece and pulling the rear camshaft bushing into place. To remove a bushing, the same procedure is followed. At intervals on the shaft corresponding to the distances between the camshaft bearings, recesses are turned for the horseshoe collar *E*. When removing a bushing or pulling a new one into place, the shoulder of the collar *F* is slipped into the end of the bushing, one of which is shown at *G*, and the horseshoe collar is slipped into place behind it so that the bushing will be pulled along with the shaft. There are as many recesses on the shaft as there are bearings for the camshaft and it is a comparatively simple matter

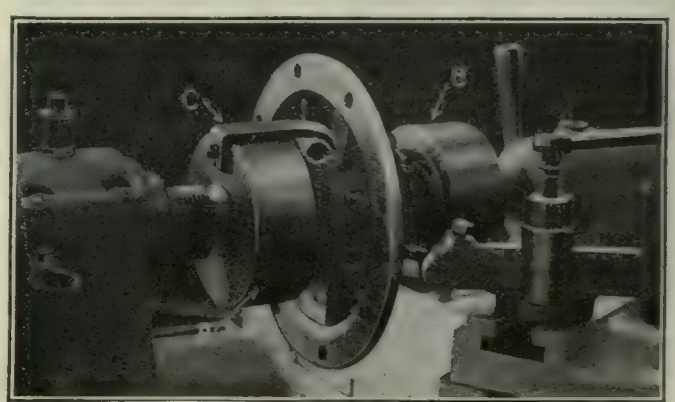


FIG. 19—MOUNTING AND DRIVING MECHANISM

to remove the old camshaft bearings and insert a complete new set.

The piece shown in the lathe in Fig. 18 is a differential mounting, to which the ring gear is assembled when in the car. Whenever the differential is taken apart, the mounting is swung between the lathe centers and



FIG. 20—TIRE REMOVING PRESS

indicated for trueness before it is reassembled. The dial indicator used is shown clamped in the tool post of the lathe. If the indicator shows a variation of 0.003 in. on the side or 0.002 in. on the edge of the flange, a fine cut is taken with the lathe tool as shown in Fig. 19. A perfect job can only be assured by swinging the mounting in the lathe in the same manner in which it is held in the assembly; therefore it must rest in its own bearings. This is made possible by the pieces *A* and *B*, which are bored to the dimensions of the inside of a roller race. A taper shank on the back of the piece *A* fits into the spindle of the lathe, and the piece *B* is centered to revolve on the tailstock center. The piece *C*, which is bolted to the headstock roller race, as shown, drives the piece and prevents it from turning in the race.

The machine illustrated in Fig. 20 is a tire-removing press. After tires have been run 6,000 miles or more without being taken off, as is often the case, they become "frozen" on and require a considerable amount of power to remove them. Before this press was made it was a common occurrence for a workman to spend 2½ hr. with a hammer and sledge trying to separate the rim from the wheel. With this apparatus an obstinate tire can be removed in not to exceed 15 min. The platform on which the press stands is 6 ft. square and is made of heavy oak planks bolted together. The wheel rests on six adjustable jaws, made to slide so that they will take three different sizes of rims. Pressure is applied to the tire by means of the handle shown on the top of the screw. The screw is 2½ in. in dia., and the thread, which is square, is 3 pitch. The screw is threaded through a cast iron nut in the 10-in. U-beam that forms the top of the press frame. To the lower end of the screw is attached a cast-iron spider, the legs of which are bolted to a circle of angle iron. When the tire is in position, the circle is lowered onto the tire, then pressure is applied and the tire is pushed off the rim.

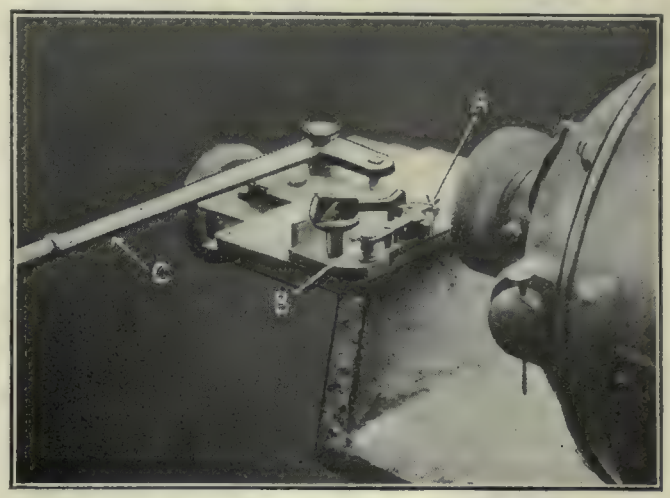


FIG. 22—CONTACT POINT GRINDING MACHINE

An outfit for testing starters is shown in Fig. 21. This consists of a 2 hp. slow-speed electric motor (made by the Jas. Clark Electric Co., Louisville, Ky.) that is wired to a rheostat and to a control board which is exactly the same as those in use in Cadillac cars. The generator that is being tested rests on a steel plate that is attached to the movable jaw of a vise, and is held in place by a metal strap which is also anchored to the jaw and is hinged so that it can be swung up over the generator and locked in place with a wing nut, as shown. By turning the vise handle, the jaw is moved in or out and the belt from the motor to the generator can be released or tightened almost instantly when attaching or removing a generator. The use of the rheostats makes it possible to control the speed of the motor so that the generator may be run at speeds corresponding to the speeds at which it would run when in use on a car. An ordinary car switch is used on the control board, and lights corresponding to those used on a car can be connected so that the generator will be tested under actual working conditions. When the electric motor is running at its maximum speed, which is 1,400 r.p.m., the generator runs at about 2,800 r.p.m., which corresponds to a speed of 40 miles per hour on the car.

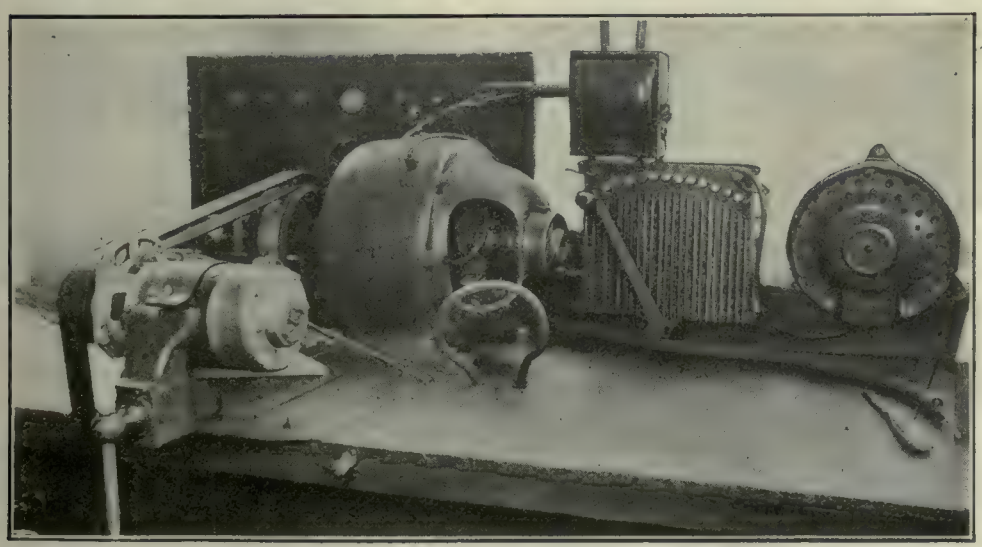


FIG. 21—STARTER TESTING APPARATUS

The ammeter should show 14 amp. at this speed. By turning the knob in the center of the instrument at the right of the picture, the speed of the motor can be increased about three times, thus speeding up the generator to a faster speed than it would be possible to run it on a car, and giving it a thorough test.

A home-built apparatus for grinding the platinum contact points on arms for circuit breakers is illustrated in Fig. 22. The contact point *A* is attached to an arm which is held in position by the pin *B*. Moving the handle *C* slides the plate on which the fixture is located so that it can be passed back and forth across the face of the grinding wheel. The fixture can also be used to grind short contact points for the distributor heads. The grinding is done with a 2½-in. x 1¼-in. 100 L Norton cup wheel, attached to the spindle of a ¼-hp. motor which runs at 1,300 revolutions per minute.

Pipe Dreams of a Tramp Mechanic

We Clean Up the Watchman

By Glenn Quharity

MR. BROOKS, Sr., founder and principal owner of the Brookdell Co., was a genuine old-fashioned "born" mechanic. This does not mean, nor did he assume it to mean, that he ought to know everything about mechanics without having to find it out, for he had worked hard all day, first on his father's farm and later in one of the leading machine and tool shops (then, as now) of old New England, and studied equally hard during the long evenings after his day's work was done, before he started business for himself in the little old wooden shack up by the dam that was the predecessor of the present plant.

He was, however, gifted with a keen intuition in matters mechanical and though in his apprenticeship days he probably made as many mistakes as the average boy, he did not make the same kind of a mistake twice—at least, not very often. He had about him in his later years an air of deliberation that deceived casual acquaintances into believing him to be sluggish and a slow thinker, but, whatever his mental processes may have been, his conclusions were generally right, and when a job was tackled by him or under his direction it was carried through to completion without a hitch or a holdup because of unforeseen difficulties, and in a time that would astonish some of our present-day industrial managers.

His Many Virtues

Among other qualities inherited by him from his New England ancestors (some said he was Scotch) were the characteristic Yankee traits of neatness and orderliness, and these traits were not only apparent in his personal habits but were reflected as well by the orderly and efficient arrangement of the machinery in the shop, the clean floors and windows, the well-kept lawns and flower beds and the general air of freshness and newness about the entire plant. He believed—without ever having heard—the modern theory that dirt is "merely matter out of place," and he made a point of keeping it in its proper place.

Many times I have seen the "old man" come out of the office in his Sunday-go-to-meeting clothes (which he wore seven days a week when I knew him) lay off his coat and vest and tackle some greasy job that would soon make the average mechanic resemble an Ethiopian, finish it up to his satisfaction, wash his hands and go back to the office without a speck upon the broad expanse of his "boiled" shirt bosom.

Observing the laws of cleanliness himself he inspired and encouraged others to observe them also, with the result that, though most of us were on fairly intimate terms with grease and dirt during the day, when we went out of the front gate at six o'clock we were a rather respectable looking bunch of citizens—if I *do* say it myself, as shouldn't.

Judge, then, of the old man's consternation when upon coming down to the gate one summer's evening he was confronted by a surly individual in ragged clothing, with soiled face and hands, unkempt hair, and the generally disreputable appearance of having slept off a jag in some convenient ditch.

"Who 're you?" he demanded.

"Th' new night watchman," was the reply.

"Umph; I'm old man Brooks"—and that password was sufficient to get him through the gate.

The next morning the old man blew into the office of Mr. Willians, our superintendent, and wanted to know, "who the devil is that jail bird that thinks he's a night watchman?"

"Why," responded Mr. Williams, "that's the fellow I hired last month to take over the job when old man Emmons passed out."

"Is he a good watchman?"

"Seems to be. Makes his rounds regular and scares everybody away from the place nights. What more do you want?"

"Wish he'd wash his face," grumbled the old man.

"We can't have everything, you know," said Mr. Williams gently. "Night watching is a job for the old, or the physically unfit. Emmons had been here since the Lord knows when, and when he died I had to get *somebody* right away. None of the younger fellows want the job."

"Well! If that's the best you can do I suppose I'll have to stand it," sighed the old man, wearily. "You'd better have a new suit of clothes ready for him and tip off the boys that I shouldn't be very mad if I heard they had soused him in the pond some night when they were in swimming and scrubbed off a few layers of dirt."

The watchman was duly "soused." I know—because I was there.

Using an Electric Drill as a Lathe

By I. B. Rich

I saw an ironworker the other day who was ingenious, even if his job was simply fitting metal window frames in store windows. He was using an electric drill for making the holes he needed.

In fitting a corner he found that the screw-heads were a bit too large to go in, so be proceeded to use the electric drill as a speed lathe for filing. He put the screw in the drill chuck, laid the drill down on the sidewalk and held it with one knee, while he used the file with both hands to reduce the diameter of the head.

Industrial Cost Accounting for Executives

By PAUL M. ATKINS

The nineteenth article—Expense distribution—Step-ladder and direct distribution methods of allocating expense—Determining and estimating the percentages—The entries in the controlling accounts

THE CLASSIFICATION of expenses for a company, if the cost-accountant has clearly in mind the fundamental principles of expense classification, is not usually a very perplexing task though it requires experience and discretion. The collection of the expenses as they occur offers no theoretical problem where a sound expense classification is at hand. It is true that there are often many practical difficulties encountered in the accumulation of the current expenses, but most of them are common to all cases where it is necessary to handle large masses of details. The distribution of the proper share of the expenses to the various units of product as they are made, however, is one of the most difficult problems in cost-accounting and one which is least frequently solved in a satisfactory manner.

In reality there are two steps in the distribution of expenses to the product and too often the attempt is made to combine them with the result that confusion in both theory and practice is a consequence. The first step—the one to which this chapter is devoted—is the distribution of the expenses of the auxiliary manufacturing departments and a certain part of the expense of the administrative departments to the direct manufacturing departments. The second step is the allocation of the earned burden to the product as it goes through the direct manufacturing departments. The earned burden is a certain part of the departmental burden which is made up of the expenses of the direct manufacturing department plus the share of the expenses of the other departments which have been assigned to it.

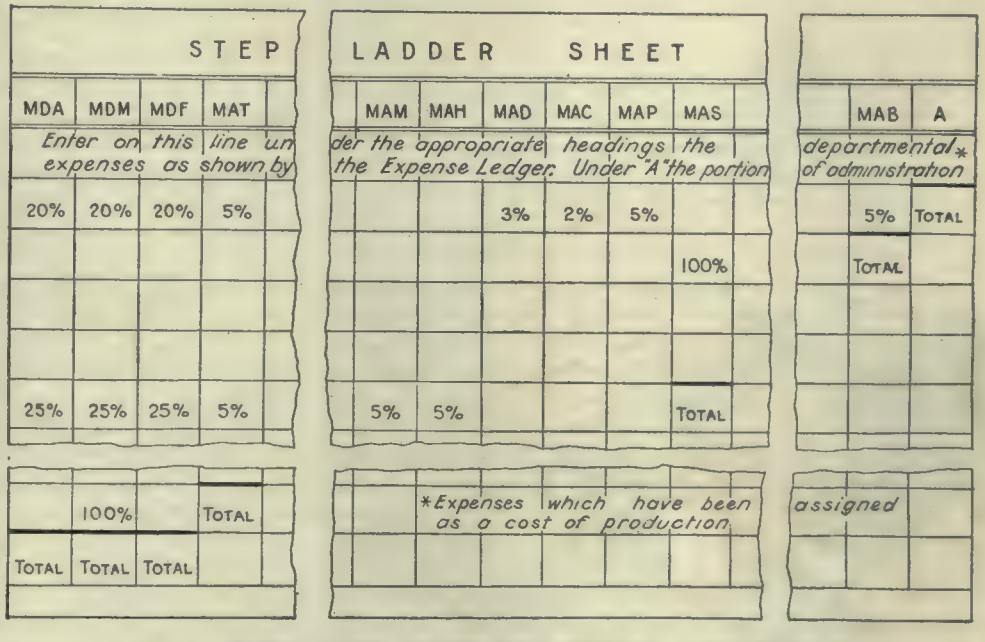


FIG. 48—STEP-LADDER SHEET FOR EXPENSE DISTRIBUTION

The reason for the necessity of two steps is evident if we analyze the problem a little. The only real basis for making a charge to the product is because a service has been rendered to it in some way. It is obviously incorrect to charge to one order material which is used for another, and it is equally clear that it is incorrect to charge against the manufacture of a certain part labor which has been expended in repairing a machine. It is just as unsound, though not quite so easily appreciated, to allocate expenses to an order which do not in some way measure services rendered to it. It is rather difficult, however, to try to decide how much of the expense of the purchasing department or of the power department should be assigned directly to an order going through the assembly department or the machine shop. In fact, it is a practical impossibility. It is possible, on the other hand, though not easy, to measure the services of the power department to the machine shop and to allocate the power department expense in the same ratio as the service. For the purchasing department, it is not quite so easy, but by tracing the service of the purchasing department to the various departments it aids, the expense of operation of the purchasing department can be transferred to the various direct manufacturing departments.

We lay down the general rule, then, that the expenses of the different departments shall be distributed in the same ratio as their services. It is only a general rule and one which it is not practical to follow literally very frequently, but it does serve as a guide and establishes a sound basic principle to follow in the matter whenever it is possible. Few cost-accountants seem to realize the significance of the principle and even when they do, they pass over the difficulties in the way of its practical application by saying that the expenses should be distributed on some appropriate basis, but seldom is any clew given as to what may be considered ap-

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propriate. The entire failure to departmentalize burden which so often goes hand in hand with the omission of any departmentalization of expenses cannot be condemned too severely. There is practically no case where burden applied without regard to the department in which the work is done is correctly allocated. It must be remembered that incorrect costs are worse than no costs for the executive is inclined to rely more or less on them and may be seriously misguided as a result.

The methods which are discussed in the following paragraphs are far from perfect, but they do represent, however, an honest attempt to work practical means for expense distribution and it is hoped that they will serve the reader as a guide in solving his own problems. They have been tested in actual practice and have proved to be satisfactory under a variety of conditions.

The first method is commonly called the step-ladder method because of the resemblance of the form which

	EXPENSE					LEDGER			DEPT MAH		
ACC.	SCHDLE	JAN	FEB	MAR.	APR.	JULY	AUG.	SEPT.	OCT	NOV.	DEC.
MAHF											
MAHJ											
MAHS											
MAHW											
MAHZ											
TOTALS											
MDF	35%										
MDM	65%										

FIG. 49—EXPENSE LEDGER SHEET FOR AN AUXILIARY MANUFACTURING DEPARTMENT

it takes to a step-ladder. It is illustrated in Fig. 48. The arrangement of the departments is in such a way as to place the ones to which the most service is rendered by other departments to the left of the sheet and those to which the least is given to the right. A good knowledge of the functionalization of the business and the interrelationship of the various departments is needed. It is not necessary that a department shall render service to every department to its left, but the total amount of service rendered to it by the departments on its right must not exceed that which it gives to those on its left.

We are at once confronted with a practical problem as soon as we try to establish the arrangement. We find that the services among the various departments have a tendency to circle in such a way that it becomes theoretically impossible to place them in a straight line. A single example may help to make plain the difficulty. The purchasing department's chief service is to the stores department in keeping it supplied with material; part of the work of the stores department often lies in caring for the coal and other supplies used by the heat, light and power department; but the latter department warms and lights the purchasing department.

Let us see how this condition affects the expense distribution if we follow literally the theory outlined. Most of the expense of the purchasing department should be distributed to the stores department. But soon man amount chargeable to the purchasing depart- finish it up; be ascertained and hence it cannot be dis- back to the portion of the cost of operating the heat panse of his "bo. department has been allocated to it

Observing the laws department cannot be ascertained and encouraged others to of the stores department has been distributed to it. The last figure cannot be found till a part of the expense of the purchasing department has been attributed to it. Hence we see a vicious circle is set up which must be broken somewhere.

In the example given it is not difficult to see how the problem may be solved. The part of the cost of the heat, light and power department to be assigned to the purchasing department is obviously very small in amount, so small, in fact, that it can be neglected without giving rise to any appreciable error. Hence these three departments can be arranged from right to left as follows: purchasing department, stores department, heat, light and power department, and the distribution made without any difficulty.

If it proves to be impossible to deal with the question so easily because the services of one department to another are so evenly balanced as not to permit omitting altogether the exchange of costs, another method may be adopted. The departments should be arranged in the most logical order possible as has been described. A certain percentage of the expenses of the department to the right which serves a department on its left should then be transferred back to it, in this way crediting the department on the left and debiting the one on the right. This procedure is not altogether satisfactory but it allows the solution of what might otherwise be a bothersome problem.

Departmental Expense Distribution

When the departments have been arranged in the proper order, the total expenses for the month for each should be entered on the top line of the sheet under the respective departmental headings. The actual distribution then begins by the application of the percentages shown under the several departmental headings on the base sheet to the total expense of the first department at the left, and the allocation of the amounts so determined to the several departments. In this way the amount of the expense of the first department is distributed to the others in the proportion of its service to them as closely as the ratio of that service can be determined.

The expense distribution of the next department to the right is made up of the expense which it incurred in its operation plus the amount apportioned to it from the first department. The sum of these two items is allocated to the remaining departments to the right in the same manner as the expense of the first department. The total charge of the third department is next ascertained as has been described for the second department, and then distributed like the others. The process continues till the entire expense of the several auxiliary manufacturing departments and such portion of the administration expense as is to be allocated to the manufacturing have been transferred to the direct manufacturing departments. Of course, in making the transfers it is not at all necessary that a department shall have some of its expense assignable to every department to its left. If it has rendered no service to one or more of such departments, the departments will receive no expense from it.

The second method, the direct distribution method as it has been called, is illustrated in Figs. 49 and 50. The expense ledger sheets, of which only parts are shown in the illustration, are the same as those illustrated in Fig. 47 of the sixteenth article of the series—The Recording of Expenses. The portion shown in Fig. 49 is for an auxiliary manufacturing department

from which the expenses are to be transferred and in Fig. 50 is shown the expense ledger sheet for a direct manufacturing department to which expenses from the several auxiliary manufacturing departments are to be allocated.

The fundamental principle underlying the method is the same as for the step-ladder method. The attempt has been made to eliminate some of the detail which is involved in the operation of the first method by making transfers from auxiliary manufacturing departments only to direct manufacturing departments, in this way omitting all inter-auxiliary departmental transfers. On the ledger sheets for auxiliary manufacturing, there should be recorded in the schedule column the percentages of the departmental expenses to be allocated to the several direct manufacturing departments indicated in the column at the left. When the percentages are applied to the scheduled expenses of a normal period the resulting sums are the amounts to be used in making up the departmental burden rates in the several manufacturing departments.

Allocation of Expense by Percentages

The percentages should be applied each month to the total expenses of the department for the month and the result will be the amount to debit to the direct manufacturing department indicated. The entry corresponds to the crediting of the expense account in the normal type of ledger account. At the same time the sums should be transferred as debits to the direct manufacturing department expense ledger sheets where they are entered below the totals of the expenses of the department itself. The expense ledger for the latter departments also serves as a departmental burden journal for the sum of the departmental expenses and the amounts transferred from the other departments make up the burden for the department.

The methods as they have been described are not difficult to operate; the perplexing part of the problem comes in determining one element of both methods—the percentages of the auxiliary departments aided. We have already discussed one trouble which is often met—the circling of services—and we have seen how it may be handled. The other phase of the question is to measure the amount of service rendered by one department to another for if that can be done it is easy enough to determine percentages or ratios.

In some cases the measurement does not present any serious difficulty. It is possible to say in many cases that the purchasing department devotes practically all its time and energy to buying materials for the storeroom in order to keep up the latter's supply. The time given to the purchase of other items is so little as not to be forth while considering. Hence, the entire expense of the purchasing department may be transferred to the stores department if the step-ladder method is used, or it should be allocated to the direct manufacturing departments in the same ratio as the expense of the latter department if the direct distribution method is employed.

This fact leads at once to the question of how the expense of the stores department is to be allocated. There are several bases on which a ratio might be established. It would be possible to say that the weight of the materials sent out to the several departments would be a good measure of the service rendered. It would be if the materials are sufficiently homogeneous, but if some of them are castings that can be stored anywhere in a shed or even in the open, and others are materials such as platinum or silver that must be handled very carefully and protected against loss, then it is evident that weight will not furnish a good measure.

Another possibility is to use value and we find that much the same thing can be repeated here that was said in the preceding paragraph. If the material is sufficiently homogeneous in respect to value this method will work out well, but if the situation is like that described above, then the results of using value for a basis are not likely to prove satisfactory. Still another possibility is to use the number of units sent out to the several departments as a means of establishing the desired percentages. The method is subject to the same limitations as the others. It should be said, however, that in a large number of cases the material is sufficiently homogeneous so that one or another of these bases may be successfully employed. To accumulate such data requires additional records to those already made for the control of material, but it must be remembered that it is not necessary to accumulate the information for any great length of time. Test runs or records kept for a day or so each week for a few months or a week each month for half a year will ordinarily give sufficient data for the satisfactory determination of the needed ratios. When they have once been established it is not ordinarily necessary to change them except when some radical alteration is made in the organization of the business.

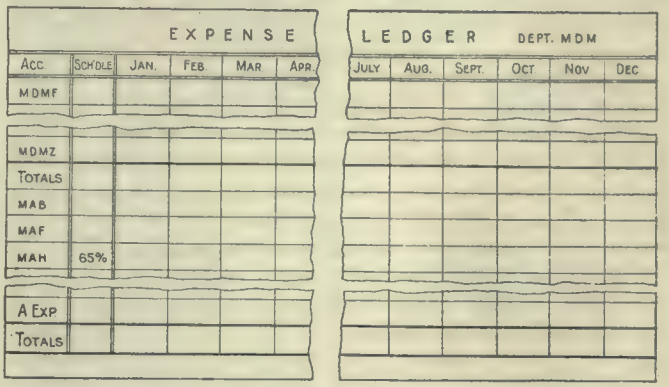


FIG. 50—EXPENSE LEDGER SHEET FOR A DIRECT MANUFACTURING DEPARTMENT

If it is not possible to use any of these bases for determining the proper percentage of expense distribution there is still another method which may be employed, a method which may be utilized whenever no other way of securing the desired results is at hand. Several individuals who are in a position to evaluate the services rendered by the department in question should be called upon to express their opinion in writing, to set down the percentages which they believe should apply. If this work is done by each independently there will be no chance for one to influence the others. The statements should then be combined and the result taken as the percentages to be used for the expense distribution. By combining the opinions of a number of individuals personal biases may be eliminated and the result may be taken as a fair evaluation of the situation.

Only persons who are in a position to form a sound judgment should be asked for opinions in such a case. In the instance discussed above, the storekeeper, chief balance clerk, factory, production and assistant production managers and the cost-accountant himself are the

ones who are likely to be best equipped for the task. If the position of one of the men is such as better to fit him to form a sound opinion, his estimate should receive greater weight than the statement of the others. It often happens that someone relatively low in the organization may be much better equipped than some one higher up to evaluate correctly the distribution of services. The storekeeper, for example, is in much more intimate contact with the details of the stores problem than is the factory manager.

It is also quite essential that all those who are to be called upon to aid in the matter should be provided with all the information which is at hand, or which can be easily collected, to guide them. In other words, the estimates should be real estimates based on such facts as are available and on personal experience with the problem, and not mere guesses. It is important also that only those persons who are properly equipped should be selected for the task. It is not at all necessary that the same men should always be on these committees. Some, like the cost-accountant, are apt to be available in connection with a number of departments and others may be used for only one.

Space will not permit a detailed discussion of the working out of the percentages for all possible departments so only two other illustrations will be very briefly discussed. The expense of the maintenance department deserves consideration because it often happens that it is not thoroughly understood, though it is really one of the easiest of the departments to handle. Most of the sums paid for maintenance material and labor are, of course, charged directly to the maintenance accounts of the departments which are benefited. Hence, they do not form any part of the expense of the maintenance department itself. There is, however, a little expense of the department such as the salary of the foreman, a part of that of the plant engineer, and many others who may supervise the maintenance work. There are also costs for power, fixed charges and maintenance of the part of the building and equipment occupied by the maintenance department exclusively.

The sum of these expenses make up the departmental expense and must be distributed in the same general manner as the other auxiliary departmental expenses. In this case the sum of the charges to the departmental maintenance accounts may well be selected as the basis for the distribution. The figures are easily obtained and serve quite well to measure the cost of the service of supervision of the work which they represent. The method can be used for either the step-ladder or direct distribution methods. If the latter method is to be employed, only the maintenance accounts in the direct manufacturing departments will be used.

Distribution of Administration Expenses

The administration expenses present a somewhat distinct problem. It has already been pointed out in a preceding article that one way of disposing of them is to charge them to the profit and loss account. The method is convenient but it does not show the real cost of production since the cost of the administrative services are not taken into consideration. In general it is better to lump all the administrative expenses before they are distributed and to treat them as the cost of the administration of the business which benefits production and selling. They are divided into departments, it is true, for care of control, but when considered in relation to the two other main divisions of the business it can well be treated as a unit. In some few cases it may be wise to distribute the expenses of certain administration departments separately from the rest of the group, but the statement made above in general holds true.

If the step-ladder method of expense distribution is employed, the percentages must almost certainly be worked out by the estimating method. If direct distribution is employed it is often quite satisfactory to take the value of the direct labor cost or the direct labor hours as the basis since the administration expenses usually represent the cost of supervision.

The Entries in the Controlling Accounts

So far the entire article has been given up to a discussion of details, but before closing it a few words about the general ledger entries are necessary. The controlling accounts for direct and auxiliary manufacturing expenses should be closed by a general journal entry into a manufacturing burden account. The part of the administration expenses distributed to manufacturing departments should also be closed into the account by means of the same kind of entry. The account would then appear much as follows:

Manufacturing Burden Account

General journal (total amount of the auxiliary manufacturing department's expense for the period. Credit therefore to the auxiliary manufacturing expense account.)

General journal (total amount of the direct manufacturing department's expense for the period. Credit therefore to the direct manufacturing expense account.)

General journal (the part of the expense of the administration departments for the period to be charged to cost of production. Credit therefore to the administrative expense account.)

The credit entries to the account will be explained in the following article where the general subject of burden is discussed at some length.

The whole subject of expense distribution is one of the highest importance to the executive who wishes to have a cost system which will give him reliable information. It is a part of cost-accounting which presents many difficulties and is not easy to grasp at once, and hence it deserves fuller consideration from both the cost-accountant and the manager than those sections which can safely be left to subordinates.

American Automobile Prohibited in Germany

The German automobile manufacturers, in order to protect their own interests, especially against foreign competition, have organized themselves into a syndicate called the "Verein Deutscher Motorfahrzeug Industrieller." This syndicate has been powerful enough to induce the Government to prohibit the importation into Germany of automobiles, motor trucks, tractors, and most automotive products, according to *Commerce Reports*, published by the Department of Commerce.

The end of the war in 1918 found the German automobile industry in a completely disorganized condition.

LeBlond Vocational Training Course

By W. H. Myers

IT IS the policy of the R. K. LeBlond Machine Tool Co. to develop apprentice training to as high a standard as is possible in the industry. Our present apprenticeship system, or vocational training course as we prefer to call it, is the outgrowth of the old method of employing boys as apprentices, placing them in some department of the plant and then forgetting their existence until their time was up and they were given the $100 bonus and called journeymen.

This condition existed until the year 1919, when it was discovered that the shortage of skilled mechanics, which then existed, was due almost entirely to the fact that the journeymen who had completed their apprenticeship in the past few years were not up to the proper standard. This, of course, was entirely due to the fact that they had either been neglected entirely during the rush of the world war, or had been allowed to remain in one job or on one machine during the major part of their apprenticeship period.

Beginning of the Training School

It was at this time that this company instituted its vocational training course. A suitable place, apart from the machine shop and located on the fourth floor of the administration building, was fitted up with all the different types of machines used in the plant. An instructor and assistant were placed in charge of the department, which is known as Department 15, Training School.

It is in this school that each apprentice or student, as we call him, begins his course. Here he is taught the use of measuring instruments, and also to operate one, or possibly two, types of machine tools on actual work. It is the aim to handle all repair jobs in this department, on account of the variety of the work required. The student is kept in the training school for a period depending upon his ability to learn. After being graded as proficient by the instructor, he is then sent to the department in the plant which uses the machines he has just learned to operate.

After six months in this department the student is again transferred to the training school where he is taught to operate another type of machine. This systematic training and practice continues throughout the course so that at its completion the student has a fair knowledge of all important departments and operations.

Three Hours per Week in the School Room

In addition to the shop training, the student is required to attend the school, which is conducted by the company in a school-room, properly equipped with all the necessary equipment. The time spent in the school is three hours per week. The school is in session during working hours, and the student is paid at his regular working rate for the time spent there. He attends this school throughout the entire length of the course, and is taught arithmetic, algebra, geometry, trigonometry, mechanical drawing, cost accounting, rate setting, economics and English. The last two subjects, while not absolutely essential, are given to broaden the student's view and make a better man out of him.

In the selection of boys suitable for our vocational training course, we have adopted a method which has proven satisfactory.

In the boy's first application we get all the information possible concerning his past employment. We then investigate his records from the schools he has attended, and also his home conditions. After this we are fairly sure as to whether he will be suitable material for a machinist, draughtsman or patternmaker. His first three months in our employ is a period of probation, and during this time he must be satisfied with his work and must also satisfy us as to his ability. If everything proves satisfactory, he then signs an agreement which is executed in legal form by his parents or guardian and the company. In this agreement the student agrees to work for the company faithfully for the full term of the course, and the company, in turn, agrees to teach him the fundamentals of the machine tool industry.

It goes without saying that a boy with no knowledge of a machine will learn to operate it more correctly and in a much shorter time when guided by a competent instructor, than if shown the machine and told to learn how to run it, as in the old days. It is also much better for the machine itself.

The writer served his time in an old-time shop, which was large enough to employ some twenty "bell hops," as we were familiarly called at that time. I was given no instruction whatsoever, and only told to watch the man next to me.

In great contrast is the well planned course described above in which all students receive the same thorough training. Students who have an aptitude for the work and a seriousness of purpose are selected, and the course is becoming so well known all over the country that at this time there is a large waiting list.

Trade Practices Adopted by the Electric Steel Founders' Research Group

The following standard trade practices were adopted by the five companies forming the Electric Steel Founders' Research Group, at their meeting in Pittsburgh, Pa,, held on June 16, 1923.

1—Suitable pattern equipment for economical molding shall be furnished by customer.

2—The foundry will not be responsible for correctness of pattern equipment to blueprint, except when such equipment is made for the customer under the supervision of the foundry.

3—Repairs on pattern equipment shall be paid for by the customer, except when occasioned by carelessness on the part of the foundry.

4—Patterns must have distinctive colors to identify separately the coreprints, machined surfaces, and rough castings.

5—All patterns, coreboxes, and loose pieces thereof, must be properly numbered for identification.

6—All transportation charges on pattern equipment to and from foundry shall be paid by the customer.

7—The foundry will not carry insurance on customers' pattern equipment.

8—Free replacement will be made of defective castings if reported and returned to foundry within a reasonable time.

9—The foundry will not be responsible for any expense on defective castings incurred by the customer.

10—The customer will be charged with the cost of molds and cores discarded by the foundry, due to change in patterns or coreboxes.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

A Much Widened Planer

By Frank C. Hudson

During the war, Seattle, in common with several other cities, was almost overwhelmed with orders for engines and machinery for vessels for the emergency fleet. One of the concerns which had a lot of this work to handle was the Hendricks Manufacturing Co., who had, among other things, a number of marine

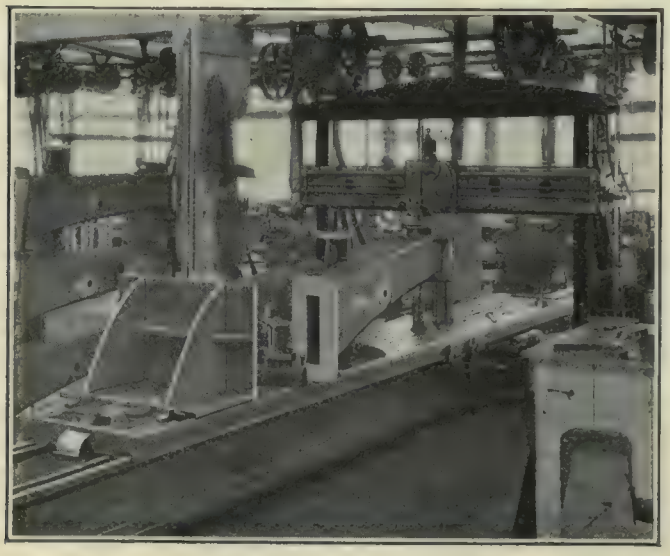


FIG. 1—THE FIRST WIDENING

engines to build for the Shipping Board. The frames of these engines were large castings and the largest planer in the shop would plane only 48 in. wide. Large planers were hard to get, so the housings of the 48-in. planer were spread apart by filling pieces built out from the bed, a new cross-rail and beam were made, and the engine frames handled as shown in Fig. 1.

Then another and bigger job came along and the widening process was repeated as shown in Fig. 2, this time to about 120 in., making almost, if not quite, a record breaker in the widened planer line. Fig. 2 shows the method of driving the planer even better than Fig. 1, both the power for the table and for raising and lowering the cross-rail being taken from the same shaft. The belts for operating the cross-rail can be shifted from the right-hand end of the rail, as we see it, and the motion reversed at will.

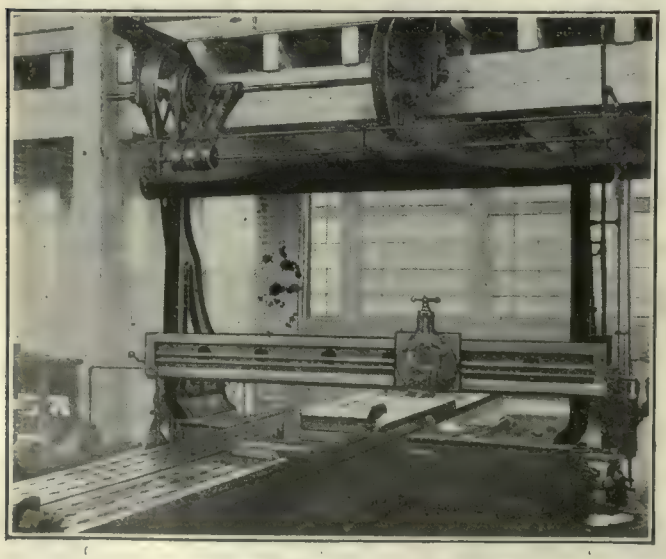
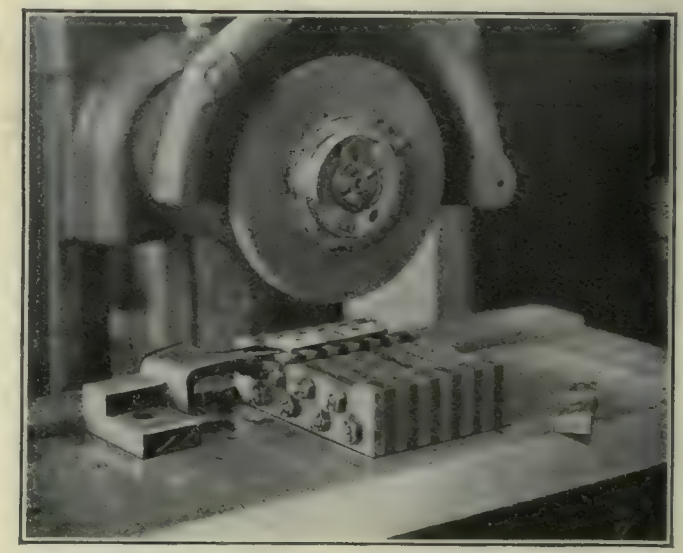


FIG. 2—WIDENED TO 120 INCHES

Auxiliary Magnetic Chuck for Holding Irregular Work

By Tom J. O'Reilly

There are times when work could be expedited by the use of the magnetic chuck, if there were some means of holding irregular work. An auxiliary mag-



AUXILIARY MAGNETIC CHUCK

netic chuck, shaped to accommodate the angle on the piece to be seen lying on the face of the magnetic chuck, is shown in the accompanying photograph. The auxiliary chuck is made of alternate sections of steel and fiber, bolter together. Sections of fiber tubing around the bolts insulate them so the current has to travel through the work. The angle of the slot across the top of the auxiliary chuck corresponds to the angle on the work, so that when the piece is in position, the back of the work is ground square with the sides. A stop block is used, as shown, in order to prevent the work being pushed out of the chuck by the action of the grinding wheel.

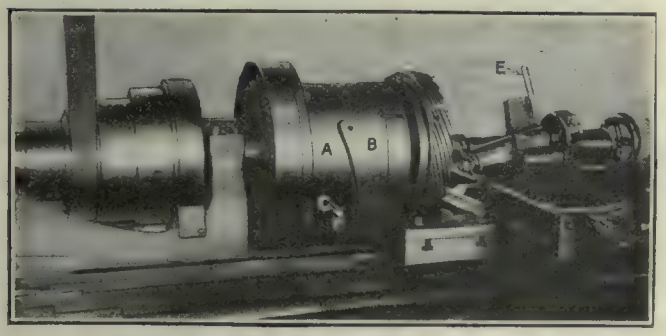
Cutting Helical Gears in a Lathe

By Milton Wright

An ingenious adaptation of an engine lathe to the cutting of helical gears is shown in the accompanying illustration. The gear to be seen in place on the fixture is 21.803 in. in diameter and has 31 teeth of 15-deg. helix angle. The device is in regular service at the plant of the Automatic Machine Co., Bridgeport, Conn., in which shop it was devised for the cutting of gears to be used in connection with steam turbine work.

The part *A* of the indexing fixture is a shell of cast iron, having a flange by which it is bolted to the face-plate of the lathe and bored to take a large-diameter stud, or arbor, upon the outer end of which the gear to be cut is mounted. An index plate having a number of notches in its periphery corresponding to the number of teeth to be cut in the gear, is a part of this stud and it is held in relation to the shell by a lever-operated locking pin, which passes through the wall of the shell and enters the notches of the plate.

A cam plate *B* is screwed and dowelled to the outer circumference of the shell, the inclined face of which



CUTTING HELICAL GEARS IN A LATHE

cam plate bears upon the roll *C*, the latter being carried upon a stud at the center of a bridge casting which passes under the shell and cam and is bolted, front and rear, to the wings of the carriage. A similar cam plate bolted to the remaining circumference of the shell (out of sight in the picture) bears against the opposite side of the roll during approximately one-half of each revolution of the lathe spindle.

In the operation of cutting the gear teeth, the lathe revolves continuously and the carriage is moved forward in harmony with the angular advance of the helix by the cam plate *B*, and then back to its original position by the return cam plate, making one complete cycle for each revolution of the lathe spindle. The lead screw of the lathe has nothing to do with this movement; in fact, as the lathe is kept set up for this work exclusively, the entire apron has been removed from the carriage

The return cam plate is permanent and serves for all gears within the range of the device. The cam plate *B* is easily removable by taking out four fillister-head screws, and other plates of different angular advance may be substituted to cut gears having different helix angles. The index plate on the central stud is also removable and others may be put on to cut different numbers of teeth in the gear.

The cross-slide of the carriage is left in its normal condition and may be fed forward at each cycle by turning the handle of the cross-feed screw, the amount of movement for obtaining the successive increments of cut being governed by a micrometer stop in the manner usual in ordinary thread cutting. The final position of the cross-slide, when the proper tooth-depth has been reached, is determined by a permanent stop.

The cutting tool is a special, formed gear-tooth cutter having but four teeth. But one tooth is used at a time, however, and the reason for having four instead of a single tooth, is that it involves no added expense to make it this way and the life of the tool is thereby multiplied by four. The bore of the cutter has four keyways to correspond to the four possible positions.

How the Cutting Tools Are Held

The tool-holding fixture *D* is a casting securely fastened to the tool-slide. The cutter is held upon the end of a spindle passing through the barrel of the fixture in such position that its axis is parallel in vertical plane with the center line of the lathe but inclined to the horizontal plane by an angle complementary to the helix angle of the gear to be cut.

The spindle upon which the cutter is held, is capable of partial rotation within the barrel, under control of the lever *E*, its forward rotation being limited by a fixed stop. As shown in the illustration the tool is in cutting position. The stud to which the cutter is keyed is eccentric to the axis of rotation of the spindle so that when the operator pulls the lever *E* backward and downward, the cutter is given a partial backward rotation and at the same time is drawn away from the work.

With the gear blank in place, the operator starts the lathe and swings the lever *E* up to the position in which it is shown, where it remains while the carriage is moving toward the headstock under the action of the cam plate. When the cutting movement is completed and before the carriage starts to move back to its original position, the lever is swung downward, turning the cutter back to clear the work on the return movement. After each pass, the cross-slide is fed forward by an amount determined by experience as to what the tool will stand, and regulated by the micrometer stop.

When one tooth of the gear is completed, the lathe is stopped, the cross-slide drawn back and the blank advanced one notch of the index plate in readiness for cutting the next tooth. In practice it is found advisable to go around the gear twice, the first turn corresponding to the roughing cut, and then resetting the cutter to an unused tooth and going over the gear again to remove a small amount of material from each tooth for the finishing cut.

Range of the Device

The device is adapted to the cutting of gears of from 16 to 21 in. approximate diameter and of helix angles varying from 14 to 16 in. linear advance for each complete turn. The cam plate *B* must, of course, correspond to the angular advance of the individual job and the number of notches in the index plate to the number of teeth in the gear.

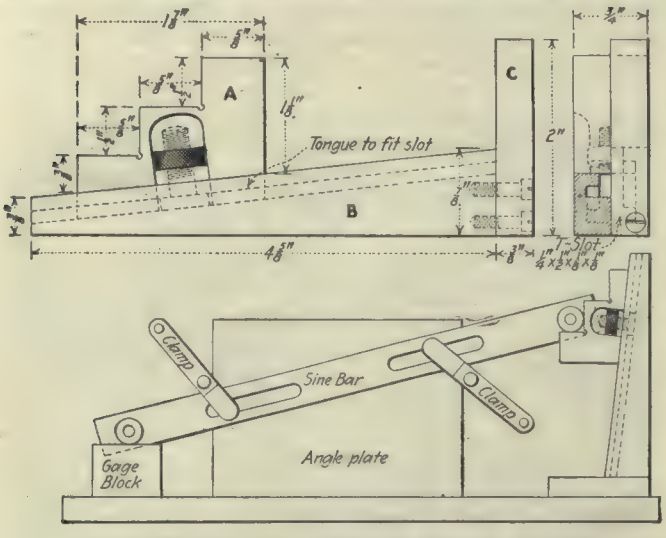
The operation is not different from the cutting of multiple-threaded screws, except that a cam is substituted for the lead screw of the lathe to obtain the necessary traverse of the carriage. The time of cutting varies with the size of gear and number of teeth and to some extent with the nature of the castings; all of which are of bronze. The minimum time is about 35 min. and the maximum has never exceeded 1½ hr. on the largest sizes.

Adjustable Height-Block for Setting Sine Bars

By J. W. Rice

In using sine bars there is often much time lost in making or finding blocks of the right height with which to set them. Here is a useful tool that will be found handy and dependable for this, as well as for many other purposes. The dimensions given in the sketch cover the range of a sine bar with 5 in. centers, which is a common and convenient size.

The adjustable block *A* has a tongue fitted to slide freely but without shake in the groove of part *B*, to which it may be clamped by means of the T-head screw and knurled thumb-nut. A pocket milled in part *A*



CONSTRUCTION AND USE OF HEIGHT BLOCK

allows the nut to be so placed that it is below the surface and does not interfere with laying the tool upon its side.

Part *C* is permanently attached to part *B* and the whole should be ground accurately square in all directions. The faces of the measuring steps should be finally ground after the tool is assembled. Setting for height, either way, is accomplished by measuring over opposite faces with a micrometer.

Turning an Oversize Job

By Clifford H. French

Blocking up the lathe to turn an oversize job has probably been practiced ever since we had lathes in machine shops. In many cases, however, new methods have to be adopted or old ones changed to some extent, on account of condition of the lathe or the work. The case illustrated herewith is from the shop of Hesse & Ersted, of Portland, Ore. The illustrations show a flywheel about 6 ft. in diameter by 15 in. face, held on the faceplate of a lathe which originally swung about 44 in., both the head and tail stocks having been raised by blocks in the usual way.

Fig. 1 shows the second operation, consisting of boring and facing the outer edge. The other edge and the face, as well as the bore of the hub were machined at the first setting.

Four arms *A*, Fig. 2, are bolted to the faceplate, and project over the edge, so that the spacing blocks *B*

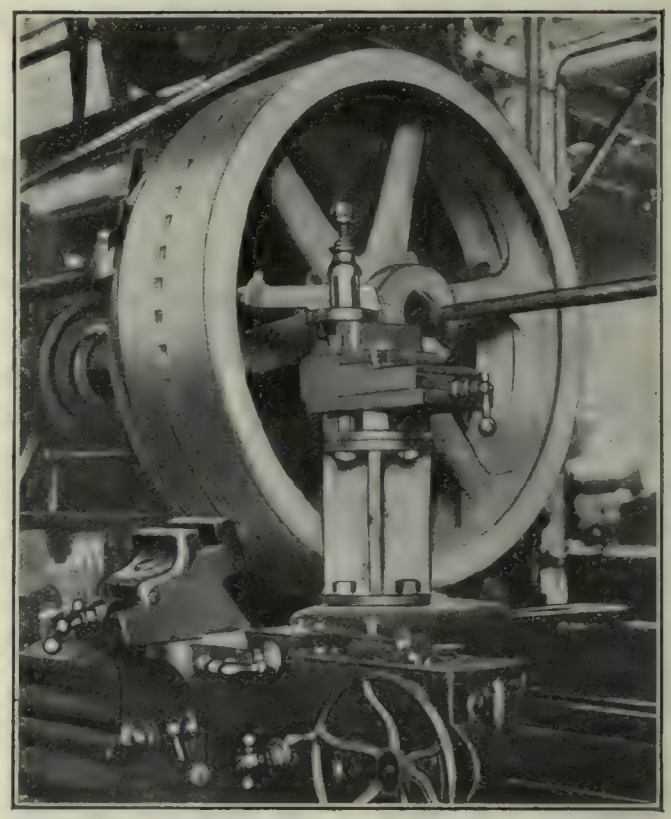


FIG. 1—TURNING A FLYWHEEL LARGER THAN THE LATHE

can be bolted to them. The outer blocks are longer than the rest, and project inwardly, as shown at *C*. These projecting blocks form the support for the inner edge of the flywheel rim, and also a seat for the C-clamp used in holding the flywheel in position for turning. The bar *D* is largely a precautionary measure, as the clamps do most of the holding and all of the

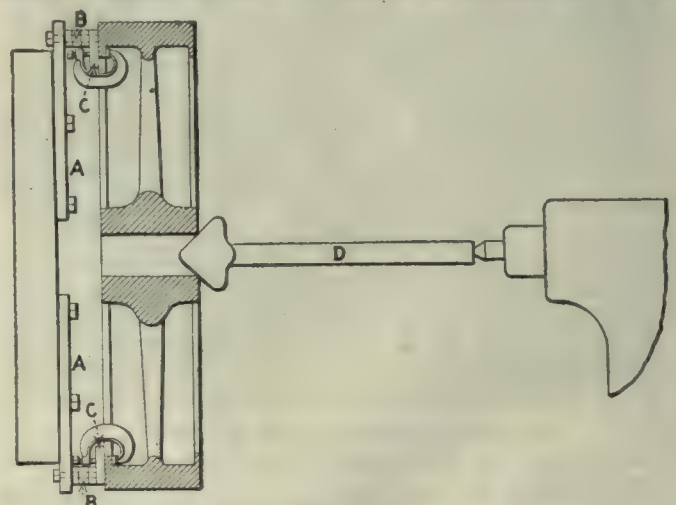


FIG. 2—HOW THE FLYWHEEL WAS CLAMPED TO THE FACEPLATE

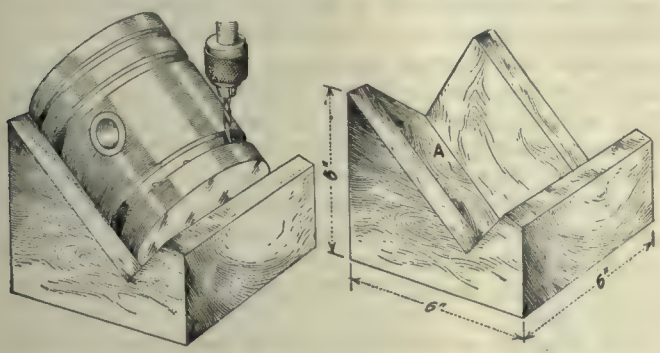
driving of the work. The end of the bar *D* is flattened to about ½ in. in thickness.

With the hub bored, the rim turned, and one side faced at the same setting, the greater part of the work is done, and the true running of the wheel assured. The second chucking is comparatively simple, as after the first side of the rim is faced, it squares itself on the blocks *C*, and it only remains to adjust the wheel until the outer diameter is running true.

A Wooden Fixture for Drilling Pistons

By Geo. A. Luers

The drilling of oil drain-holes through the groove at the bottom ring of a gas engine piston is a job which can easily result in breaking many drills unless the piston is held properly in some fixture. The practice in many cases is to clamp the piston against an angle



SIMPLE FIXTURE FOR DRILLING PISTON OIL-HOLES

plate on the drilling machine table. But if the piston moves under the pressure of the drill, off goes the point.

The simple fixture shown herewith illustrates a method which has proved very useful in drilling the diagonal holes. A 6-in. square block of oak is cut so as to seat the skirt and side of the piston.

The groove at *A* holds the piston from rolling. The fixture can be built up of separate pieces if more convenient.

Boring and Turning Spherical Bearings

By Herbert F. Crawford

Some of the various companies for which the General Iron Works, Denver, Colo., does the machine work, use a number of large sized bearings in which the bearing shell is mounted in a spherical seat. The machining of both the shell and the seat is accomplished by very

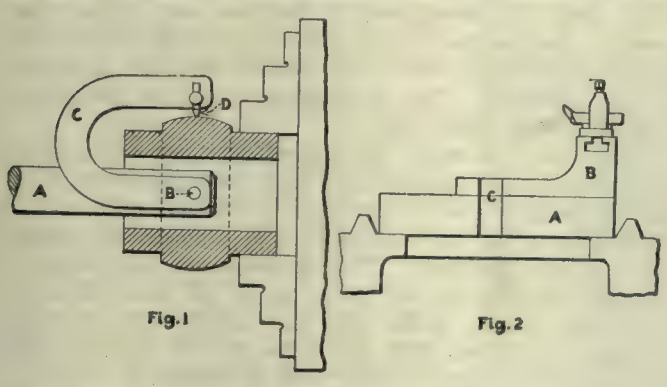


FIG. 1—TURNING A SPHERICAL SHELL. FIG. 2—ANOTHER DEVICE FOR THE SAME PURPOSE

simple fixtures, which are illustrated herewith. Fig. 1 shows one of the bearing shells held in the jaws of a lathe chuck. The bar *A*, of as large a diameter as can be used in the bore, is fastened to the tailstock and run into the shell, so that the pivot pin *B* comes in the center of the desired radius. The bar is flattened on top to accommodate the swinging arm *C*, which is pivoted at *B*. The outer end of the arm *C* is fastened to the toolblock and carries the turning tool *D*. As the tool is moved along by the carriage, it describes an arc around the pivot *B*. The toolpost is so well supported by the toolblock that a fair sized cut can be taken.

An improved method of doing this job is shown in Fig. 2, this device being under way at the time of my visit. It consists of a substantial base block *A*, which fits between the inner ways of the lathe and carries the toolblock *B*, which is pivoted at *C*. The desired diameters are secured by setting the tool forward in the toolpost. The toolblock *B* is to be swung by a connection from the lathe carriage.

The bearing to receive this shell was being bored at

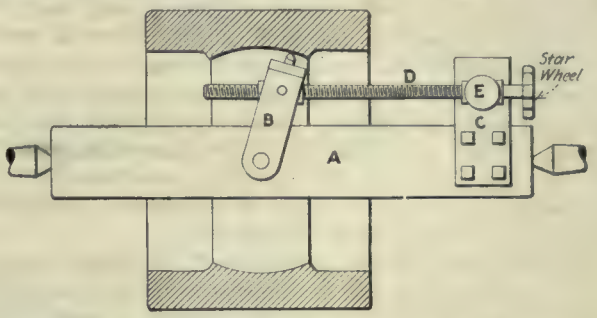


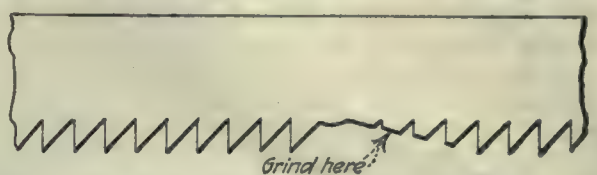
FIG. 3—BORING THE BEARING TO FIT THE SHELL

another plant of the General Iron Works by the device shown in Fig. 3. The operation is self-evident, the apparatus consisting of the bar *A*, the swinging arm *B*, which carries the boring tool, and the stationary arm *C* bolted to the bar for carrying the feed screw *D* in a swiveling bearing at *E*. The feed is obtained by a star-wheel on the end of the screw in the usual way.

Saving Hacksaw Blades

By W. Bradley
Horwich, England

Unless good care is taken when using the hacksaw to cut thin stock, some of the teeth are apt to break off, generally one or two at a time. When this happens, although the saw may have been in excellent condition at the time, it is not long before more and more of the



HOW THE SAW SHOULD BE GROUND

teeth will be knocked off by constant collision with the work, so that before long there are practically no teeth left. This difficulty may very easily be overcome by grinding a few of the teeth taper at the end of the fracture, as shown in the accompanying sketch. This has the effect of causing the saw to rise and slide up from the bottom of the teeth (where it has naturally fallen) to its proper cutting level without any hard jar. It will be found that when a saw is treated in this way there will be no further breakage at this point.

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KENNETH H. CONDIT AND FRED H. COLVIN
Editors
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The Passing of a President

THE NEWS of the untimely death of Warren G. Harding came as a severe blow to citizens of the United States in every walk of life. Every one who had known him or had met him only in the most casual way experienced the feeling of having lost a warm friend and many who had never even seen him had much the same sentiment. In everything that has been written about him since the end came the sense of Mr. Harding's friendliness for every one has been expressed in some way or other. It has been a wonderful tribute to the character of the man.

After the first shock has worn off one finds a somewhat conflicting flood of emotions possessing him. Among them is surprise at the almost complete lack of flurry or excitement incident to the unexpected transfer of the reins of government from the hands of one man to those of another. One reason for this may be the wise policy which provided Mr. Coolidge with a place at all cabinet meetings and thus kept him closely in touch with all that went on. The stock market, usually our most sensitive barometer to such national calamities as the death of a chief executive, has been affected hardly at all.

There is a general feeling of confidence that President Coolidge is eminently fitted to take up the heavy burden of directing the administration through the crucial months ahead. If the farmers had a sincere friend in Mr. Harding they should have an equally sympathetic one in Mr. Coolidge who comes from a long line of Vermont farmers and was actually engaged in helping get in the hay when the call came.

Industry as well may enjoy the assurance that its interests will not suffer at the new President's hands. His words to the Senate of Massachusetts have been widely quoted and show his fearless purpose to act rightly as his conscience dictates. That he cannot be bluffed or coerced by the radical type of labor leader was shown conclusively in the Boston police strike.

Photographs of Mr. Coolidge taken during the past fortnight show his sadness at the loss of his friend and chief. His face also bears a look of realization of the heavy responsibility thrust upon him that is almost grim. And well it may be when he considers what the terrible strain placed upon its chief executive by the United States has done to his predecessors. Harding is dead, Roosevelt is dead, Wilson is an invalid and only Taft, whose four years were relatively uneventful, remains unscathed. Perhaps, after all, we could learn something from our friends in England who have found it wise to separate the social and business functions of the administrative office.

The English Market for Machinery

THE CALAMITY howlers who take delight in comparing the current business situation with that of 1920 and predicting equally dire developments overlook, among other things, conditions in Europe. Three years ago such countries of Europe as were not scraping bottom financially were going downward rapidly. Today some few have turned the corner and are on the way up. How far they will get depends, of course, upon their ability to steer clear of the various imminent political disturbances that are now threatening.

England, in particular, is staging a recovery that is the admiration of American business men who have recently returned from abroad. Even our own London correspondent, whose rose-colored spectacles have been lost for years, begins to see signs of improvement in certain lines.

The English machinery builders have gone hungry for so long that there seems to be little opportunity for American makers of tools that compete on even terms as to quality, capacity and price with the English ones. When it comes to tools of a type somewhat different from anything that can be obtained from English makers the chances are much improved. One American builder reports two recent sales of heavy grinding machines to English customers and a most encouraging increase in inquiries from that quarter after a long and disheartening silence.

One swallow does not make a summer, nor does one machine tool sale indicate a boom market, but in this case the return of interest in a direction where nothing has been happening for months is at least encouraging.

Selling Production Not Machines

ONE OF THE most successful salesmen in the machine-tool line informs us that he has given up arguing over the prices of the machines he sells. His customers are large producers, mostly in the automotive field, and they understand production costs better than many. And he has educated them to think of the "cost per piece" of the work done, rather than the first cost of the machine. They graduated from the "price-per-pound" stage long ago.

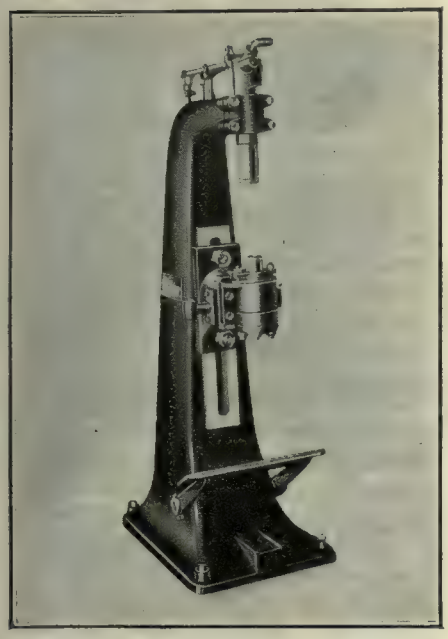
The men who select machines for these big production plants have learned that first costs mean but little. The demand for lower and lower production costs makes it necessary for machine-tool builders to develop newer and better machines. This development work has to be paid for by the customer as in all other lines of business. And, unlike the automobiles which these machines produce, this development cost must be distributed over comparatively few machines.

The sooner machine-tool builders and salesmen get this idea firmly fixed in their own minds, and instill it into the minds of users of their machines, the better for all concerned. For in too many cases, the builders themselves are at fault in not appreciating the fact that it is generally the users of their machines who make the most money.

Shop Equipment News

Findlay Pneumatic Riveting Hammer

A pneumatic riveting hammer has recently been placed on the market by the Findlay Engineering & Manufacturing Co., Findlay, Ohio. The machine is self-contained and operated by air alone without other power. For this reason it can be placed anywhere convenient to the work and simply connected to the air line.



FINDLAY PNEUMATIC RIVETING HAMMER

The frame is a semi-steel casting with a box section and the base has a considerable spread to insure stability. A treadle, pivoted on the frame, starts the hammer and operates the valve of the air cylinder which raises the anvil or dolly-bar. The hammer cylinder is clamped in the projecting arm of the frame and the anvil cylinder is attached to a bracket which is adjustable vertically on guides on the frame.

In operation the anvil moves up under uniform air pressure until the rivet is driven home. The pressure on the anvil is regulated by the amount the treadle is depressed. It is said that the machine not only makes the rivet head but also upsets the body of the rivet and fills the hole. The piston and anvil are made from chrome vanadium steel, heat treated.

The hammer is made in two models. The larger machine will drive 1-in. hot rivets or $\frac{3}{4}$-in. cold rivets at the center of a 20-in. piece. This machine requires a floor space 18x28 in., is 62 in. high and weighs 648 lb. net. The smaller machine is designed to drive $\frac{5}{8}$-in. hot rivets or $\frac{7}{16}$-in. cold rivets at the center of a 16-in. piece. It requires a floor space 15x20 in., the height is 57 in. and the net weight 555 lb. Both machines require air pressure at from 80 to 100 lb. per square inch.

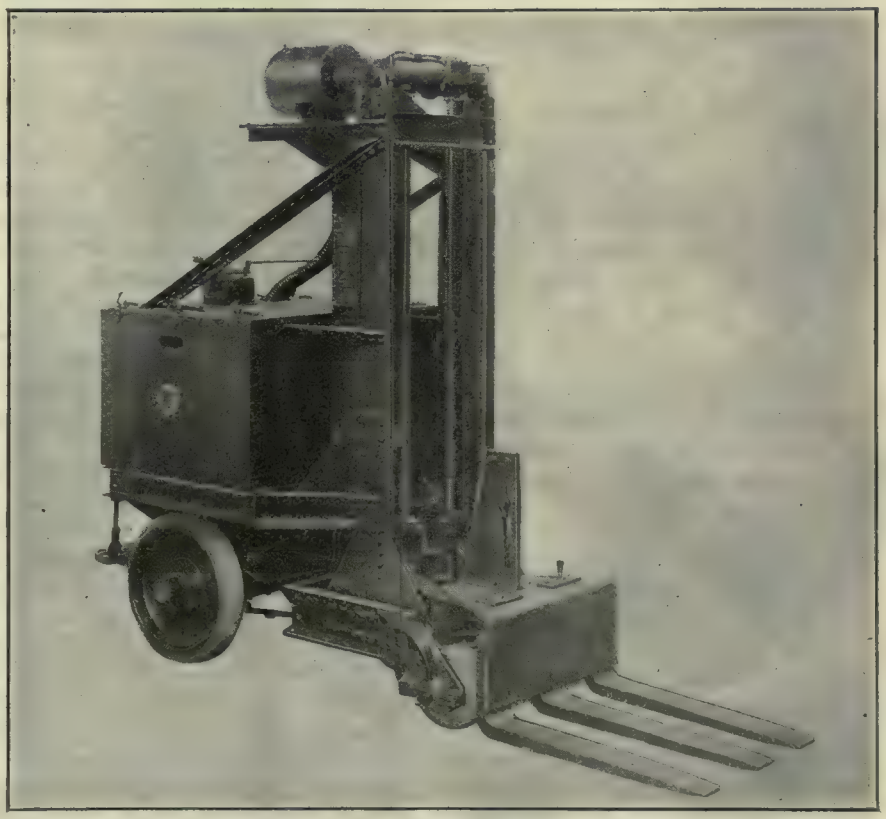
Lakewood Modified "Tier-Lift" Truck

The Lakewood Engineering Co., Cleveland, Ohio, has just placed on the market an elevating truck which is a modification of its orginal "Tier-Lift" truck. One of the leading design features of this machine is its ability to pick up its load without the use of platform skids. This feature makes possible the tiering or stacking of units without the usual waste space which is incident to the tiering of loads on platform skids.

The driving and lifting mechanism of the truck is the same as that on the former machine. The lifting motor is mounted horizontally on the top of the frame and drives the lifting screws through suitable reduction gearing. The frame is constructed of heavy structural steel and the lifting forks are forged steel.

The lifting forks shown on the truck illustrated were designed especially for handling sheet tin which is placed on 2 x 2-in. strips to be picked up by the truck. Other types of forks can be furnished for handling other commodities or packages.

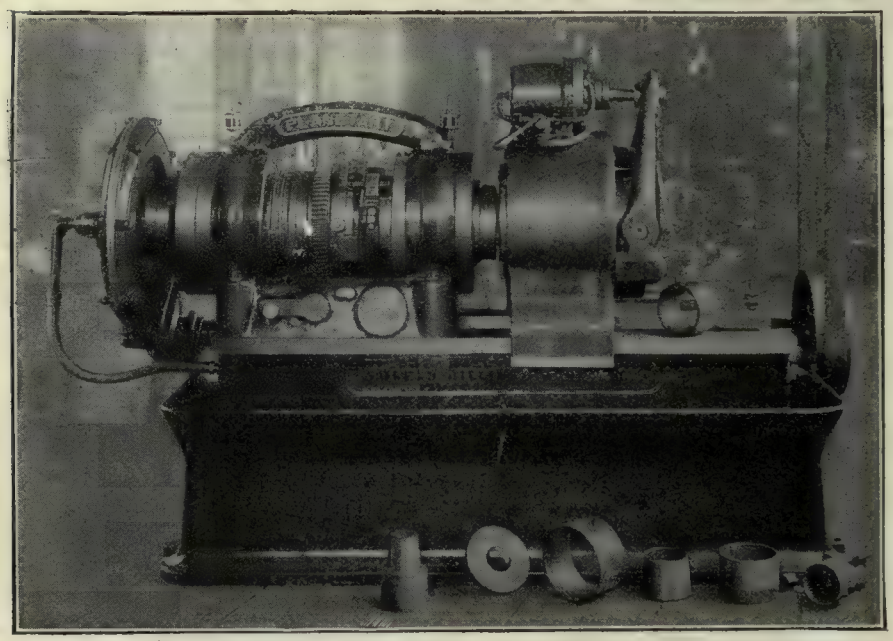
The load capacity of the truck is approximately 2,000 lb. and various maximum lifting heights are available. The wheels are rubber-tired and the driving mechanism and control mechanism are the same as those furnished with the previous design.



LAKEWOOD MODIFIED "TIER-LIFT" TRUCK

Hall Planetary Thread Milling Machine

A series of planetary thread milling machines has recently been brought out by the Hall Planetary Thread Milling Machine Co., Inc., Bridesburg, Philadelphia, Pa. In these machines the piece upon which the thread is being cut remains stationary, the rotating cutter revolving in an orbit about the center of the piece. For milling outside threads, the cutter is annular in shape, has the cutting teeth on its inside surface similar to a die, and completely surrounds the work. The internal thread cutter rotates and revolves inside the hole to be threaded. Cutters with no lead are used, the cutter being given a longitudinal motion as it revolves about the work.



HALL PLANETARY THREAD MILLING MACHINE

The general construction of the machine is shown in the accompanying illustration. The drive shaft is at the rear of the machine and carries a single belt pulley for belt driving. A 5-hp. motor may be mounted on a bracket and belted to this pulley or power may be taken from a countershaft. At the head end of the machine the drive shaft carries a sprocket which drives a large sprocket, keyed to the cutter spindle, through a silent chain. The cutter spindle is hollow and is mounted in bearings inside an eccentric sleeve. This sleeve is, in turn, mounted in another sleeve which rotates in the frame bearings. The amount that the cutter is thrown off center is determined by the angular relation of the two sleeves which is easily adjustable. For planetary revolution of the cutter the outer sleeve is driven by a worm and worm wheel, the worm receiving its motion through reduction gearing from the drive shaft. The worm wheel will be noticed on the sleeve between the two head bearings in the illustration. Motion is transmitted to the sleeves, which rotate together, through a clutch which is thrown in by a handle at the front of the machine. The revolution of the cutter then takes place until the thread is completed, when the clutch is automatically tripped and another clutch engaged which returns the sleeves to their original position automatically. A little more than one revolution of the sleeves is required to complete the threading operation.

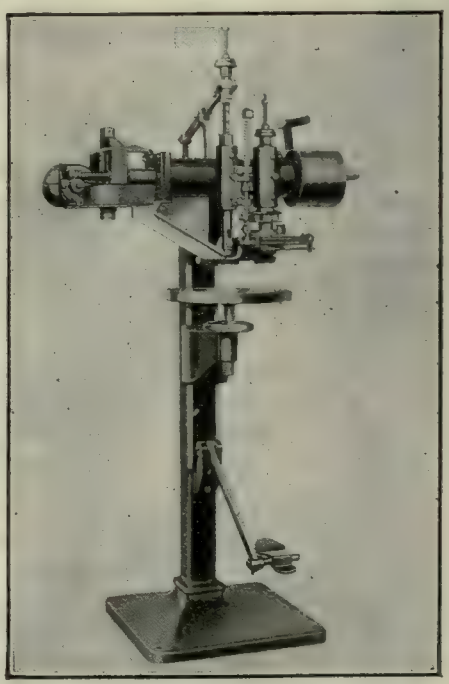
The sleeves and the spindle are fed longitudinally by a large threaded master ring on the outer sleeve which engages a master nut attached to the frame. A device, which feeds the cutter radially as it revolves around the work, makes possible the production of taper threads. The cutter is lubricated through the hollow spindle, the lubricant being pumped from a reservoir in the base through suitable piping to the end of the spindle and to the cutter.

The work is held in an air-operated chuck of the push-in collet type. The chuck is positioned for the work in hand and then bolted to the bed. The planetary action of the cutter gives the cutting edge a long sweep through the work and a good finish, it is stated, is the result of this action. The machine is built for production purposes on automobile parts and similar pieces. The bearings are ring-oiled. The machine shown in the illustration weighs about 13,000 pounds. Other sizes of the machine are also manufactured.

Reynolds Automatic Screw Driving Machine

An addition to the line of screw driving machinery manufactured by the Reynolds Machine Co., Massillon, Ohio, has recently been placed on the market in the form of an automatic hopper-fed screw driving machine. This machine is designated as the "No. 1 Special" and may be fitted to drive electrical binding screws, washer-head screws, switch-box screws and other forms which cannot be handled by the standard equipment.

It is designed for short screws and screws with short bodies and large heads, in sizes from No. 4 to No. 10 and up to ½ in. long. The screws are loaded into the hopper of the machine and no further handling is required. The operation of the machine is simple and adapted for operation by relatively unskilled labor.



REYNOLDS AUTOMATIC SCREW DRIVING MACHINE

A 12-in. round or 14 x 24-in. rectangular table is furnished and the machine will drive screws at the center of a 14-in. circle. Screws may be driven tight or loose as required.

The spindle speed is 800 r.p.m. and the pulley speed 400 r.p.m. The table has a vertical adjustment of 2 in. without moving the bracket on the column. The size of the base is 18 x 20 in. and the height of the machine is 5 ft. 6 inches.

Consolidated No. 26 Hacksaw Frame

A heavy handle-adjustment hacksaw frame has recently been added to the line of such equipment manufactured by the Consolidated Tool Works, Inc., 296 Broadway, New York, N. Y.

The frame is made of $\frac{3}{16}$ x $1\frac{1}{8}$-in. stock to insure strength and rigidity. The depth of the frame is $3\frac{1}{4}$ in.



CONSOLIDATED NO. 26 HACKSAW FRAME

and the length is adjustable for blades from 8 to 12 in. in length. The design is such that all the parts are held together when the blade is not in place. The blade is tightened by turning the handle and may be faced in four directions. The metal parts are nickeled and buffed and the handle black enameled.

Wallace Bench Solder Pot

An electrically heated bench solder pot with automatic heat control has recently been placed on the market by J. D. Wallace & Co., 1401 W. Jackson Blvd., Chicago, Ill. The automatic heat control is the same as that used on the bench glue pot manufactured by this company and described on page 428, Vol. 57, of the *American Machinist*.

In the solder pot shown in the accompanying illustration, the heating element is built below and around the container to insure an even distribution of heat at the side as well as at the bottom, since babbitt, white metal and wax circulate very sluggishly and require uniform heating throughout. The placing of the heating element in this way also decreases the time necessary to heat the metal. It is stated that 15 lb. of babbitt can be raised to a temperature of 600 deg. in 20 min. The



WALLACE BENCH SOLDER POT

material is always kept at the proper working temperature by the automatic heat control without further attention from the workmen, and the danger of overheating, with its attendant difficulties of oxidation and loss of material and tensile strength, is overcome.

The solder capacity of the pot is 15 lb. and the temperature is held at 600 deg. The heating element requires 900 watts, and the standard elements are furnished for voltages of 110 or 220 volts. Elements for other voltages can be supplied if desired. The pots arranged for direct current can be used with alternating current but the reverse is not true. The net weight of the pot is 13 pounds.

First Half of Year in Electrical Exports

Exports of electrical apparatus and supplies from the United States during the first six months of 1923 were valued at $34,514,924, which represents an increase of $2,694,412 over the corresponding period of 1922, according to preliminary figures announced by the electrical division of the Department of Commerce. The increase is attributed mainly to increased business in small plants and supply lines rather than in heavy power equipment. The provision gives the following summary of exports for the semi-annual period:

The total value of generating apparatus exported, including both a. c. and d. c. equipment, was $2,025,171 during the first six months of 1923, a 6.8 per cent increase over the same period of 1922. Shipments of mechanical drive turbines taken alone, however, were less this year than during the half of 1922.

Export shipments of self-contained lighting plants during the first half of 1923 were nearly double in value those of the same period of 1922. Over 1,200 lighting sets were shipped between January and July of this year.

Dry battery exports increased about 36 per cent in number and 15 per cent in value during the period in question in comparison with 1922. Storage battery shipments also showed a heavy increase, $1,224,572 worth being the amount exported during the first half of 1923, while the total was only $653,539 for the same period of 1922.

Shipments of transformers, converters, switchboards, circuit breakers and lightning arresters, aggregated $4,384,619 in value during the first half of 1923. This is somewhat less than the exports during the same period of the previous year, which were swelled by large individual shipments of power plant equipment.

Meter Exports

The total for all kinds of meters shipped abroad between January and July, 1923, amounted in value to $686,109, also a decrease over the previous year.

Fractional horsepower motors gained largely over 1922, a total of 68,332 motors valued at $981,533 having been exported during the first six months of the year. Shipments of other kinds of motors, however, fell off during the first half of 1923. Thirty-four electric railroad locomotives, valued at $1,926,990, were sent to foreign markets. In the same period of 1922 there were only two such locomotives shipped, valued at $22,361.

Electric Fan Sales

The value of electric fans exported during the January-June period in 1923 was $513,867 as against $497,055 during 1922. It is interesting to note that the number of fans shipped was 6,793 less than the total for 1922.

Shipments of metal filament lamps decreased in value, although a larger number were exported during the half of 1923 than during 1922. A total of 118,955 motor driven household devices went abroad during the first half of 1923, these being valued at $453,254. This is an increase of 57 per cent over the same period of 1922. An even larger increase took place in the case of domestic heating and cooking appliances, the total for the first half of this year being valued at $474,546. This is almost 80 per cent above the 1922 period.

Radio apparatus shipments varied widely from month to month during 1922. A much wider distribution is shown this year by the manner in which the quantity of exports maintained a steady high level. During the first six months of 1923 the shipments were valued at $1,209,389.

Fixtures and Wiring

Exports of house wiring supplies and fixtures made a 207 per cent increase during the first half of 1923 over the total for the same period of 1922. This is in line with the same tendency shown in the case of motor driven household devices and domestic heating and cook ing apparatus, indicating the great development which is taking place in our foreign sales of these lines.

The electrical export business of the first half of this year has made a most creditable showing and it is safe to say that a steady if not rapid increase is taking place in the demands of foreign countries for American electrical goods, convenience of design, sturdiness in construction and many other features of American products have aided in building up this business.

News Section

Railroad Report Shows Fine Condition

The Class 1 railroads of the country earned during June a return of 5.47 per cent on their minimum tentative valuation as fixed by the Interstate Commerce Commission. This rate is lower than in May, when the earning return was 6.33 per cent. The falling off was due principally to a decrease in earnings of the Western railroads, the Eastern group having again earned above the 6 per cent figure. The report by groups showed a return of 6.39 per cent for the Eastern roads, against 4.20 per cent for the Western group.

With the June figures in, the Bureau of Railway Economics and the Car Service Division of the American Railway Association were able to report on railroad operation for the first half of this year. These figures show a return for the period at the annual rate of 5.64 per cent, which is only .11 per cent below the return set by the Interstate Commerce Commissioin as "fair."

This is the best half year that the railroads have experienced since before the war, and the showing was regarded by railroad men as particularly impressive in view of troubles growing out of strikes by shopmen and coal miners last year, and the consequent impairment of equipment. In addition, the Western and Eastern roads encountered severe weather conditions during the first three months of this year.

For June the report shows an aggregate of net earnings for 194 roads having a mileage of 235,400 miles, amounting to $87,742,000, against $76,271,000 in June, 1922. Thirty-one Class 1 railroads in June operated at a loss. Nine of these roads were in the East, two in the South and twenty in the West.

For the first six months the net operating income of the Class 1 roads is cited as $443,912,000, against $349,069,000 for the same period a year ago.

From Sept. 1, 1920, when the roads were returned to private operation, the average annual return to and including the June figures of this year has been 3.94 per cent, according to the report. For the Eastern district the return has been 4.02 per cent, the Southern, 4.05 per cent and the Western, 3.82 per cent.

Tornado Wrecks Three New England Plants

A tornado that cut through the industrial district of West Springfield, Mass., on Sunday afternoon, Aug. 5, caused many thousand dollars' damage to several plants. The Gilbert & Barker Mfg. Co. suffered a loss of nearly $10,000, its locomotive shed being virtually ruined, and much damage done in the twisting of window frames and the breaking of glass. Piles of wreckage were deposited on the roofs of the company's buildings, the remnants of nearby properties.

At the plant of the Wico Electric Co. a 100-ft. chimney was demolished, and the wreckage crashed through the roof of the assembly room resulting in much damage to machinery and loss of materials. This company estimates its loss at $25,000 and its production is set back somewhat. The C. H. Smith Corp., makers of fine wire specialties, suffered damage to machinery and part of the roof was torn away, as well as the rear end of the main building. No lives were lost, owing to the storm breaking when the plants were inactive.

Plenty of Employment in St. Louis

Shops in St. Louis with few exceptions continue to run on a full time schedule. There has been a little falling off in the past two weeks in new orders, but the number of inquiries received seems to indicate that Fall business will be good.

The automotive industry has slowed down a little and in one shop that manufactures automobile machinery a cut in the working force has been made.

Construction in the oil fields of the Southwest has been resumed and should in a short time re-act in favor of the machine tool trade.

Railroads are still very conservative in their buying, but some members of the machine tool trade think that it will be only a short time until they are much more active in the market. This conclusion is based on the obvious necessities of the railroads to properly equip their shops and from their purchases of other equipment.

Woodworking machinery is finding a fairly good market. Shops engaged in the manufacture of this product are working full time and are very optimistic as to the outlook.

There has been quite a little labor trouble in this vicinity lately which, while it has not hit the machine tool industry directly, has stopped or slowed up the construction of many jobs and threatens to spread further. The supply of labor for shops is adequate, although—as is always the case—skilled mechanics are needed for some work. No concern, however, is handicapped through its inability to get such men.

The Federal Reserve Bank report for July for the St. Louis District states that "during the month of July there was heavy production and shipments of iron and steel products, but a halting condition of new business. Reductions in prices of certain lines caused uncertainty in the buyers' minds and resulted in the postponement of orders for the purpose of filling future needs."

Collections are backward and money is hard to obtain. Therefore some hesitancy is noticed in credit departments and every effort is being made to keep accounts up to date.

Machine tool builders are confident as to the future and are looking forward to an early Fall return of business this year.

Decrease in U. S. Steel Unfilled Orders

The United States Steel Corp. recently reported a reduction of 475,498 tons in the amount of forward business on its books as of July 31, 1923. This reduction was about as expected in the Wall St. district as estimates recently called for a decrease of from 400,000 to 500,000 tons. The reduction reported yesterday makes a total of 5,910,763 tons carried on the books of the corporation at the close of last month, the smallest total reported in exactly a year. It compares with a total of 6,386,261 tons at the close of June and with 7,403,332 tons at the close of March, the record total for the current year to date.

The reduction had virtually no effect on the market action of the company's shares yesterday. This was due, in part, to recent official statements issued by executives of the company that new orders during the last few weeks were sufficient to cover shipments and that if this continued the plants of the company were assured of near capacity operations "for a long time to come." The company's plants are now operating at slightly better than 90 per cent of capacity. It is calculated that on this basis the company has sufficient orders to keep its plants active until Jan. 1, 1924, even though no new business is taken between now and the close of the year, which is not likely, of course, to be the case.

Youngstown Sheet & Tube Shows Good Profits

The Youngstown Sheet & Tube Co. for the six months ended June 30 reports gross income of $18,888,335. These figures include the operations of the Steel & Tube Co. of America and the Brier Hill Steel Co. which were merged with the Youngstown company some time ago.

After allowing for depreciation and depletion charges, there was reported net income of $14,883,310. Net profits available for the capital stock for the period aggregated $12,912,553, and the surplus after dividends was $9,600,114.

Automotive Industry Has Record July Output

The National Automobile Chamber of Commerce reports 318,000 motor cars and trucks produced in the United States during July. This total represents a drop of 10 per cent from the June total, but is the largest reported for any July in the history of the industry. Compared with July, 1922, a gain of 29 per cent is reported. From Jan. 1, to July 31, 1923, there were produced 2,343,000 cars and trucks in the country, while the total for the twelve months ended July 31, 1923, aggregated 3,525,000 cars and trucks.

Many Inquiries for Tools in Pittsburgh

With all the branches of the iron and steel industry very quiet these days on account of the seasonal letdown and the shortage of labor, the same condition practically is encountered in the field of machinery and machine tools. The equipment market has been quiet for several weeks past, and in the past two or three weeks has just about reached the low ebb, without, however, discouraging the dealers in machine tools or machine equipment in general. Industrial conditions are such that there is sure to be a natural rebound back to activity along all lines, including structural and all building lines, which always means orders and inquiries for tools of every description.

The Pennsylvania R.R. put out large lists for bids some time ago, and many responses have been received for requirements of the railroad shop at Youngwood, Derry, Pitcairn and Sharpsburg. It is said that the needs of the yards at Conway, Pa. and the shops at Columbus, O., which had been expected to give an impetus to the machine tool trade, will not be satisfied at this time, but will have to be attended to later, as machinery and tools are needed badly at these two places, and dealers are looking for some fine orders in the near future.

The Baltimore & Ohio R.R. came out some time ago with requests for bids against a list of nearly two dozen items for the shops at Glenwood, a suburb of Pittsburgh. Inquiries and sales in the past two weeks have been confined to single items with one exception, that of a customer in the northern part of the state who bought four lathes.

Among other sales noted were those of two or three lathes to as many customers, as well as two drilling machines for out of town. A new shop has been started at Neville Island, formerly government property in the Ohio river, by the Dravo Construction Co., and machinery equipment dealers are keeping close tab on its needs, as the company will need structural shapeworking machinery in the near future. There are sales of used machinery every other day or so, but in general they are single installations. It is said that the business in both new and used machinery for the month of July in the Pittsburgh district will measure up very favorably with that of the same month in any previous year.

Buffalo Manufacturers Spend Busy Summer

Although not by any means swamped with business, Buffalo manufacturers of machinery such as punches, shears and bar cutters report that they have had a steady flow of orders during the past couple of months and are quite well satisfied with conditions. Although orders have been coming in steadily they generally run smaller in volume than during the period from January to June of this year and this has made it possible for some of the manufacturers who had been behind for some time to catch up on their work.

Another thing that has enabled manufacturers of this type to catch up has been that there are more men available, both skilled and unskilled labor. Many are coming here from out of town and a few local concerns manufacturing other lines have let out small numbers of men since July 1. The Buffalo Forge Co. reports that for the first time in two years it has been able to get all the men needed. Laborers for foundry work have been especially hard to get in the past, but now the market seems to be well supplied.

Just now, in heavy equipment, the railroads seem to be the largest buyers, several of them coming in the market recently for shears, punches, bar cutters and some other types of smaller machinery. One recent contract to a Western railroad ran to $50,000 and this, while comparatively small, is considered good for this time of the year with general conditions as they are.

Milwaukee Experiences an Improvement

Enough new business has been booked by machinery manufacturers in Milwaukee during the first half of August to confirm expectations that there would be a substantial recovery from the midsummer dullness felt during the latter part of June and throughout July. The course of business remains uneven and has not assumed respectable volume as yet, but a slowly broadening tendency is noticeable as Fall approaches.

Metal trades shops are putting out fair inquiry, the most impressive feature of this being that it embraces no large lots. Inquiry is not general, but more sources are coming forth with requests for quotations and delivery dates. Manufacturers of prime movers, hydroelectric and steam generating machinery, pumps, oil well equipment and railroad materials are the most active at present. Automobile shops are doing a little buying, but their activity is less pronounced than earlier in the year, so far as purchasing is concerned. Inquiry from this source is increasing and the machine tool trade expects fair buying in September and the months following.

Employment in industry in Milwaukee reached its peak during the first week in July and sustained the figure past the first week of August. Fifty typical industries employed 35,776 on July 2, and the same employers reported a total of 35,740 on Aug. 2, a reduction of 36 which is not considered significant.

Excessive turnover of labor, especially in the metal trades shops of Milwaukee, has been reduced slightly but is still uncomfortable. For the first six months turnover was at an annual rate of 200 per cent, which is dangerously close to the figure of 211 per cent reported for 1920. In June it was 17 per cent, but for July a decrease to 15 per cent was reported, and conditions in August, so far as determinable, indicate a slight further decline.

Letdown in building construction, principally housing, has released a large quantity of common labor, but this is not yet felt in relief of industrials, as the men as a rule are content to remain without jobs until financial conditions compel re-entrance upon employment or weather conditions are more suitable for labor.

The call for skilled labor is not as heavy as it was up to a month to six weeks ago, but a shortage still exists because there is no increase in the supply.

Improvement Holds in New York Market

The improvement noted in the report of business in the New York district last week has continued into this week and dealers feel that while there is no apparent cause for this unexpected turn, there is no reason for an abatement. This week's reports were equally as cheerful. As one dealer pointed out, many of the transactions were the culmination of weeks of work by the salesmen, but even considering this, it showed a willingness on the part of the manufacture to conclude the deal and also a confidence in present times.

While the death of President Harding has had its depressing influence on the machine tool trade in the Metropolitan district and the loss is keenly felt, all dealers joined in expressing the opinion that in President Coolidge the country has a sound leader and one who will ably guide the ship of state away from the shoals of business depression in an equally calm and efficient manner as the one that President Harding had pursued.

Dealers in used machinery reported an improvement in business this week and they, like the dealers in new machinery, are at a loss to explain the sudden upward turn of affairs.

Inquiries from railroads are still coming in in good volume and purchasing is going on with about the same amount of activity as during the past two months. Preparations for exceptional Fall buying on the part of the automotive industries are being made by most dealers and it is anticipated that a heavy Fall business will be consummated.

General industrials are buying single machines from time to time and the textile industry is still in the market, though feebly.

Skilled Labor in Demand in Chicago

July machinery sales in the Chicago district were considerably less than any previous month this year. Industrial buying continues to be very slow and the railroad business which kept up the volume of sales during previous months has apparently spent itself.

The automobile industry has not made purchases of machine tools to the extent that the heavy production in that industry would lead one to expect. However, announcement that the General Motors Corp., Oldsmobile Division, will spend several million dollars for new machinery, equipment, and additions to the present plant at Lansing, Mich., brings promise of further activity in that line. Automobile production apparently will not materially slow up in the near future and several large manufacturers report production of automobiles during July in excess of all previous records for July. The automobile industry may do sufficient buying of machinery to compensate the machinery market for the loss of railroad buying.

The Pennsylvania R.R. continues to make small purchases for various shops, the Chicago & North Western R.R. is also buying and the Santa Fe and the Union Pacific placed a few more orders this week. The Illinois Central R.R. issued a list for five tools.

Common labor is plentiful, although specialists and skilled workers are in demand.

Personals

FRANK PURNELL and W. C. REILLY were named vice-presidents of the Youngstown Sheet & Tube Co., Youngstown, Ohio, and WALTER E. WATSON was named general manager of sales at a meeting recently of that company's board of directors.

ELMER T. MCCLEARY was named manager of the new and enlarged Youngstown district of the Youngstown Sheet & Tube Co., C. M. LINGLE, manager of all of the company's properties and F. H. GORDON, general manager of the Zanesville property.

J. ELMER FRANTZ and RAYMOND FRANTZ of the Landis Tool Co., Waynesboro, Pa., sailed Aug. 4 on the S.S. "America" for a trip to Europe. They will land at Bremen and tour the continent and England.

COL. THALES L. AMES, who has been transferred from the post of commandant of the U. S. Armory at Springfield, Mass., to Governor's Island, to have charge of the Ordnance Corps of the Second Corps Area, left Springfield Aug. 8, and is succeeded at Springfield by MAJ. EARL MCFARLAND, who for some time had been in charge of manufacturing at the Armory. Col. Ames was chief ordnance officer at Tours, France, in the World War. He had been stationed at Springfield since April, 1920.

J. W. SPENSLEY, for a number of years Eastern representative of the Champion Crane & Engineering Co., Kent, Ohio, with offices in New York, has resigned to devote more time to the sale of industrial and domestic oil burners for the Brooklyn Oil Burner Co., Brooklyn. He was associated with the crane industry for more than 25 years, being early affiliated with the American Hoist & Derrick Co., St. Paul.

A. E. QUERE has resigned as assistant general manager of sales for the Ashtabula Steel Co., Ashtabula, Ohio, to accept a position with the Cleveland Steel Co., Cleveland. He formerly was connected with the Niles Steel Products Co., Niles, Ohio, and the Brier Hill Steel Co., Youngstown, Ohio.

H. M. BOWMAN, who for several years was advertising manager of the Betts Machine Co., Rochester, N. Y., has been appointed advertising manager of the Consolidated Machine Tool Corp., New York, with headquarters at the Betts plant in Rochester. He will be assisted by F. T. Van Syckel, who has been in the New York office.

W. R. BARNETT, superintendent of the Zanesville, Ohio, branch of the American Rolling Mills Co., has resigned his position. He has been associated with the plant for the past twenty years.

WILLIAM B. MCSKIMMON, vice-president and general manager of the Union Twist Drill Co., Athol, Mass., sailed Aug. 8 on a two months' business trip to Europe.

CHRIST. WALTER has been elected president of the Wisconsin Automotive Corp., of Menasha, Wis., which is the new title of the former U. S. Tractor & Machinery Co. assumed recently following the decision to manufacture passenger automobiles and power farm equipment in addition to tractors and gas engines. Mr. Walter has been vice-president for two years and will now give the enterprise his entire time. G. D. Harris continues as vice-president and general manager. Joseph G. Sailer is secretary, and Dr. A. B. Jensen, treasurer.

WILLIAM J. WOODRIDGE has been appointed manager of the electrical sheet department of the Mansfield Sheet & Tinplate Co., Mansfield, Ohio. Prior to his appointment he was connected in the same capacity with the Whitaker-Glessner Co., Portsmouth, Ohio, resigning there in May. For more than 25 years he was electrical engineer with the General Electric Co., Schenectady, N. Y., during which time he specialized on electrical sheet problems.

CHARLES C. GIBSON, for many years vice-president and secretary of the Mullins Body Corp., Salem, Ohio, has been elected president to succeed W. H. MULLINS, who is resigning as active head of the company. It is also announced that FREDERICK P. MULLINS will succeed the new president as vice-president.

R. J. MCNAMARA of McNamara Brothers Co., Baltimore, Md., and others have formed the Atlas All-Steel Truck Body Co. for the purpose of manufacturing steel bodies for automobile trucks. The company plans to make about a hundred bodies a week.

JULIUS J. GOETZ, 349 Broadway, Milwaukee, has been appointed receiver of the Christensen Engineering Co., 1813 Fond du Lac Ave., Milwaukee, manufacturing pneumatic machinery and automobile devices, by the Circuit Court for Milwaukee County. The action was taken on petition of C. Adelbert Goodrich. The receiver is now receiving sealed bids until Aug. 18 for all machinery, tools, equipment, raw material, etc.

WILLIAM E. DUNN, JR., secretary of the Southern Metal Trades Association, will represent the industries of the South in the European tour of the American Foundrymen's Association and at the International Congress of Foundrymen at Paris. Upon his return to this country Mr. Dunn will visit the industries in the North and East before returning to the South.

P. B. TUSSING, formerly assistant traffic manager of the Weirton Steel Co., Weirton, W. Va., has been appointed traffic manager of the Imperial Coal Corp. at Johnstown, Pa.

C. A. MCCOLLOUGH is now the chief engineer of the Pittsburgh Bridge & Iron Works Co., Pittsburgh, succeeding the late L. F. W. HILDNER.

Obituary

WILLARD PENNOCK, president of the Minerva Steel Foundry Co., Minerva, Ohio, died recently at his home in that city. He was nationally known as an inventor and architect. He drafted the plans for the first steel railroad car in 1892 which was manufactured by the Pittsburg Steel Car Co. of Pittsburg, Pa. He also was interested in several Canton, Ohio, steel industries and formerly was owner of the Minerva Manufacturing Co.

EDWARD M. WOODWARD, president and treasurer of Woodward & Powell Planer Co. and an ex-president of the National Machine Tool Builders' Association, died recently. A complete obituary will appear in next week's issue.

WILLIS F. MCCOOK, president of the Pittsburgh Steel Co., Pittsburgh, Pa., died recently in a hospital in that city.

HARVEY H. BROWN, aged 75 years, died recently at his home in Cleveland following a year's illness. Mr. Brown was a partner in Harvey H. Brown & Co., iron ore dealers, president of the Stewart Furnace Co., Sharon, Pa., and chairman of the board of directors of the Brown Hoisting Machinery Co., Cleveland.

EDWARD T. CADLE, former president and general manager of the Globe Iron Works at Sacramento and Stockton, Calif., died in Sacramento recently.

THOMAS B. CONROY, aged 62 years, died at his home in Chicago recently. He was president of the Conroy Boiler & Tank Co., and was a member of the Illinois Athletic Club, Beverly Hills Country Club and the Elks.

Business Items

The new assembly building of the Dodge Brothers' Motor Car Co., Detroit, is nearing completion. The building is six stories high, 1,000 ft. long and 75 ft. wide. Other units of the 1923 expansion program of the officials is the new cynide building, now under construction. This is a million dollar addition to which will be added an immense power house. The total cost of the additions will be approximately $5,000,000. New equipment for the building of closed bodies, and machinery for the power house will be purchased.

An application for incorporation of the Central Furnace Co. of Massillon, Ohio, which will be organized in connection with plans of the Central Steel Co. to erect a blast furnace and auxiliary plants near its present mills has been filed at Columbus, Ohio, according to announcement by the Central Steel Co. officials. The new company is to be incorporated for 100,000 shares of no-par stock. Incorporators of the new company are R. E. Bebb, F. J. Griffiths, C. E. Stuart, B. F. Fairless, J. M. Schlendorf and C. G. Herbruck.

Extensive alterations are being made to the plant of the Ohio Nut & Bolt Co., Berea, Ohio. The company announces that considerable of its old hand operated machinery is being scrapped and modern automatic equipment installed.

The Machinery Supply & Equipment Co., Milwaukee, has been chartered in Wisconsin to buy, sell, deal in, repair and manufacture saws, knives, bits, cutters, etc. The incorporators are E. V. Mallay, H. E. Vedned and Harold W. Connell, attorney, 68 Wisconsin St.

The Elliott & Stephens Machinery Co., St. Louis, Mo., has been appointed exclusive distributor for the Lodge & Shipley Machine Tool Co. in the Southwest.

The Motor Tool Specialty Co. has opened a salesroom at 613 North Illinois St., Indianapolis.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THE nation was not much concerned with business last week. The passage of the Harding train across the continent and the observance of the funeral services at Washington and Marion had a compelling hold on a sorrowing country's attention, and in mourning for the late President business houses and exchanges closed at suitable times throughout the country. Virtually only half a normal week's business was conducted.

But it was quickly apparent that the change of presidents would have no effect on the markets, particularly as Mr. Coolidge is making it clear that there will be no divergence from the conservative policies that Mr. Harding followed. Stocks have been firm and at times strong. Bonds have held steady and give promise of soon doing better. Grains were higher at the close of the week. In none of the speculative markets has there been any evidence of the kind of selling that would indicate widespread distrust of the future, and leaders among business men everywhere have been quick to express the view that President Coolidge deserves the country's complete confidence and support.

We must therefore look elsewhere for the facts and fancies which are influencing the course of prices and trade. Many of the principal commodity markets continue dull and the prophets of disaster are making the most of it, but there is nothing unusual about dullness in July and August and in all lines from cotton goods to hardware most of the merchants who admit they are doing little at present expect an active Fall trade.

The bases of some of the pessimistic outgivings are really amusing. One of the leading professional forecasters sounds a warning because he thinks "the attitude of the younger generation is distinctly harmful" and because people are spending too much, though the average business man's complaint is that they are spending too little and at present a revival of free buying is more desired than addition through saving to our huge credit reserves.

Then a great many people write me complaining because workingmen have too many automobiles, citing instances of a whole block of cars parked before a factory or something similar. It seems strange that this should be regarded as a sign of danger rather than a symbol of progress and prosperity. An automobile is a manufactured commodity, made up of raw materials in whose fabrication hundreds of thousands of men are employed, and the money paid for automobiles in the last analysis goes principally for the employment of labor in the basic industries of the country, just as it would if it were paid for clothing or some other commodity. Furthermore I was told recently by a prominent furniture manufacturer that he had found his workmen more efficient since they had enjoyed the greater leisure which the automobile provided.

In this and other ways "calamity howling" has created a series of popular misapprehensions which because they undermine confidence are just as unsettling as if they were well founded. Take, for example, the following statement made recently by a business prophet: "Earnest and industrious manual laborers, such as we had twenty-five years ago, are almost an unknown quantity. Everyone wants to ride in the cart and no one wants to pull."

As this gentleman's vantage point is high on the cart seat he perhaps should be able to see what he is talking about, but the fact that our production of goods has attained hitherto unheard of proportions only this year is sufficient refutation of the implication contained in his statement.

The country is "sent to the dogs" periodically, but somehow the wheels of trade keep on turning, and at present, despite some momentarily unfavorable phases of the outlook, American business is on a sound basis. There is no valid reason for pessimism, at least as long as our eyes are kept on this side of the water. The "hand to mouth" buying so frequently reported means simply that merchants are showing commendable caution against over-stocking, which is for the good of trade in the long run. Even so the physical volume of business as measured by car loadings and check transactions is enormous, and in conducting it our credit machinery does not give forth the slightest squeak.

Specifically, the steel industry reports a continuance of recent improvement. Building and automobile manufacturing, on which the Spring activity was largely based, have been surprisingly well maintained, though naturally they have declined considerably from the peak. It is quite possible that the bottom of inactivity in the cotton goods market has already been passed, as the renewed strength of raw cotton and the refusal of the mills to accumulate stocks decreases the expectation of further price cuts.

On the farm the prospect is certainly no worse. The Government Aug. 1 report showed a decrease of half a billion dollars in the potential farm value of the crops, but the total is still half a billion above last year and wheat and cotton were both higher than they were at the first of the month.

The stock market has shown greater powers of resistance and there is little doubt that many far-sighted investors are taking advantage of the buying opportunities afforded by the low levels of security prices.

There are, of course, unfavorable facts to record also. The over-production of petroleum, resulting from the almost criminally wasteful methods of its exploitation, continues and there seems little immediate chance of better times in the oil markets. The industries which are partly dependent on Europe, such as shipping and copper, are also lagging, and more or less dullness is reported in silk goods, leather and tires. And an anthracite strike is still threatened, although Washington dispatches seem confident that President Coolidge will find a way to avert it.

In Europe there have been few further developments and there is little more to report than was said in this article last week. The tension between Great Britain and France has not been lessened, but Belgium, which has hitherto supported France, seems to be shifting to the side of Great Britain because the decline of the Belgian and French francs has engendered profound alarm that unless a settlement is reached they will follow the German mark into oblivion. Because this possibility is daily becoming more probable I am inclined to think that a compromise will eventually be reached.

As to Germany, it is evident that the mark will be buried within a very short time and replaced in part by some new form of paper and in part by American and other foreign currencies. Nor is it probable that the world's business will suffer much more from the shock than it has in anticipation of it.

As one considers that Germany has kept on doing business in the face of what appear from here to be insurmountable difficulties, one wonders how any American can be pessimistic.

Tremendous Gains Shown By Erie Railroad

Traffic on the Erie R.R. from the first of the year to date is heavier than ever before in the history of the railroad, according to T. C. Powell, vice-president. The tremendous gains the road has made over last year are due principally to the increase in the amount of anthracite coal traffic that is being handled over the line, but to make the high freight record for all time it was necessary for the road to show an increase on all commodities for the first seven months of this year.

The continued demand for anthracite coal and the promise of a 22 to 30 per cent increase in the amount of fruit business coming into New York this year, it is pointed out, indicates that the traffic will continue heavy over the Erie for the remainder of the year.

Improvements are being made by the road in order to adequately handle the anticipated business.

News of Washington Activities

By Paul Wooton

THE President cannot die without affecting all industries and most individuals. The lamentable death of Mr. Harding comes at the worst possible time insofar as it affects the coal situation. It is certain to have a very direct bearing on the questions of labor relations which are now in such an acute stage.

While those who are in a position best to appraise the situation are convinced that there will be no strike, they must admit that the situation is one in which a crisis might develop at any time. Government intervention is more likely now than ever before in peace time, due to the fact that the public is not inclined, after the experiences of the last few years, to be kept in suspense as to its fuel supply.

Enough has been learned in the last few years of Government intervention to make it very clear that it is a diplomatic rather than an executive undertaking. To undertake to mediate in such a situation as exists today in the anthracite region means the employment of diplomacy such as is implied by the better sense of the word—the use of sympathy and understanding. Such a task can be undertaken only by a person in whom each side has confidence. Whatever may be said about Mr. Harding's greatness as an executive, no single individual in the land will dispute that he was a man of friendship—a man with an intense desire to do the right thing. He commanded the respect of capital and labor alike because they knew he was big hearted and would do his best to be fair. On the other hand, the public would have been satisfied with his mediation.

People generally do not have an opportunity to go into the details of issues. They would have been willing to abide by his conclusions. The man so amply suited to undertake mediation has been suddenly removed. It is true that the country is to be spared the aimless drifting which marked the administration's policy just before and during the strike of 1919. At that time there was great uncertainty as to the extent of President Wilson's incapacity. No one was sure whether or not the pronouncements coming from the White House were those of the President or of someone else. Later it was established that some of these pronouncements, at least, did not come from the President himself.

What Will the President Do?

In the present situation, the uncertainty is of a different character. There naturally will be delay before the new helmsman will feel confident to take the ship of state into the main channel. The situation is complicated by lack of knowledge as to what the new President may do. The outstanding achievement of his career is his handling of a labor matter. His action at Boston in connection with the strike of policemen brought him into national prominence and secured for him the praise and support of those who believe a firm stand must be made against the exactions of labor unions. That act, however, antagonized labor. It is certain the United Mine Workers would hesitate a long time before they would agree to accept President Coolidge as final arbiter of questions which to them seem vital.

Coolidge and Labor

Unquestionably labor unions are not at all sure, but that one of the principal opponents of their policies has been elevated to the presidency. They must recognize that since Mr. Coolidge first came to national notice because of his stand against unionism, it would be only natural were he to be of the opinion that the public approves of such a policy. His experience in Boston may have convinced him that unionism must be curbed and that nothing can be gained by temporizing with it. In such a case he might conclude that the anthracite situation offers a splendid opportunity to put his views into effect.

On the other hand, many think Mr. Coolidge will take this opportunity to demonstrate that he is not opposed to labor unions when properly conducted. He may admit the right of the United Mine Workers to demand all that they have and to strike if they do not get what they ask. At best, however, it is admitted on all sides that the prospects of agreement is less auspicious today than it was yesterday.

The Real Issue

Many doubt that the check-off is the real objective of the United Mine Workers. The rank and file of that organization is so much more interested in wage than in any of the collateral issues, that it is not probable that the necessary support will be forthcoming to insist upon the check-off. The check-off means a great deal to those who are responsible for the financing of the international union, but it means much less to the member of a local. The heads of labor unions are like political leaders or the heads of European states in that they can go only so far in persuading their people to accept solutions which are distasteful to them.

Signs are multiplying that the anthracite workers are ready to insist on the increase. Apparently the more conservative leaders, like the heads of the international union, will have great difficulty in avoiding a suspension unless they can promise a wage increase.

During the last strike it was claimed at first that the anthracite workers were being held out to win for the bituminous workers, and that if they were left to themselves they would return to work. Exactly the reverse proved to be the case. It was nearly a month after the Cleveland agreement before work was resumed, and even then the terms of settlement were all but rejected when the ratification convention met in Wilkes-Barre. Steam roller tactics had to be employed to get ratification through and even then it carried by a small margin.

New factors have entered since then to bolster up the determination of anthracite workers. They elected Capellini. They not only elected him but they did it by a large majority. For a time after his election, Capellini seemed to have joined hands with the conservative leaders, but now that he has been accepted as a member of the negotiating committee, he has come out with a statement that he will not surrender any demand and that he will press each one of them.

With the death of the President and with unmistakable signs of increased determination on the part of the mine workers, the prevalent opinion in Washington is that the situation has taken on new seriousness. Industrialists are carefully watching Mr. Coolidge's every move.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb....	$0.0337	$0.034	$0.0263
Cold finished shafting.....	per lb....	0.0428	0.042	0.034
Brass rods.....	per lb....	0.1825	0.1825	0.1650
Solder (½ and ½)	per lb....	0.276	0.2862	0.221
Cotton waste...	per lb....	0.1231	0.1231	0.101
Washers, cast iron (½ in.)...	per 100 lb.	4.66	4.66	3.83
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100...	3.08	3.08	3.11
Lard cutting oil	per gal...	0.575	0.575	0.575
Machine oil....	per gal...	0.349	0.349	0.36
Belting, leather, medium.....	off list....	37%	37%	46⅔%
Machine bolts up to 1x30 in.	off list....	44¼%	44¼%	59%

Carnegie Institute Has Metallurgy Course

As a result of the definite and increasing demand of the metallurgical and allied industries for college men, Carnegie Institute of Technology in Pittsburgh has recently established a group of new and special courses in metallurgy and allied subjects says an announcement. The courses, some of which are for one year, have been prepared to appeal both to graduates of liberal arts and technical colleges. They will be given for the first time in the college year of 1923-1924.

This new development at Carnegie Tech is another step in line with its policy to train its students to fit the practical demands of various industries. The iron and steel industry, with a capital investment of probably more than five billions of dollars, and with more than a million and a half workers employed in its various branches, apparently, has long suffered from the dearth of trained college men. It is impossible to compute the actual loss through waste that has been met by the industry in training the raw college men coming to it each year. Carnegie Tech and other institutions located close to the metallurgical centers such as Pittsburgh have been continually pressed for their graduates of metallurgy and allied subjects.

England Still Cautious in Buying

Labor troubles have added to the general unemployment in Great Britain—Good business in motor carfield—Selling for replacing a difficulty job

BY OUR LONDON CORRESPONDENT

INDUSTRY in Great Britain still moves at a moderate rate and the engineering section is no exception. Of overseas trading, the figures for June call for little comment—at least as regards imports—but exports, including re-exports, show a decline of about 9¾ million pounds in the month. On the other hand, as compared with a year ago considerable increases are to be noted, but once again it may be necessary to mention that strict comparisons cannot be made owing to the setting up of the Irish Free State. The decline in exports last month was chiefly in manufactured goods, particularly in cotton materials.

Several reports regarding fiancial results of firms engaged in engineering, and perhaps more in regard to steel production, have of late made unpleasant reading, and while the Ruhr troubles act as a running sore industry is not likely to be healthy. The numbers of people who imagine that a settlement of the Ruhr problem would by itself mean the complete restoration of pre-war activity and prosperity steadily decrease day by day, for it is recognised that larger areas must be brought into the survey and the effect of war and its aftermath elsewhere must be taken into account. Great Britain has her usual share of labor troubles, and strikes are being directed and carried on against the advice of the leaders and officials of the trade unions to which the strikers themselves belong. The idea that wages must be based to some extent on the cost of living as officially estimated may be pleasant enough when the calculation shows an increase and the time lag is not pronounced, but when the figures imply a lowering of wage rates the result is not always accepted with equanamity, and not for the first time the methods employed in estimating the cost are being assailed.

Unemployment in England

The cost of living, by the way, as computed is 69 per cent above pre-war rates; the strikes may cause the next figures to show a slight increase. The number of people on the registers as totally unemployed is still under the 1¼ million mark, with no very material change from week to week, the work people registered as on short time and receiving payment for intervals of unemployment similarly totalling about 63,000, it is reported.

The motor car industry, more particularly the lighter type, has had a better season than was anticipated, and one of the points for discussion among machine tool firms is whether this is likely to mean orders for tools during the coming Winter. Not much is expected, however, as some sections of the industry are water-logged, and, although increases in output have been effected, they have not always led to proportionate increase of profits. Prices have been reduced. One of the firms that during the past season has maintained an output of 500 cars a week and never caught up to its sales possibilities, is increasing its capacity to double that number by the beginning of next year. Further reduction of price is confidently predicted in this case. The commercial vehicle field may be entered, but the chassis will remain standard. The various units are made, some by contact, some in the firm's own factories, some in separate places and are assembled at a centre and it is the works concerned that have to a large extent been encouraging tool makers by asking for quotations, generally, however, for special tools, the designs of which have been drawn up by the manufacturers themselves.

The engine factory, to take an example, is being enlarged by 60 per cent for the increase in production of 100 per cent or more. This firm will be, if not already, the largest producer of the kind in Europe. While it has from year to year steadily increased output it has since the war never been able to meet the demand completely.

The home railways have given out a few more orders but nothing compared with the number hoped for, and India and South America have been mentioned as markets for machine tools in connection with railway development. Few people anticipate a definite improvement in conditions for two or three months. The holiday season is upon us and in normal times this always means that the wheels of industry run slower and, new business is not looked for until the early Autumn.

Increases Not Reductions

Though the idea has been steadily promulgated that price increases rather than reductions are to be expected, it is undoubtedly true that price "considerations" are all important in the acquisition of orders for machine tools. Sometimes it would appear that they can only be sold as "bargains." Some large organizations are now recognized by the industry as following the practice of demanding a discount even where the lowest price quoted indicates a very decided difference as compared with the next competing price. Once seen, the position is easily met. In another large organization, before the officials can obtain sanction for expenditure on new tools they have to demonstrate that compared with the displaced method the estimated yearly usage of a new tool will show a saving in labor cost that includes 5 per cent on the capital cost plus the cost of installing, 5 per cent for depreciation and 5 per cent maintenance, and further, at least another 6 per cent per annum profit on the expended capital. The estimates are made quite fairly, and allowance is made for the scrap value of the machine or machines displaced.

Among minor items we may note that another—the second—of the machine tool firms in Associated British Machine Tool Makers, Ltd., is understood to be withdrawing. To add that in the machine tool world it is the makers of special rather than standard tools who show the most liveliniess is to repeat a many-times-told tale.

Those who are interested may like to know that the Industrial League and Council here, a body which is intended to bring both employer and employed into active co-operation in the consideration of industrial problems, has set up a special committee to consider the problem of efficiency, the co-operation of a number of industrial engineers and cost accountants having been secured. Before long the result of the inquiry will be made public, and it is confidently anticipated that the work of the efficiency engineer will be demonstrated as advantageous.

Will Electrify Henry Ford's Railroad

Contracts aggregating $1,000,000 have been awarded to the Westinghouse Electric & Manufacturing Co., it was announced, for the construction of electrical equipment, including locomotives, for the Detroit, Toledo & Ironton, Henry Ford's railroad. Preparation for the electrification of the first unit of the Detroit, Toledo & Ironton R.R. is under way.

New equipment at the Rouge power house will furnish the motive power for the first electrified unit of the Detroit, Toledo & Ironton. At this power house the original capacity is being doubled. The present generating system, consisting of two 12,500 kw. turbine generators, is being replaced by eight turbine generators each rated at 30,000 kilo volt amperes. The steel work on three of the giant stacks is already completed, and one of the turbines, among the largest in the world, is near completion.

Besides this addition at the Rouge plant, the new plan calls for the building of locomotives, the construction of thirteen and a quarter miles of double track between River Rouge plant and the Flat Rock yards, and many minor changes.

The new electric locomotives for the Detroit, Toledo & Ironton R.R. for freight service will weigh 360 tons. They will have a normal capacity of 4,000 hp. and will be capable of producing 5,000 hp. for an hour. They will have sixteen driving axles and will develop 108,000 pounds drawbar pull at twenty-five miles an hour. Their maximum speed will be forty-five miles an hour.

Iron and Steel Exports Show Decline

Exports of iron and steel from the United States during the first six months of 1923 amounted to 982,144 long tons, as compared with 1,160,177 tons for the corresponding period of 1922. The quantity of iron and steel that left United States ports for foreign lands in June, 1923, however, was higher than the monthly average for last year.

Steel Mills Face Hard Task, Says Bank

"The American Iron and Steel Institute has set about the task, which is no easy one, of completely abolishing the twelve-hour day in that industry," says the official publication of the National City Bank, New York. "The twelve-hour turn was the result of the continuous operation of furnaces, and, although it has been done away with in many departments, has persisted in some because of the difficulty presented by the problem of wage-adjustments to an eight-hour turn. The change might have been made long ago if the workmen had been willing to take the same hourly pay for eight hours that they were receiving for ten hours or if the employers had been willing to give the same pay for eight hours as they were giving for twelve. Changes from ten hours to nine or nine to eight, or even from ten to eight have been comparatively easy to make. Besides the difficulty in reaching a satisfactory adjustment with the workmen now on the twelve-hour turn, the relations between the pay of these men and the pay of men heretofore working eight or ten hours must have attention. The twelve-hour men have been getting more pay than the men on shorter turns, and if they are reduced to eight hours with more pay than other men working eight hours there will be dissatisfaction. Readjustments can be readily accomplished in only one way, and that is by wage-increases and these involve higher costs for iron and steel in farm implements, fence wire, railroad equipment, tools and machinery of all kinds.

"It is conceded that the twelve-hour day should be abolished, on the ground that it keeps men on duty and away from their homes too long at a stretch, but it is not true that the work is exceptionally exhausting, as the actual labor is intermittent and does not aggregate eight hours per day. That the men on the twelve-hour jobs are not eager for other work is evident from the fact that in times of labor shortage, as in 1920 and last Spring when plenty of other work has been available they have not sought it. The same question has come up in the coal industry and the anthracite operators have agreed to do away with the twelve-hour day for men tending pumps .

"An Iowa newspaper, the *Elkader Register*, referring to the announcement for the iron and steel industry drily remarks that 'this will about finish the twelve-hour day except on farms and for housewives and employers."

Penn States Prepares for Summer Courses

The Pennsylvania State College's Summer course in Industrial Engineering will open at State College, Pa., on Aug. 27 and continue to Sept. 8. This course offers an opportunity for representatives of industrial concerns to study co-ordination methods between departments and individuals in industrial establishments.

The college has been studying the problem for several years. The purpose is to provide necessary leadership in co-ordination plans.

For seven years an average of twenty-five plants have sent men to the college's group meetings. The list includes the Westinghouse Electric & Manufacturing Co., the Bethlehem Steel Co., the White Motor Co., and other nationally known concerns. Superintendents, employment managers, store keepers, foremen, cost accountants, foremen and production men have attended.

J. O. Keller, head of the engineering department, has completed arrangements for the sessions.

The course consists of an intensive study of costs, rate setting, personnel, planning and production, with particular reference to their relation to each other. These subjects are gone into through laboratory study and lectures.

In the seven years the college has had this work under way, a co-ordination leadership group has been invited to meet with the college experts for a study of the problems. One of the leaders of industrialists at this year's conference will be Hugo Diemer, widely known industrial engineer.

Plans for Convention of Steel Treaters

The fifth annual convention of the American Society for Steel Treating and the International Steel Exposition will be held in Motor Square Garden, Pittsburgh, Pa., during the week of Oct. 8. Last year there was an attendance estimated at 20,000 when the Exposition was held in Detroit and it is expected that this year an even larger attendance will be recorded.

As an inducement, the railroads are offering a round trip for a fare and a half, but to obtain this reduction it is necessary to write to the headquarters of the society in Cleveland for a certificate that is needed when applying to the railroad for transportation.

Exceptionally able papers have been secured and technical subjects will be thoroughly discussed and reviewed at this convention. Not only papers by the foremost metallurgical engineers of this country, but also papers from Japan, England, France and Germany will be presented.

Missouri Pacific R.R. Has Record Month

July was a record month for the Missouri Pacific R.R. according to reports from L. W. Baldwin, the president, surpassing in traffic any month since October, 1921. During July 82,682 cars of revenue freight were loaded on the system and 30,094 cars were received from connections, a total of 112,776 cars. This exceeds the same month last year by 12,823 cars, a gain of 12.8 per cent.

Trade Catalogs

Belting. The Chas. A. Shieren Co., 37 Ferry St., New York City. A folder of four pages showing belting in its various uses and descriptive matter relative to belting. The folder is perforated for filing.

Lathes, Planers, Shapers and Radials. The American Tool Works Co., Cincinnati, Ohio. A series of circulars showing the many products of the company. The booklet is fastened together in such a manner that it is an easy matter to detach such circulars as may have a special appeal. The booklet is well illustrated with halftones, and cross-section drawings of various machines.

Electric Furnaces for the Laboratory. The Norton Co., Worcester, Mass. The construction of electric furnaces is described by text and illustrations.

Gages. The Waltham Dial Gage Co., 85 Myrtle St., Waltham, Mass. The Waltham 4-in. dial Universal gage is described in a four-page folder.

Electric Hoists. The Shepard Electric Crane & Hoist Co., Montour Falls, N. Y. A booklet of sixty-eight pages, well illustrated showing the various uses of hoists in many different types of factories.

Grate Stokers. Combustion Engineering Corp., Combustion Engineering Building, Broad St., New York. The Coxe traveling grate stoker is described and illustrated in an eight page folder.

Automatic Die Heads. Rickert-Shafer Co., Erie, Pa. Models of die heads are described and illustrated in a twelve-page folder.

Battery Charging Outfit. Hobart Brothers Co., Box 206, Troy, Ohio. Eight-hour battery charging is related in this four-page folder.

Thread Generators. The Fellows Gear Shaper Co., Springfield, Vt. Drawings and halftone illustrations and descriptive text tell of thread generation in this twenty-four page booklet.

Key-Seating and Broaching Machine. The Pawtucket Manufacturing Co., Pawtucket, R. I. The Knowles key-seating and broaching machine with dimensions and descriptions is the subject of this booklet. It is perforated on the side for filing.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Automobile accessories. Calcutta, India. Purchase. Reference No. 7353.

Automobile parts and accessories. Warsaw, Poland. Purchase and agency. Reference No. 7355.

Bendix drive for electric starters on automobiles. Turin, Italy. Agency. Reference No. 7354.

Five to fifty hp. motors, generators and fans. Hongkong, China. Purchase. Reference No. 7368.

Machinery for manufacturing butts and bolts. Monterey, Mexico. Purchase. Reference No. 7388.

Hand and twist drills. Tokyo, Japan. Purchase. Reference No. 7372.

Ball bearings, steel bearings and roller bearings. Warsaw, Poland. Purchase and agency. Reference No. 7371.

Forthcoming Meetings

The Supply Association of the American Railway Tool Foreman's Association. Hotel Sherman, Chicago, Ill., Aug. 29, 30 and 31. Eleventh annual convention. Herbert S. White, Cleveland Twist Drill Co., 9 North Jefferson St., Chicago, Ill., secretary and treasurer.

New Haven Branch of the American Society of Mechanical Engineers. Third annual machine tool exhibit Sept. 18, 19, 20 and 21. Mason Laboratory, New Haven, Conn. A. C. Jewett, chairman.

Association of Iron and Steel Electrical Engineers. Iron and steel exposition, Buffalo, Sept. 24 to 28. John F. Kelly, secretary. Association of Iron & Steel Electrical Engineers, 708 Empire Building, Pittsburgh, Pa.

American Society for Steel Treating. Annual convention at Pittsburgh in connection with the International Steel Exposition, Oct. 8, 9, 10, 11 and 12. W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio, national secretary.

Society of Automotive Engineers. Production meeting at Cleveland, Ohio, Oct. 25 and 26. Headquarters, 29 West 39th St., New York City.

American Management Association. October 29, 30, and 31, Hotel Astor, New York City.

New and Enlarged Shops

Machine Tools Wanted

Conn., New Haven—Connecticut Co., 22 Church St.—complete garage and small machine shop equipment.

Ill., Chicago—J. J. Benas, 144 West Kinzie St. (machinist)—power punch press.

Ill., Chicago—Illinois Central R.R., 135 East 11th Pl., J. J. Bennett, Purch. Agt.—one 500 lb. power hammer.

Kan., Dodge City — Allen-Combs Motor Co.—power drill press for garage.

Kan., Dodge City—Davis Electric Co., 201 2nd Ave.—power metal lathe.

Kan., Dodge City—Gingrich Garage, 407 W. Chestnut St., F. Gingrich, Purch. Agt.—Babbitting machine and cylinder grinder.

Kan., Dodge City—D. C. Godfrey, 203 2nd Ave.—automobile cylinder grinder for machine shop.

Kan., Dodge City—E. C. Haynes (machine shop)—power lathe, drill press, emery stand, belting, hangers, bearings, shafting, pulleys and cutting off machine.

Kan., Dodge City—Jenkins Bros., 101 2nd St., D. J. Jenkins, Purch. Agt.—cylinder grinder for garage (used).

Kan., Dodge City—Kennedy Bros. (garage and machine shop)—power drill press.

Ky., Louisville—Hilton Collins Co., 1300 12th St. (boiler and plate shop)—100 lb. helve hammer, bull dozers and metal punch.

Md., Baltimore—Beckerley & Trusler, 614 East Lombard St. (marine supplies, machinery, etc.) C. Trusler, Purch. Agt.—Landis bolt cutting and threading machine, largest capacity.

Mass., Boston—H. Swanson, c/o J. H. MacNaughton, Archt., 177 State St.—machinery for new machine shop.

Mass., East Cambridge (Boston P. O.)—Viscol Co., 200 1st St. (manufacturer of oil and grease)—lathe with 2 in. hollow spindle, 8 ft. bed, 18 in. swing; medium size milling machine (used).

Mass., Pittsfield—Smith & McCarthy—machine tools for new automobile repair shop.

Mass., Quincy—Colburn Gear & Mfg. Co., 98 Holmes St.—machinery for proposed 1 story machine shop.

Mass., Taunton—Magee Furnace Co. (manufacturer of stoves, ranges and furnaces)—1 ton deep throat press for sheet metal work (used).

Mich., Ramsay—Castile Mining Co., E. W. Hopkins, Purch. Agt.—hoisting machinery, iron planer, drill press and lathe, all for heavy duty repair work.

Mo., Kansas City—P. A. Stutermeister Supply Co., 1909 McGee St. (machine shop)—½ in. electric drill (used).

N. J., Jersey City — Bertolette Machine Tool Co., 357 West Side Ave.—16 ft. plate bending rolls, punches and shear.

O., Columbus—Higgy-Avery Co., 1199 Franklin Ave. (manufacturer of radio and electrical equipment), R. C. Higgy, Mgr.—small drill press and boring machine.

O., Columbus—Jaeger Machine Co., 502 Dublin Ave., G. Jaeger, Mgr.—one 24 in. lathe, drill press and other equipment for general machine shop.

O., East Palestine—Wayman Electric & Mfg. Co.—punch presses, sensitive drills and tapping machines.

Pa., Phila.—Budd Mfg. Co., 25th St. and Hunting Park (manufacturer of automobile bodies)—cranes, steel presses, etc., for proposed $350,000 factory.

Pa., Phila.—Koelle-Greenwood Motor Co., 6025 Germantown Ave.—lathes, vulcanizers and tools for proposed $100,000 automobile sales and service station.

Wis., Baraboo—Baraboo Auto Wrecking Co., L. Leno, Purch. Agt. — 22 in. drill press, 6 to 8 ft. lathe, air compressor, grinder and chain hoist.

Wis., Kenosha—Mantkus Motor Sales Co., Elizabeth St. and Howland Ave.—gasoline tanks, pumps, chain hoist, drill press, small lathe and small tools.

Wis., Madison — University Motor Co., 2201 University Ave., J. Fishnick, Mgr.—automobile repair machinery and small tools for proposed garage and repair shop.

Wis., Merrill—E. Trantow, South Foster St.—automobile repair machinery, drill press, chain hoist and small tools for proposed garage and repair shop.

Wis., Milwaukee — Universal Clothes Presser Mfg. Co., 1356 Forest Home Ave. (manufacturer of patent clothes presser), W. H. Dick, Purch. Agt.—drilling machine, 6 ft. lathe, emery wheels, etc.

Wis., New London—New London Motor Co.—garage equipment, air compressor, gasoline storage tanks and pumps.

Ont., Toronto—International Petroleum Co., 56 Church St.—one 30 in. squaring shears.

Ont., Toronto—J. G. Pendrith, 970 Queen St. W.,—Lathe, drills, etc. for proposed $50,000 machine shop.

Que., Acton Vale—R. Boisvert, Railway St.—garage equipment.

Que., Amos—Garage Bacon, J. Bacon, Purch. Agt.—additional equipment for garage and automobile repairs.

Que., Cap de Madeleine (Three Rivers, P. O.)—Garage Montplaisir, Notre Dame St.—garage equipment.

Que., Cap de Madeleine (Three Rivers, P. O.)—Rocheleau & Frere, A. Rocheleau, Purch. Agt.—automobile repair shop and garage equipment.

Que., Montreal—G. Daigneault, 1301 Cartier St.—complete equipment for automobile repair shop.

Que., Montreal—Montreal Wire Wks., Ltd., 50 Craig St. W., E. Doral, Purch. Agt.—one buffer and one set punching shears.

Que., St. Valerien—O. Laframbois—garage, automobile repair and blacksmith shop equipment.

Que., Three Rivers—Garage National, 313 St. Maurice St., E. Marchand, proprietor—automobile repair equipment.

Que., Three Rivers—I. H. Guillemette, 46 Badeaux St.—garage and repair equipment.

Que., Three Rivers—Lymburner Garage, 99 St. Antoine St.—garage and automobile repair shop equipment.

Que., Three Rivers—F. A. Papin, 380 Notre Dame St.—garage and automobile repair equipment.

Que., Three Rivers—Reid Motor, Ltd., 432 St. Maurice St., A. Reid, Purch. Agt.—garage and automobile repair equipment.

Machinery Wanted

Calif., Oakland—Kaiser Paving Co., 1st Natl. Bank Bldg.—equipment for gravel pit at Livermore.

Conn., New Britain—The city, Bd. of Health—complete refrigerating machinery for slaughter house.

Fla., Jacksonville—Florida Steel & Wire Co., Professional Bldg.—machinery for the manufacture of nails.

Ga., Athens—Athens Hosiery Mills—Scott & Williams model B-5 half-hose machines, 3½ in. diameter, 200 needles, 48 gauge, high spliced heel and double toe.

Ga., Athens—C. L. Upchurch & Sons, Box 801 (hosiery)—ten No. 30 Foster cone winders with 100 spindles each (used).

Ga., Barnesville — Collier Mills (underwear)—Scott & Williams or Wildman body machines, 10 or 12 cut, sizes 16 to 24 in. inclusive.

Ia., Dubuque—The city, O. E. Carr, Mgr.—15 ton electric traveling crane.

Kan., Dodge City — Anawalt Campbell Mercantile Co., 3rd and Chestnut Sts. (lumber and planing mill)—cutting off machine.

Kan., Dodge City—Barker Bros., 619 3rd Ave. (cabinet maker)—wood lathe and belt sander.

Kan., Dodge City—Brown & Castanien—wood lathe.

Kan., Dodge City—Dodge City Journal, F. Sailors, Purch. Agt.—power job press and Miller feeder.

Kan., Dodge City—Dodge City Printing Co., 310 Chestnut St.—power saw and trimmer.

Kan., Dodge City—Etrick Printing Co., 314 Chestnut St.—power paper cutter and saw trimmer.

Ky., Louisville—Pendennis Club, 324 W. Walnut St., B. B. Davis, Norton Bldg., Purch. Agt.—complete laundry equipment for 2 story, $25,000 addition to club building.

Mass., Boston—Jealous & Fitch Co., 10 High St.—additional machinery for yarn mill for the Virginia Worsted Co., Norfolk, Va.

Mass., Brookline (Boston P. O.)—Brannen's Wet Wash Laundry, 74 Kent St.—pulleys, shafting and belting to operate washing and drying machines.

Mass., Dorchester (Boston P. O.)—G. N. Lawson, 242 Freeport St. (boat builder)—18 or 20 in. surface planer (used).

Mass., Dorchester (Boston P. O.)—H. D. Malone, 324 Ashmart St.—machinery and equipment for laundry at 15 Barnes St.

Mass., Gardner—Bd. Educ.—woodworking machinery, including lathe, planer, matcher, saws, tables, benches, shafting, pulleys and small tools for manual training department of new high school.

Mass., Medford—E. Teel & Co., 70 Union St. (manufacturer of truck and wagon bodies)—two 1½ ton chain hoists, metal workers' shears, drills, reamers and other small wood and metal working tools.

Miss., Meridian—M. M. Lockwood, P. O. Box 315—stiff mud brick machine, including drier.

Mo., Kansas City—C. W. Bechtel, Sr., 5645 Virginia Ave.—woodworking machinery.

N. Y., Brooklyn—Wheeler Salvage Co., 224 Bush St.—steel tanks for 100 lb. pressure, also fuel oil pump, 6 in. suction.

N. Y., New York — A. Loewy — baling presses.

N. C., High Point—McEwery Lumber Co.—saw trimmer, direct electric drive.

N. C., Rocky Mount—Rocky Mount Mills Co. (manufacturer of cotton yarns)—$130,000 worth of equipment for proposed addition to mill.

N. C., Wilmington—Carter's Production Wks., 210 South Front St. (machinery), O. Carter, Mgr.—complete sawmill plant, 15,000 capacity.

O., Cleveland—B. Bell, 3531 East 118th St. (dry cleaner)—three tumbler machines and a 500 gal. gasoline storage tank.

O., Cleveland—West Cleveland Trim & Hardwood Co., c/o H. W. Stearns, 14651 Lorain Ave.—planing mill equipment.

O., Columbus—Dept. of Purchase, State House—milk pump, pasteurizer, etc., for Grafton Farm, Cleveland State Hospital.

O., Columbus—Winslow Glass Co., Southwood Ave. and 19th St., P. Winslow, Genl. Mgr.—glass manufacturing equipment to enlarge plant.

O., Dayton—Bd. Educ., Ludlow Bldg., C. J. Schmidt, Clk.—receiving bids until Sept. 4 for wood and metal working machinery; printing shop machinery and equipment; laundry equipment for Roosevelt High School.

Okla., Commerce—S. S. & G. Mining Co.—electric hoist for ore.

Pa., Pittsburgh—Dravo Contg. Co., Diamond Natl. Bank Bldg.—structural shape working machinery.

Tenn., Jacksonville—M. B. Automotive Corp.—equipment for the manufacture of autobuses, trucks, etc.

Tex., Corsicana—Navarro Ice Co., South 12th St. along tracks of Cotton Belt R.R.—machinery for proposed $100,000 ice plant.

W. Va., Dunbar — Dunbar Flint Glass Corp., J. M. Payne, Pres.—link belt and conveyor system, also transmission equipment.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Iron and Steel—Pig-iron prices still weak, despite recent active buying. Finished steel market firmer; decline in scrap prices checked. July steel ingot output dropped over 222,000 tons from the June total, and unfilled orders of the U. S. Steel Corp. fell off 475,498 tons, during month. August steel demand showing improvement over July. Oil and building industries most conspicuous buyers. Revival expected in railroad and automobile demand. Steel pipe requirements large; stocks small. Less difficulty experienced in getting prompt mill deliveries. Prices unchanged; shapes and plates, $2.50 and bars, $2.40 per 100 lb., f.o.b. mill.

Advances—Tin rose ⅜c. per lb. in New York during week. Coppered bessemer rods firmer. Antimony, 10c. in Cleveland, against 9½c. per lb., last week. Copper market shows improvement. Lubricants in better demand.

Declines—Zinc dropped 5c. per 100 lb. in New York, during week. Open-hearth spring steel down about ½c. per lb. Aluminum ingots declined 1/10c. per lb. Raw linseed oil $1.18, compared with $1.22 per gal. (5 bbl. lots) in Cleveland; market soft in other cities. Furnace and foundry coke down 25c. to 50c. per ton.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$28.55
Northern Basic	28.77
Southern Ohio No. 2	28.77
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.25
BIRMINGHAM	
No. 2 Foundry	25.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	27.76
Virginia No. 2	32.17
Basic	26.76
Grey Forge	26.76
CHICAGO	
No. 2 Foundry local	28.61
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.51
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	27.77
Basic	26.77
Bessemer	28.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5.00@5.50

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.95	4.45	5.05
Nos. 22 and 24.	3.75	5.00	4.50	5.05
Nos. 25 and 26.	3.80	5.05	4.55	5.10
No. 28	3.85	5.15	4.65	5.20

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00	5.15	4.70	5.35
Nos. 12 and 14.	4.10	5.25	4.80	5.45
Nos. 17 and 21.	4.40	5.55	5.10	5.75
Nos. 22 and 24.	4.55	5.70	5.25	5.90
No. 26	4.70	5.85	5.50	6.05
No. 28	5.00	6.15	5.80	6.35

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	62	50½	⅜ to 1¼	30	13
		LAP WELD			
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	26	11
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	60	49½	⅜ to 1½	30	14
2 and 3	61	50½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	8.00	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.40	3.90	4.55
Cold finished flats, squares	4.90	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Carbon tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 5/32, 8.35c.; 1/8, 7.85c.; 5/32 to 1/4, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.00
Tin, 5-ton lots, New York			39.75
Lead (up to carlots), St. Louis	6.50	New York	6.97½
Zinc (up to carlots), St. Louis	6.20	New York	6.60

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.10	27.00	28.00
Antimony (Chinese), ton spot	8.75	10.00	8.25
Copper sheets, base	24.50	23.50	23.00
Copper wire (l.c.l.)	17.25	20.75	16.25
Copper bars (l.c.l.)	22.00	24.00	19.50
Copper tubing (l.c.l.)	27.00	29.00	23.00
Brass sheets (l.c.l.)	19.75	29.25	18.75
Brass tubing (l.c.l.)	25.50	29.25	20.50
Brass rods (l. c. l.)	18.00	29.00	15.75
Brass wire (l. c. l.)	20.25	23.75	.....
Zinc sheets (casks)	10.25	10.10	.....
Solder (½ and ½), (case lots)	29.50	27.75	20.00
Babbitt metal (83% tin)	52.00	48.00	40.00
Babbitt metal (35% tin)	25.00	17.00	16.00
Nickel (ingot and shot)	29.00	.....	35 00
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	12.00	12.50
Copper, heavy, and wire	11.50	11.50	11.50
Copper, light, and bottoms	10.00	9.50	10.50
Lead, heavy	5.00	5.00	5.00
Lead, tea	4.00	4.00	3.75
Brass, heavy, yellow	7.50	....	7.50
Brass, heavy, red	9.50	9.50	9.50
Brass, light	6.00	5.00	6.50
No. 1 yellow brass turnings	7.00	6.00	7.00
Zinc	3.75	3.00	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$23.50	$19.50	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.00	17.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	12.60	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7 40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13½x13½, per lb.	10.25	36.00 per M	.10
Wiping cloths, 13½x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	1.05	1.18	1.14
White lead, dry or in oil	100 lb. kegs.	New York, 14.00	
Red lead, dry	100 lb. kegs.	New York, 14.00	
Red lead, in oil	100 lb. kegs.	New York, 15.50	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.00@4.50	
Coke, prompt foundry, Connellsville	per net ton	5.25@5.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	30%	50-10%	45-5%
1½ and 1½x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	15%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	20%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	30%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	25%	45%	40-5%
Bolt ends, with hot pressed nuts	30%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 5/16 and smaller	60%	.....	....
Semi-finished nuts, ⅜ and larger	55%	65–10%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅜ in., per 100 lb. (net)	5.50	4.00	3 50
Washers, round plate, per 100 lb. Off list	1 50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	List net	2.75	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	40%	50–10%	60%
Rivets, tinned	40%	50–10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
¾ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30–10%	30–10%	30–10%
Heavy grade	20–5–2½	30%	20–5–2½%
Rubber and duck:			
First grade	50–10–5%	50–10%	40-10%
Second grade	60–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20

Wis., Aniwa—Bd. Educ., R. Perry, Clk.—30 in. bandsaw, wood turning lathes, drill press, medium size planer, glueing macnine and rip saw.

Wis., Appleton—Fox River Paper Co., Water St.—paper machine for proposed addition to mill.

Wis., Beloit—Keeler Lumber & Fuel Co., 108 State St.—coal hoisting and loading machinery for proposed $30,000 coal elevator.

Wis., Green Bay—Green Bay Newspaper Co., 315 Cherry St.—additional presses for proposed $100,000 newspaper plant.

Wis., Madison—M. B. Allison, 119 Monrova Ave.—refrigeration machinery and plant, either ammonia or brine.

Wis., Markesan—O. F. Guderian and H. Terens—pea canning machinery, belts, shafting and power machinery for proposed $50,000 canning plant at Cobb.

Wis., Manitowoc — Grimm Aluminum Casting Co., South 21st St.—cupola and furnace for proposed $40,000 foundry.

Wis., Milwaukee—M. Ert, 530 Jefferson St. (garage)—one large size air compressor, vulcanizing outfit, etc.

Wis., Milwaukee—G. Ladwig, 668 American Ave. (carpentry and millwork)—one standard window frame making machine.

Wis., Milwaukee—Ludwig Shoe Mfg. Co., 216 Harmon St., J. L. Ludwig, Purch. Agt.—shoe working machinery, including lasting machine, cutters, vampers and punches.

Wis., Milwaukee — Milwaukee Coke & Gas Co., 187 Greenfield Ave.—steel tanks and distilling apparatus for proposed $100,000 benzol plant.

Wis., Milwaukee—Natl. Family Laundry, 786 12th St.—manglers, power washers, mechanical dryers, belting, shafting and hangers.

Wis., Milwaukee—Northeast Power Co., 559 Marshall St., W. Pulliam, Purch. Agt.—one electric traveling crane.

Wis., New London — M. Smith — small tools, gasoline storage tanks, pumps and air compressor for proposed $40,000 garage.

Wis., Prairie Farm—C. L. Borson (planing mill)—rip saws and heavy duty planer.

Wis., Racine—School Dist. 11, A. Harcus, R.F.D., Secy.—small woodworking tools, benches, etc. for proposed grade school building.

Wis., West Allis—G. Dallmann, 898 69th Ave. (carpentry and millwork)—portable combination woodworking machine, standard size.

N. S., Lunenburg—Smith & Rhuland—extensive equipment for ship building.

N. S., New Glasgow—I. W. Cummings & Sons, Ltd. (manufacturer of mine tools, cars, forgings, etc.), J. T. Cummings, Genl. Mgr.—additional equipment for the manufacture of manganese toughened steel, self oiling wheels and axles for mine cars.

N. S., Stellarton—D. Porter & Son (woodworking)—moulder, matcher, etc.

Ont., Alexandria—F. McCormack—wool carding and batting equipment.

Ont., Fort Erie—Campbell-Alladin Gas Maker, Ltd., F. M. Campbell, Purch. Agt.—small machinery and tools.

Ont., Galt—Galt Forge, 38 Ainslie St., S., D. Ford, Purch. Agt.—equipment for angle iron work and flanging.

Ont., Maxville—A. J. McEwan (saw and planing mill)—additional sawing equipment.

Ont., Monkton—Monkton Cheese & Butter Co., A. Petrie, proprietor—equipment to replace that which was destroyed by fire.

Ont., Guelph—Guelph Specialty Mfg. Co., Ltd., A. R. Burrows, Purch. Agt.—machinery and equipment for the manufacture of mops, polishes, car washers, bottle holders, tools, etc.

Ont., Windsor—Canadian Roofing Co., McDougall St.—machinery and equipment to replace that which was destroyed by fire.

Que., Montreal — F. Flaba, 2660 St. Hubert St.—laundry equipment.

Que., Montreal—Henderson-Baruck Co., Ltd., 1 Oliver St. (tinsmith)—additional equipment.

Que., Montreal — Meldrum Iron Wks., Ltd., 1140 Lajoie St., G. H. Meldrum, Purch. Agt.—machinery and equipment for the manufacture of ornamental iron, steel and brass.

Que., Montreal—Western Quebec Paper Mills, Ltd., c/o W. K. McKeown, 145 St. James St.—pulp and paper machinery.

Que., Three Rivers—O. Garceau, 289 Laviolette St.—additional equipment for blacksmith shop.

Que., Three Rivers—Three Rivers Brass Fdry., 106 St. George St., O. Dumont, Purch. Agt.—additional foundry equipment.

Que., Upton—J. Lamadeleine—additional equipment for blacksmith shop.

Metal Working Shops

Ark., Brinkley—W. F. Brown is having preliminary plans prepared for the construction of a 1 story, 60 x 80 ft. garage. Estimated cost $45,000. E. W. Mann, Madison Ave. Bldg., Memphis, Tenn., Archt.

Calif., Emeryville — Standard Underground Cable Co., First National Bank Bldg., San Francisco, is having plans prepared for the construction of a factory, including 100 x 300 ft. main building, power house and warehouse. Estimated cost $200,000. A. Prack, c/o Westinghouse Electric & Mfg. Co., Emeryville, Archt.

Calif., San Francisco—The Great Western Smelting & Refining Co., Folsom and Spear Sts., is having plans prepared for the construction of a 1 story foundry. Estimated cost $80,000. Morrow & Garren, Chronicle Bldg., San Francisco, Archts.

Calif., San Francisco—The Williams Bros. Aircraft Corp., 1211 Van Ness Ave., awarded the contract for the construction of a 1 and 2 story factory on 25th St. and Potrero Ave. Noted July 19.

Calif., Santa Monica—C. C. Haworth is having plans prepared for the construction of a 1 story, 100 x 150 ft. garage. Estimated cost $40,000 A. G. Bailey, Junior Orpheum Bldg., Los Angeles, Archt.

Conn., Hartford—F. D'Esopo, 647 Main St., is having plans prepared for the construction of a 1 story, 50 x 70 ft. garage at 161 State St. Estimated cost $40,000. H. B. Sumner, 45 Gold St., Hartford, Archt.

Conn., New Haven—The Connecticut Co., 22 Church St., is receiving bids for the construction of a 1 story, 68 x 210 ft. garage and machine repair shop for automobile buses. Estimated cost $60,000. Harte & Stamur, c/o owner, Engrs. and Archts.

Conn., Waterbury—The Amer. Brass Co., Grand and Meadow Sts., awarded the contract for the construction of a 1 story, 75 x 210 ft. garage on Freight St. Estimated cost $40,000.

Conn., Waterbury—The French Mfg. Co., 128 Robbins St., awarded the contract for the construction of a 1 story, 72 x 120 ft. addition to its factory for the manufacture of small tubing. Estimated cost $40,000.

Conn., Waterbury—The Scoville Mfg. Co., 99 Mill St., manufacturer of brass goods, awarded the contract for remodeling its factory on East Main St. Estimated cost $50,000.

Ill., Chicago—D. H. Patterson, c/o Holton, Seeleye & Co., 140 South Dearborn St. is receiving bids for the construction of a 1 story, 125 x 135 ft. garage at 1314-28 East 53rd St. Estimated cost $40,000. L. E. Russell, 25 North Dearborn St., Archt.

Kan., Hoisington—B. Whalen will build a 45 x 90 ft. machine shop. Estimated cost $5,000.

Kan., Topeka—The Simplex Rim Co., c/o L. L. Pearce, 3824 East 1st St., Wichita, is having preliminary plans prepared for the construction of a 2 story factory for the manufacture of patented automobile rims. Estimated cost $75,000. Private plans.

Mass., Quincy—Colburn Gear & Mfg. Co., 98 Holmes St., will build a new 1 story machine shop.

Minn., Austin — The Austin Auto Co. awarded the contract for the construction of a 1 story, 85 x 140 ft. garage on Lansing Ave. Estimated cost $45,000.

Mo., St. Louis—J. F. Queeny, 3453 Hawthorne Blvd., is having plans prepared for remodeling 6 story hotel building into garage, on Bway. Estimated cost $175,000. Mauran, Russell, Crowell, Chemical Bldg., Archts.

N. Y., Albany—J. D. Parsons, 93 North Pine Ave., manufacturer of store fixtures, plans to rebuild portion of his plant recently destroyed by fire. Loss $175,000.

N. Y., Albany — E. V. Stratton Motors Co., 25 Washingon Ave., is having plans prepared for the construction of a 10 story, 60 x 140 ft. garage and office building.

N. Y., Brooklyn—L. Gershowitz, c/o E. M. Adelsohn, Engr. and Archt., 1778 Pitkin Ave., is having plans prepared for the construction of a 1 story, 100 x 100 ft. garage on 1st St. Estimated cost $40,000.

N. Y., New York—Garrison Ave. Constr. Co., c/o D. S. Lang, Archt. and Engr., 110 West 40th St., will build a 1 story garage on Garrison and Bryant Aves. Estimated cost $50,000.

N. Y., New York—C. S. Levy, c/o Moore & Landseidel, Engrs. and Archts., 148th St. and 3rd Ave., will build a 1 story, 105 x 125 ft. garage on West 145th St. Estimated cost $50,000.

N. Y., West New Brighton—The President of the Borough of Richmond, Room 108, Borough Hall, Staten Island, will soon award the contract for the construction of a repair shop and garage on Clove Rd. south of Castleton Ave., here.

N. C., Charlotte—Etheredege Meter Co. plans to construct a garage and salesroom building. Estimated cost $100,000. Lockwood, Greene & Co., Charlotte, Engrs.

N. C., South Rocky Mount (Rocky Mount P. O.)—The Atlantic Coast Line Ry., Atlantic Coast Line Bldg., Wilmington, will soon receive bids for the construction of coach shops here. Estimated cost $500,000. J. E. Willoughby, Ch. Engr.

O., Cleveland — Amer. Stove Co., 4415 Perkins Ave., has had plans prepared for the construction of a 1 story, 72 x 132 ft. enameling plant addition on Hough Ave. Estimated cost $40,000. Carter-Richards Co., Engineers Bldg., Archts.

O., Cleveland—Globe Brass & Mfg. Co., 5532 Perkins Ave., is having plans prepared for the construction of a 1 story machine shop and foundry, on East 55th St. near Bower Ave. Estimated cost $60,000. H. F. Schroeder, Pres. A. C. Wolf and F. M. Griffith, Truman Bldg., Archts.

O., Cleveland — Jordan Ohio Co., 4400 Euclid Ave., had plans prepared for the construction of a 1 story, 50 x 103 ft. garage. Estimated cost $40,000. Hubbell & Benes, 4500 Euclid Ave., Archts.

O., Cleveland—The Standard Oil Co. of Ohio, c/o J. A. Watterson, East Ohio Gas Bldg., has had plans prepared for the construction of a 1 and 2 story garage and pump house on Berea Rd.; also a 1 and 2 story, 28 x 80 ft. and 32 x 92 ft. garage and pump house on Babbitt Rd. and St. Clair Ave. Estimated cost $40,000 and $50,000 respectively. Private plans.

Pa., Altoona—The Davis Murray Motor Co., 1921 Union Ave., plans to build a 3 story, 25 x 100 ft. garage and a 1 story, 25 x 120 ft. sales and show room. Estimated cost $100,000. J. R. Davis, Pres.

Pa., Bellefonte—Decker Bros., North Spring St., are having plans prepared for the construction of a 3 story, 90 x 120 ft. garage and service station. Estimated cost $80,000. Private plans.

Pa., Dormont (Pittsburgh P. O.)—Bartey Bros., West Liberty Ave., is receiving bids for the construction of a 2 story, 50 x 67 ft. garage on McFarlane Rd. Estimated cost $40,000. Private plans.

Pa., Phila.—The Budd Mfg. Co., 25th St. and Hunting Park, manufacturer of automobile bodies, will soon award the contract for the construction of a 6 story, 100 x 325 ft. and 1 story, 75 x 325 ft. factory on Hunting Park Ave. and Wissahickon Rd. Estimated cost $350,000. Ballinger Co., 12th and Chestnut Sts., Archts.

Pa., Phila.—P. S. Tyre, Archt., 1509 Arch St., will receive bids until Aug. 22 for the construction of a 2 story, 70 x 209 ft. automobile sales and service station on Chelton Ave. east of Wayne St. for the Koelle-Greenwood Motor Co., 6025 Germantown Ave. Estimated cost $100,000.

Pa., Uniontown—M. Friedman is receiving bids for the construction of a 2 story, 124 x 150 ft. garage on Fayette and Wilson Sts. Estimated cost $40,000. Private plans.

Wis., Manitowoc—W. J. Raeuber, Archt., South 8th St., is receiving bids for the construction of a 2 story, 50 x 100 ft. foundry for the Grimm Aluminum Casting Co., South 21st St. Estimated cost $40,000.

Wis., Milwaukee — Jim's Repair Shop, 1524 Galena St., will receive bids about Aug. 27 for the construction of a 1 story, 50 x 100 ft. machine and repair shop for automotive service.

Wis., Milwaukee — A. Seidenschwartz, Archt., 290 3rd St., is receiving bids for the construction of a 1 story, 50 x 77 ft. addition to foundry for the Milwaukee Steel Fdry. Co., 127 South Water St. Estimated cost $45,000.

Wis., Racine—F. Applegate, 1043 Washington St., is receiving bids for the construction of a 1 story, 60 x 105 ft. garage and repair shop. Estimated cost $55,000. Noted July 5.

Wis., Racine—H. Koelbel, 2116 16th St., is receiving bids for the construction of a 1 story, 40 x 110 ft. garage and repair shop on 15th and Racine Sts. W. J. Redden, 2819 Arlington Ave., Archt.

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Special Devices in the Grand Trunk Shop at Battle Creek

By FRED H. COLVIN
Editor, *American Machinist*

Special machines for handling air brake or steam hose in large or small quantities—Lining up locomotive guides—Frame-bolt gages

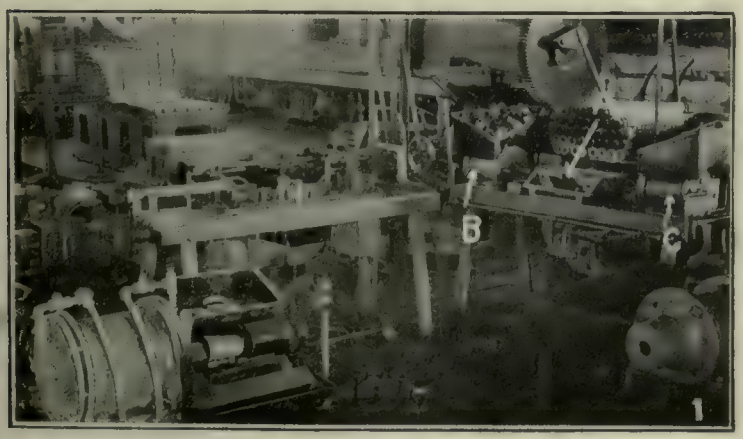
AIR-BRAKE and steam-heating hose and their fittings require more work in the average railroad shop than might be supposed by the uninitiated as they are subject to hard usage. Fig. 1 shows the compact arrangement of a group of special machines which have been built to handle hose fittings in the Battle Creek, Mich., shop of the Grand Trunk Railway. They are so grouped that they can be readily handled either by one man or a group of men, depending on the amount of work to be done.

The machine at the right presses the fittings in each end of a hose at the same time. The hose is held in the central clamp *A*, while plungers on cylinders *B* and *C* hold the fittings and force them in simultaneously, by air pressure. The piping and control valves are shown in front. Over each air cylinder is a conveniently placed bin for the fittings, so that the operator can use both hands, and the work proceeds very rapidly. The first operation clips the nut end off the old bolt. This is followed by stripping the old hose of the clamp and the hose fittings, many of which can be renewed.

The machine in the center of the group, is used to hold the clamps or bands and to tighten the bolts in place while they are so held. This machine is shown in more detail in Fig. 2. In the lower left-hand corner of Fig. 1 is a little machine used to reclaim old clips or clamps. These clamps are very apt to be more or less distorted when removing them from old hose, and this machine takes out any distortion and opens them to the required diameter for use again. This is done by forcing the clamp over a stationary tapered pin, the clip falling off automatically over the portion cut out for this purpose, after each stroke. The machine is double acting, one of the taper pins being concealed by the sliding member. This is seen in detail in Fig. 3 which shows the clips and plugs in both directions.

In the machine shown in Fig. 2, the hose with the clamp in place is laid in one of the jaws *A* or *B* with the hose supported at the other end. The curved clamping arms *C*, close around the hose and force the two ends of the clamp together, so that a bolt can be inserted and the nut screwed on by the power-driven tools held in friction chucks at the back. These chucks are driven by bevel gearing from the shaft shown at the back.

This machine is, in reality, two single machines instead of one, for operating on each end of the hose at the same time. The clamp on the hose at the left has just had the nut screwed on, as can be seen in the cut.



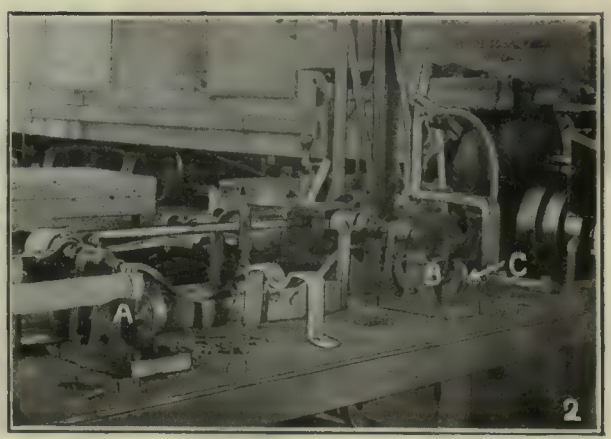
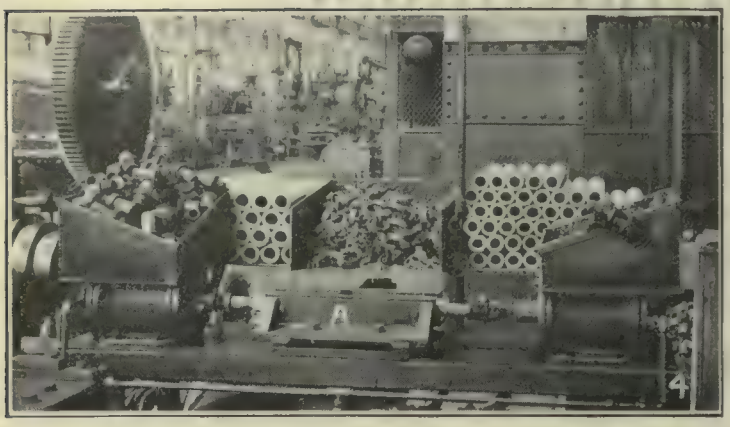


FIG. 1—RECLAIMING AIR BRAKE HOSE. FIG. 2—MACHINE FOR PUTTING ON HOSE CLAMPS



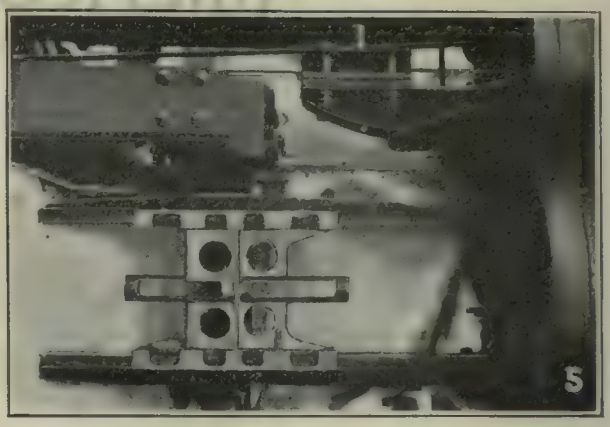


FIG. 4—THE HOSE FITTING MACHINE. FIG. 5—SKELETON CROSSHEAD FOR LINING GUIDES

For pulling the couplings off of old hose, the machine shown in Figs. 1 and 4 is used. The hose is clamped in the central vise *A*, and the plungers from each cylinder pushed forward until their clamps grip the fittings. Admitting air to both cylinders at once, pulls out the fittings, which are placed in the metal boxes or trays over each cylinder. The clamps go into the open-front box shown at the rear.

This machine serves the double purpose of stripping the old hose and of forcing fittings into the new.

When it becomes necessary to line up the guides on a locomotive after they have been resurfaced by grinding or otherwise, the skeleton crosshead shown in Fig. 5 is used. It is an aluminum casting so as to be light enough to handle easily.

The bottom guide is first lined up in the usual manner, then the dummy or skeleton crosshead is put on the lower guide. The top guide is then lined up so that both guide bars are parallel and properly spaced so that the dummy will move freely from end to end. The dimensions of the new crosshead must be the same as those of the dummy, which affords a means of maintaining them at the standard dimensions shown on the blueprints.

The problem of taper bolts, largely used in locomotive frame work, is handled in a somewhat unusual manner in this shop. Fig. 6 shows a set of taper plug-gages used by erecting-shop men when reaming bolt holes. Bolts are ordered by the numbers of the gages.

The bolt-turning department has the gages shown in Fig. 7, which correspond with the taper plugs in Fig. 5, and which are numbered in the same way. By the use of these gages, the bolt department can supply taper bolts for the men on the erecting floor without the time and delay of fitting them to the holes reamed in the frame. The bolts are turned to fit the corresponding taper hole in the gage block and sent to the erecting department just as though they were plain bolts.

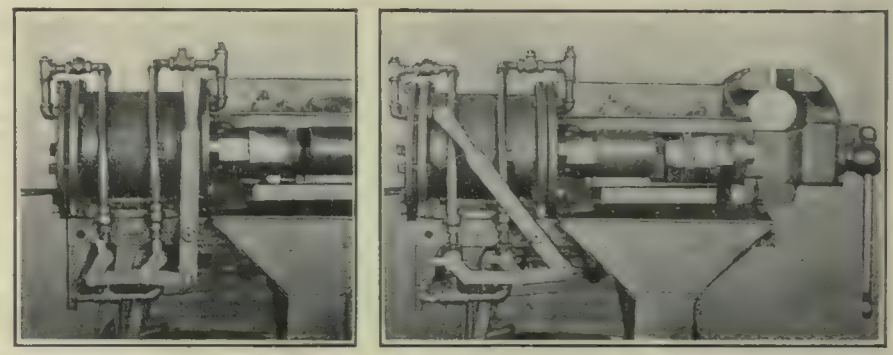
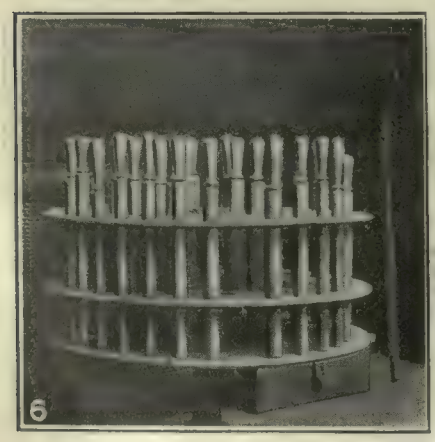
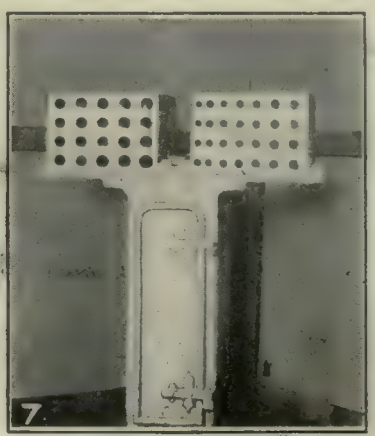


FIG. 3—RECLAIMING THE HOSE CLAMPS

Other gages used by the erecting shop men are shown in Fig. 8. These are cast iron plates containing 12 holes each, which can be used in checking up both the plug gages and the taper bolts after they have been received.

In order to facilitate the turning of taper bolts and to prevent variation in the taper, the special lathe shown in Fig. 9 is used. This is an engine lathe in which the V's are planed at an angle so the bolts will





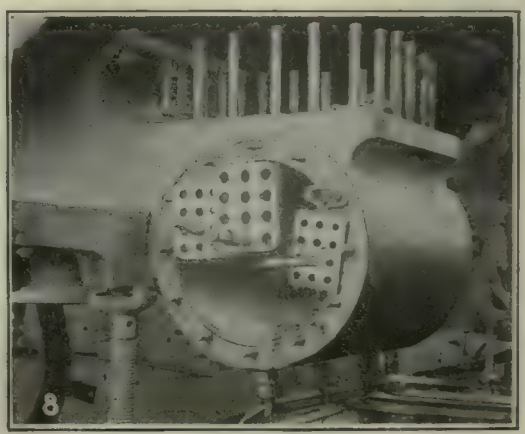


FIG. 6—STANDARD PLUG-GAGES FOR TAPER BOLTS. FIG. 7—GAGE BLOCKS FOR TAPER BOLTS
FIG. 8—PLATE GAGES AND PLUGS

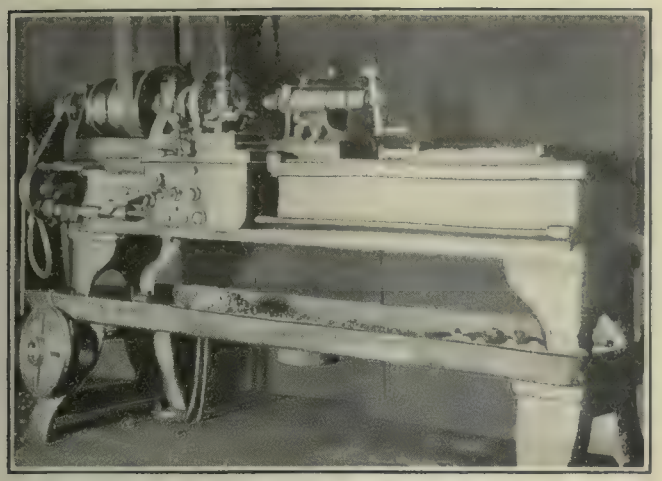


FIG. 9—SPECIAL LATHE FOR TURNING TAPER BOLTS

be turned to a taper of ⅛ in. to the foot, without adjusting the tailstock or the use of a taper attachment. The only point to be observed is in setting the turning tool at the center of the work. Such a lathe aids greatly in securing rapid and uniform production.

Another interesting fixture is the one shown in Fig. 10, for milling the proper form on the end of the tools used in beading flues. This is a simple fixture which holds the beading tool blank at *A*, and allows it to be turned in the trunnions shown so as to give the correct

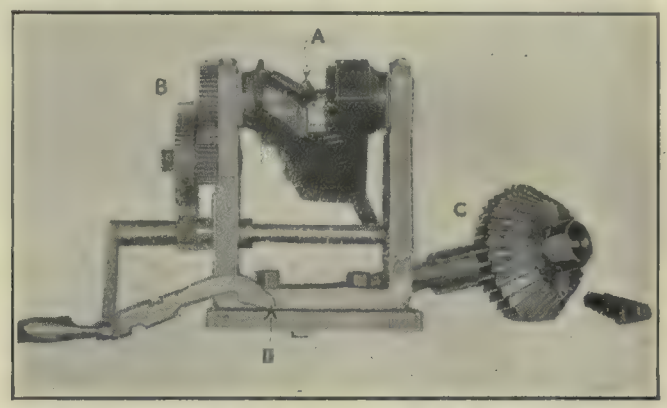


FIG. 10—FIXTURES FOR MILLING FLUE BEADING TOOLS

radius to the working edge. The illustration shows the double reduction gearing at *B*, the formed cutter *C* and the contour gage at *D*. This insures the beading tools being of the correct shape, and uniform in every case.

Making Belt Joints

By M. W. Edgar
Detroit Belt Lacer Co.

The subject of belting has only quite recently received attention. The economical production of power and production efficiency of machinery have been subjects of careful study and constantly improving conditions for a considerable time, but the connecting link has been decidedly neglected. Belting, in the great majority of industries, is an item of considerable initial expense and, without proper care, a serious item of upkeep and delay from breakdowns.

The general subject of belting as an engineering problem is yet somewhat vague. The technical formulas are so complicated, and subject to so many qualifying variations to meet the almost infinite requirements, that they are seldom used, tables published in engineering handbooks and catalogs of the belt manufacturers being rather generally resorted to. Admittedly these tables are usually on the safe side to allow for inefficient joints, some of the manufacturers going so far as to issue two sets, one for factory-made endless belts and one for belts joined while in service. It would seem rather evident that the figures for actual service are those which must be used, as the belt which requires neither shortening or repairs is unusual, to say the least.

The endless belt without question is the perfect belt, as it is, or should be uniform throughout. It is equally evident, however, that the endless belt does not solve the problem for several reasons, the principal one probably being time. We quote only one paragraph from an article written by a recognized authority that is being widely published: "Permit the glue to set for one hour before putting the belt on the pulley." Making no allowance for the time required to prepare the joint, evidently considerable, judging from the detailed directions, the item of one hour's delay in getting machinery in operation is serious and, in case of breakdowns, prohibitive.

It is a peculiar fact that engineering handbooks and, as far as the writer has seen, all published data of a general nature, excepting advertising matter, skillfully dodge the subject of belt joints. They give only directions for making belts endless and for the old style of lacing with a leather thong which is also a method requiring considerable time, and so inefficient as to cause the following comment in a leading textbook: "The strength of the laced belt is usually figured at one-third the strength of the joint or from 10 to 16 times less than the strength of the original belt." Tests made fifteen years ago in one of our technical schools showed an extreme efficiency of 25 per cent for a leather-laced joint, the majority of failures being between 15 per cent and 20 per cent.

Due to the necessity for quicker, better and more efficient methods, there has been a flood of belt lacer patents in the last twenty years. Perhaps the kindliest criticism would be that some are better than others; but none are as inefficient or time consuming as the old-time lacing method. Further, an unusual proportion of these devices have survived the test and made good business propositions for their owners. The last few years have seen a great advance in the making of belt joints, the problem being taken up from an engineering standpoint, and a very high percentage of efficiency reached.

Granting a previous statement that the endless belt is the perfect belt, the ideal solution is to duplicate all the properties of the endless belt in an artificial joint. We find that the endless belt is of equal strength throughout, that it has equal width and thickness and is uniformly flexible; therefore, our joint must, so far as possible, duplicate these qualities.

Taking the requirements in detail, the first, strength, immediately introduces a problem. The fastening must be attached to the belt, and any method but penetrating the fabric would upset the requirements of uniform width or thickness. This penetration must be the least possible, as everything taken out of the belt reduces its strength just that much, and it is evident that this loss of strength in the belt itself cannot be replaced.

In other words, the finished job cannot be stronger than the least remaining cross sections of the belt. By distributing the penetrations over different cross sections of the belt, we can reduce the loss of strength proportionately. Thus, if we make two rows of holes far enough apart, we have reduced the strength of the belt 50 per cent less than if they were all in one row.

In determining what is most suitable to put in the holes so carefully located, the remaining requirements must be borne in mind. Strength becomes in a degree secondary as almost any metal construction will be stronger than necessary. The outside dimensions of the finished joint should not exceed those of the belt itself, and in addition the joint must be flexible. The first condition requires a structure that can be imbedded in the belt without distorting or damaging it. The second a hinged construction and a degree of flexibility in the fastener itself. A further important consideration is the weight of the joint for, if this is excessive, it will cause vibration and knocking in high speed work.

The perfect solution of all these requirements is perhaps still in the future. Once found, however, the belt thus joined will meet all the requirements of the endless belt, and if suitably designed can be applied by unskilled labor and with practically no loss of time. Advance in this direction has been rapid in the last few years, and today fasteners that very nearly meet all of the conditions are available and are replacing endless belts in many large plants.

"Styles" in Scratches

By Frank C. Hudson

Styles are not confined to ladies' bonnets nor yet to the length of skirts. They reach into the machinery operations which go to make up our many machine products. And one of the styles which has changed and is still changing, is the kind of scratches we put into metal in grinding.

Back forty or more years we talked about grinding as the last word in finish. In fact we talked about it much more than we ground. For grinding as a finish was confined to a few machines of both cylindrical and surface types.

Of course, every up-to-date shop had a tool-post grinder, for grinding centers after hardening and occasionally someone ground a mandrel or shaft in this way. But there was more fireworks than cutting of metal and, unless the spindle was a much better fit than usual, the surface was a series of small arcs dug out of the metal.

Styles in scratches, however, are for the most part confined to surface grinding. With the older type of machine, where the table carries the work under the periphery, or outside of the grinding wheel, the scratches ran lengthwise of the piece just as when we used to polish the work with emery cloth, either on a piece of wood, or perhaps held over a file. As this kind of grinding gave the same kind of a looking finish that we were accustomed to see, we called it smooth and had no criticism to make.

Then came the surface grinder where the edge or side of the wheel did the work, and immediately we began to criticise and condemn. For a new style of scratches had been introduced by the disk or cup wheel type of machine. The scratches were curved instead of straight, more plainly visible because we had forgotten that the straight lines were scratches, and the work didn't look pleasing to the eye trained to the older method.

It took much argument and demonstration to show that the surface was just as flat and just as smooth as though these circular scratches didn't show. Slide valves and their seats were proved to be just as tight though these scratches were not visible. And though the scratches show plainly, we now know that we cannot detect the depth with any measuring instrument. They are so minute that they do not affect the tightness of a seat or the perfection of a bearing surface.

Now the styles in scratches have apparently shifted to the grinding of gear teeth. The formed wheel which passes through the tooth space, leaves a straight line scratch just as the old type grinder or the gear cutter did on the flat surface. And as this type came to be known first, here again we became accustomed to the straight style in scratches.

Later machines for grinding gear teeth by the generating method use a straight sided wheel and work the gear past the side of the wheel. This gives us curved scratches of the same radius as the wheel, as with the disk or side surface grinding. And once more we hear criticism in some quarters as to the quality of the work with the curved scratches.

But, as in the case of surface grinding, we cannot measure the depth of these scratches, although we have very delicate instruments which "feel" the surface of the teeth to determine the correctness of the profile. And they do not show at all on a "tenth" indicator, even though the radius of the wheel is not very large.

As with the scratches on the flat surface, the only real test is that of service. Here again we are shown that our old notions were not sound and that the curved style in scratches is just as accurate as the "straight lines" even though we have not yet become thoroughly accustomed to the newer curves.

When Advertising Injures Trade

Advertising is not always effective and particularly in connection with work in foreign countries care should be exercised to make sure that advertising efforts shall be really effective. In a number of countries duties are imposed on catalogs and it frequently works out that if an American manufacturer seeking to cultivate trade with business men there, sends a catalog in the manner customary to this country the party addressed will find it necessary to undertake all of the work necessary in connection with a large consignment in order to pass this catalog through the customs and in addition to the expense involved in the duty actually paid, there is also a fee for the custom house broker and possibly others. It can easily happen that a catalog may cost the party addressed $5 or more and obviously this will not put the prospective customer in a very satisfactory frame of mind.

In order to assist the American business man in the handling of his foreign advertising campaigns the Foreign Tariffs Division of the Bureau of Foreign and Domestic Commerce has in course of preparation a series of bulletins showing in detail the restrictions in each of the sections of the world. The first of this series is trade information bulletin No. 122 entitled "Shipment of Samples and Advertising Matter to the British Empire" copies of which may be secured by addressing the above mentioned division at Washington.

The Elements of Production Grinding

BY ELLSWORTH SHELDON
New England Editor, *American Machinist*

The fourth article—Conditions affecting machine important—Vibration must be eliminated and source of power must be adequate and constant —Wheels should be tested for cracks before mounting

BESIDES the somewhat bewildering array of conditions that we have thus far considered, the condition of the machine upon which production grinding is to be done must be taken into account.

In the first place the machine should be located upon a floor that is not susceptible to vibration, either from adjacent machinery or from trucking heavy loads over it. A cement floor laid upon the ground furnishes an ideal foundation. There should be no rotating parts of the machine out of balance, though this is a condition not likely to be found in the product of any reputable builder.

Too much care cannot be expended in joining the belts that drive the machine, for a poorly made joint, even upon the small belt that drives the work head, may introduce a jar that will be responsible for a great deal of apparently inexplicable trouble. The belt that drives the wheel spindle should be made endless if possible, and it should at all times be maintained in proper condition to deliver its full driving power.

FEW MACHINES commonly used in the mechanic arts are more sensitive to conditions—extraneous and otherwise—than the production grinding machine. The location of the machine should be such that no vibrations from outside sources can reach it, and it goes without saying that all possible causes of vibration within the machine itself should be eliminated. Driving belts must be of ample width, carefully joined, and kept in the best of condition. Every wheel should be tested for flaws or cracks each time it is used and as a wheel wears down in diameter it should be tested for balance. A great deal of trouble that is difficult to locate may finally be traced to a faulty wheel.

The source from which the machine derives its power must be ample to meet all demands upon it and never allow the speed of the wheel to slacken, for a reduced wheel-speed changes the intricate and interdependent relations of the various factors governing the output, and a sharp change in both quantity and quality of work may be expected to follow.

Though little or no trouble need be anticipated from vibrations due to unbalanced rotating parts of the machine itself the same cannot be said of the wheels. New grinding wheels are usually in balance, but this condition should not be taken for granted, nor should it be expected to persist during the life of the wheel. It is practically impossible to make a wheel the structure of which is absolutely homogeneous, and as the wheel is reduced in diameter by wear and repeated redressings it will become out of balance.

Before placing a wheel—new or otherwise—upon the spindle of a grinding machine it should be tested for balance. The best way to do this is to run the wheel upon a balancing machine as shown in Fig. 15, but this method presupposes the existence in the shop of the necessary equipment and a man with considerable knowledge and skill in the art of balancing. The machine method is, however, the only way in which a wheel may be put in running balance, the condition under which it is expected to run true and quietly in the grinding machine.

A much simpler method of balancing is shown in Fig. 16. It is called the static balance test, and can be applied in almost any shop and by anyone who has sufficient knowledge of mechanics to balance a pulley. Though it is possible for a wheel to be in perfect static balance and yet vibrate badly when running, it is a condition very unlikely to exist in any but very wide and heavy wheels and the static test can, therefore, be relied upon in more than 90 per cent of the wheel balancing necessary in the grinding shop.

The illustration shows a wheel mounted upon a true shaft and resting upon balancing ways. If the latter are not available the bed of a large lathe will make a very satisfactory substitute, provided it is level. The test weight shown on the side of the wheel is placed there merely for the purpose of assisting the operator to locate the heavy side of the wheel. It may be stuck on with wax or soap and its position and weight indicates to the operator at what point he must begin operations to restore the balance.

Having located the heavy side by allowing the slowly rolling wheel to come to rest upon the balancing ways (or the shears of the lathe) the collars are removed and a quantity of lead dug out of the bushing upon the side (diametrically) opposite to the weight. Remounting and testing the wheel again will show whether or not the correction has been properly made, and only by repeated trials can the wheel be brought to balance.

In extreme cases it may be necessary to dig out some of the abrasive material near the periphery of the wheel, but this should be undertaken only by an expert as it may introduce complications liable to lead to dangerous conditions. If a wheel is so badly out of balance as to require such treatment it would be better to rebush it.

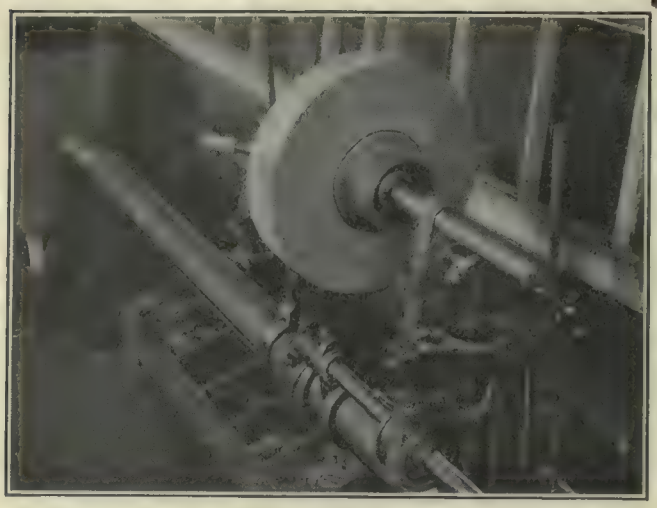


FIG. 15—GRINDING WHEEL ON THE BALANCING MACHINE

As evidence that a wheel may be sufficiently out of balance to make trouble without the operator being aware of the cause, it may be said that the wheel shown in Fig. 16 had just been taken from a grinding machine that was giving trouble because of "chattered" work. When all other possible sources had been looked after without result, the wheel was dismounted and sent to the balance test. The wheel as shown in the illustration is in static balance with the weight in place. The size and radial position of the weight will serve to convey an idea as to how much it was "out."

Fortunately, extreme cases of unbalance are rare, and a wheel may usually be restored to balance by digging a small amount of lead out of the bushing. Further, though the necessity for carefully balanced wheels has been emphasized, it is with the supposition that they are to be used upon work that must be accurate to size and nicely finished. A roughing wheel may be run in a condition of unbalance that could not be tolerated if the wheel were to be used for finishing.

A wheel should always be tested for faults in the structure before mounting it in the machine. This can be done very easily by suspending the wheel from a bar passed through the hole and striking it with a hard wooden object, such as a small mallet or the handle of a screwdriver. Metal objects, such as hammers, wrenches, etc., should never be used. A sound wheel will ring like a bell. Wheels are much more likely to be cracked in handling them into and out of storage than in service, and for this reason the sound test should never be neglected.

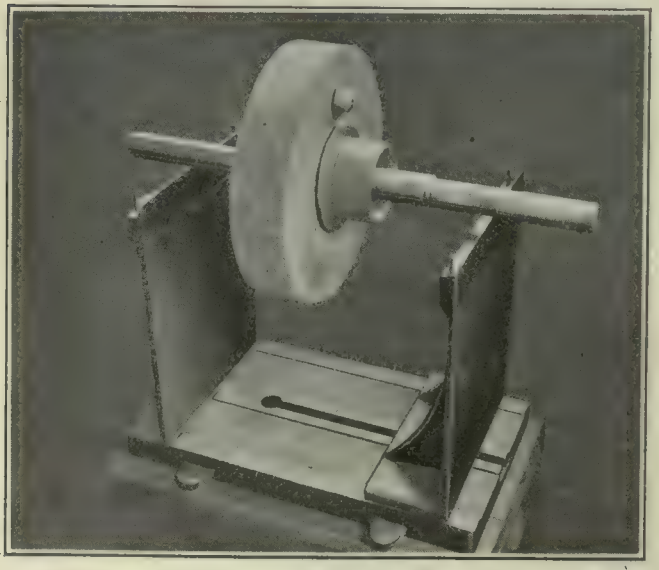


FIG. 16—PUTTING A WHEEL IN STATIC BALANCE

When out of service, wheels should be put away in racks where they may stand upright. Large wheels should never be piled flatwise or be so laid that other objects may be thrown upon them. Fig. 17 shows a storage rack in a factory that uses a large number of wheels. Shelves are provided for each size and compartments for each grain and grade. A substantial, raised rib along the front of each shelf prevents the wheels from rolling out and does not interfere materially with the easy removal of a wheel when wanted.

Small and thin wheels, especially elastic wheels, may be stacked flatwise preferably in drawers where they will not be in danger of being broken by other objects thrown upon them, but care should be taken to provide a flat surface for them to lie upon and nothing should be allowed to intervene to prevent them from getting a full bearing, otherwise they may be cracked. The wheel storage should be located in a dry place, for though a running wheel may be flooded with water or grinding compound without detriment, it should not be allowed to stand for any length of time in a damp place. Elastic wheels must be protected from undue heat to prevent them from warping.



FIG. 17—WHEEL STORAGE RACKS

There are two reasons why a grinding wheel should run true, and though they are unrelated they are both of vital importance. If a wheel does not run true it will wear away much more quickly than it ought because of the succession of shocks to which it is subjected, and the rapidity with which it wears away will be in increasing proportion to the amount it is out of round; therefore, frequent redressing is an economy rather than a waste, and a proper attention in this respect will prolong the life of the wheel.

The second reason is that it is impossible to produce accurate work with a wheel that is not round, and therefore all machines should be provided with means that will enable the operator to true the wheel accurately and without undue difficulty. Most grinding machines include in their design some means of holding a wheel-truing tool so that it may be brought into action without loss of time, and the operator is thus encouraged to keep his wheel in proper condition.

"Truing" and "dressing" are not necessarily synony-

mous terms. A wheel may be "dressed" for the purpose of removing the grains of abrasive that have become dulled, or particles of foreign matter that have become embedded in the surface because of loading, and thus be made to present clean sharp cutting points to the work.

There are upon the market many forms of wheel dressing tools, some composed of small star-shaped wheels of very hard steel, so mounted in a holder that



FIG. 18—DRESSING A WHEEL BY HAND

they may revolve freely when brought into contact with the grinding wheel, causing the sharp points to dig away the bond and release the dulled grains. Others are made with a single steel roll having sharp-edged helical grooves that serve the same purpose. It is essential with all dressers, the active agent of which is a steel wheel or wheels, that the latter revolve freely in the holder, else the metal will be ground away quickly and without effect upon the grinding wheel.

Such dressers as the above, may be, and frequently

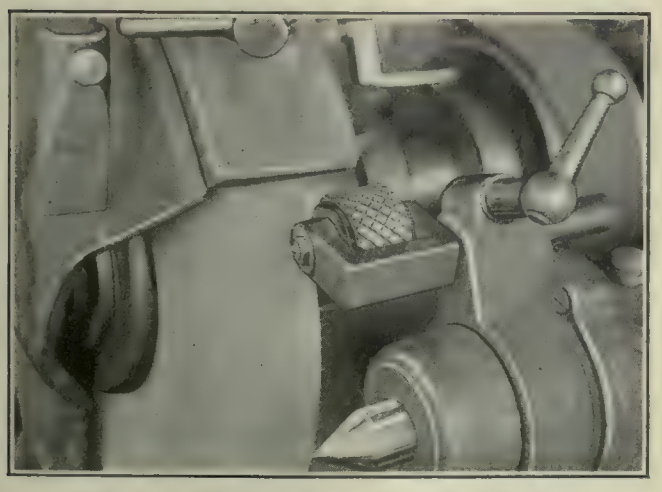


FIG. 19—WHEEL DRESSER IN THE MACHINE

are, applied by hand. In such case a rigid support should be provided for the tool, as in Fig. 18 where the dresser is resting upon a steel block on the table of the machine. A better way is to provide a fixture by means of which the dresser may be clamped in the diamond holder of the machine, as in Fig. 19.

Wheels can be dressed with fragments of broken

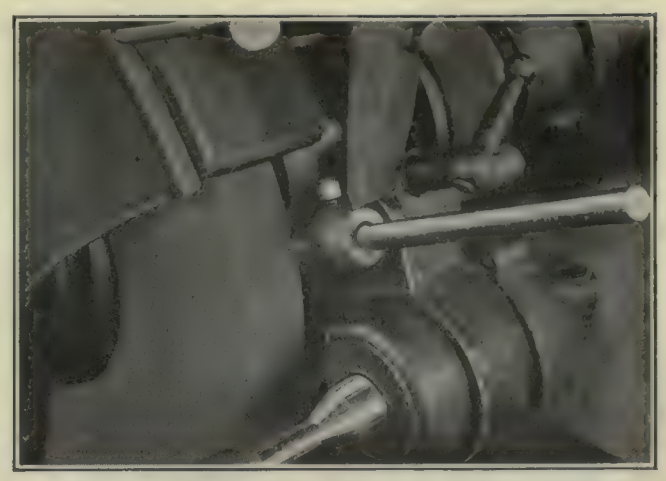


FIG. 20—THE DIAMOND HELD IN THE MACHINE

wheels, with crystals of abrasive held in metal tubes, or with small abrasive wheels mounted upon arbors that are arranged with handles to be held in the hands of the operator. In the hands of experts these tools are capable of producing a clean sharp surface upon the grinding wheel, and putting it in excellent condition for taking a roughing cut, but none of them will under any conditions make a wheel *true*. The only tool with which a grinding wheel may be trued is a diamond, and the only way to use a diamond to make a wheel true is to clamp it rigidly in a holder that is guided past the wheel face by the movement of the machine.

Hand diamond-tools are indispensable around cutter grinding machines, where the wheels have to be sharp rather than true, and often have to be formed to special shapes. A hand diamond-tool around a precision grinding machine is an anomaly and should never be tolerated.

How to Hold and Use a Diamond

In Figs. 20 and 21 are shown the proper way to hold and use a diamond in a cylindrical grinding machine. The table should be traversed by power at a slow rate of speed and a full flow of grinding compound should be directed upon the tool. Heat, in any degree ordinarily attainable under shop conditions, will not injure a free diamond, but when the stone is rigidly confined in a metallic holder the difference in the rate of expansion as between the metal and the stone is very likely to fracture the latter.

The terms loading and glazing are almost self-explanatory. Though they are far from being the same



FIG. 21—PROPER WAY TO TRUE A WHEEL



FIG. 22—SURFACE OF LOADED WHEEL

thing, the effect upon the work is very similar, for neither a loaded nor a glazed wheel will cut freely, and the result is undue friction and consequent heating of the work by reason of the wheel dragging over it.

Loading is the result of particles of the material being ground—the chips—becoming embedded in the surface of the wheel and filling the interstices between the abrasive grains until the latter do not project sufficiently far beyond the built-up surface to take a proper cut. Loading is much more likely to occur when grinding soft materials than harder ones, both for the reason that the chips are larger and the nature of the material lends itself more readily to the process.

Loading may be caused by forcing the cut too fast or too deep to allow the chips to be carried away. A fine grained wheel will not load as readily as a coarser one. A soft bonded wheel will not load as quickly as a hard bonded one. If the trouble is primarily due to the nature of the material being ground, increasing the speed of the wheel, using a softer bonded wheel, or using one of finer grain may be the means of effecting a cure without reducing the output of the machine.

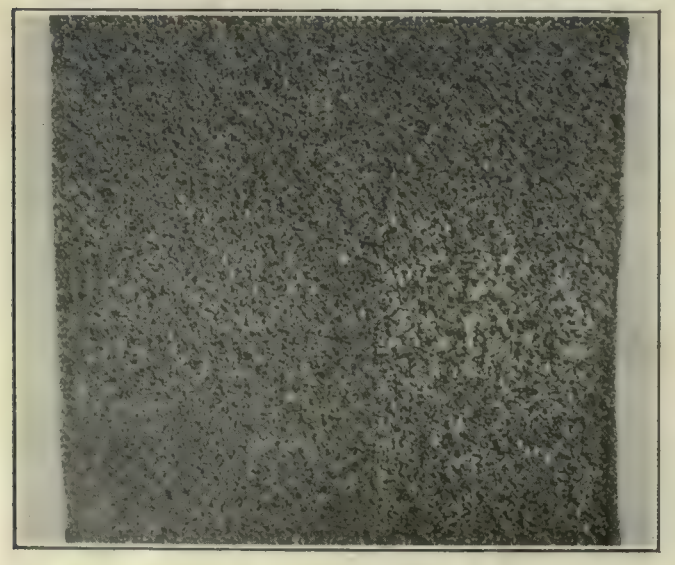


FIG. 23—SHARP AND GLAZED PORTIONS OF WHEEL FACE

Glazing is caused by the wearing away of the sharp edges of the grains until they no longer project above the bond, and is usually due to the use of a wheel that is too hard for its work, or, what amounts to the same thing, is running too fast. Reducing the speed of the wheel or changing to one of softer bond will cause the particles to break away more rapidly and thus renew the cutting surface, or the same result may be brought about by increasing the work speed or the radial depth of cut.

In Fig. 22 is shown a portion of the surface of a badly loaded wheel. It will be observed that comparatively large areas present a smooth appearance because of the material that has been forced into the grain of the wheel and has been dragged over the work. Fig. 23 shows the surface of a wheel that has been glazed over about one-third of its width, the remainder being sharp and clean.

The function of the lubricant in connection with grinding is twofold. In the first place it renders the passage of the abrasive across the work easier in some degree and acts in a measure to preserve the wheel.

The second, and perhaps the most important function of the lubricant, is to keep down the temperature of the work. Unfortunately a grinding wheel generates an intense and very localized heat, causing a distortion of the work that, if it were allowed to persist, would render accurate grinding impossible. It is not necessary that the work should remain cold, but the heat must be distributed as uniformly as possible. Some of the heat of grinding will be absorbed by the work anyway, regardless of the quantity of liquid that is poured upon it, but so long as the work does not become appreciably hotter in one place than another there will be little if any distortion.

Coolants or Lubricants

For the sole purpose of carrying away the heat there is nothing better than clear water, but water alone is not desirable for the reason that it will cause the machine and work to rust. Carbonate of soda in the proportion of ½ lb. of soda to the gallon of water will prevent the rust from forming but the soda solution will leave an unsightly residue upon the machine that is anything but easy to clean off. Two quarts of machine oil added to each five gallons of the soda solution renders the cleaning somewhat easier and also counteracts the corrosive action of the clear soda.

Clear machine oil has been used as a cooling or lubricating medium for grinding operations in some special cases, but no definite data are at hand to prove that the results obtained by its use warrant the extra cost. A mixture of machine oil and kerosene in equal parts has also been used.

In any mixture where oil, especially kerosene, is used, it is well to remember that such mixtures are inflammable and that grinding wheels in action produce sparks—even under water, therefore extraordinary precautions should be taken to guard against fire.

Whatever is used as a lubricant should be present in ample quantities at the point of contact of wheel and work, for an insufficient amount is worse than none at all as it introduces all the evil effects with none of the compensating advantages. An insufficient supply of cooling medium is extremely likely to cause checking of the surface of hardened work, and the operator should exercise especial care to see that nothing interferes with the free circulation of the liquid.

It Pays to Replace—

How a Shop Saved by Replacing Old Shop Equipment with New Equipment

BY WILLIAM F. HAUPT
Production Engineer, The Bates Manufacturing Co., Orange, N. J.

These articles won $10 prizes

IN RELATING the following experience, I believe that my associates in the various mechanical lines may feel interested in a field not so generally known. Exceedingly small and complicated devices, such as ours, do not seem to be represented in technical magazines to the same extent as those of the automotive and allied lines. Nevertheless, the writer acknowledges drawing from the experiences of our bigger brothers. Processes adopted on large work may often be applied to our small work though the difficulties sometimes seem unsurmountable. A common difficulty is that the average machine tool is too heavy for our work. Large numbers of special-built tools and devices are required to overcome this objection, and naturally it falls to the technical department to make up for this.

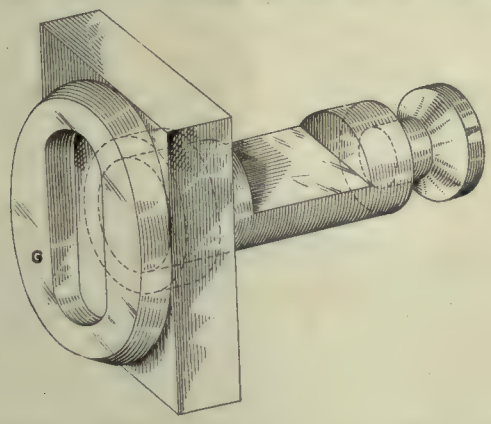


FIG. 1—DROP CYPHER FOR BATES NUMBERING MACHINE

In reducing costs through replacing old shop equipment with new equipment in our shop, one most striking example is herein related.

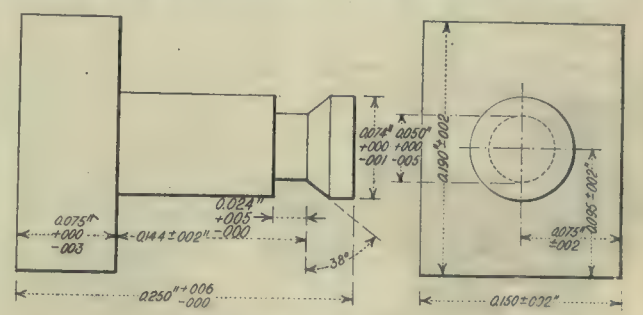
The component, known as the "drop cypher," and shown in Fig. 1, is used in considerable quantities and it is a very important component of the Bates automatic numbering machines. The sequence of operations given in Table I was adhered to for many years. A close study of these operations, in connection with Figs. 2 and 3, will show why all of them had to be performed, especially if reference is made to the machine-tool equipment provided for the job. The raw material used in connection with this process is also referred to, since it had a direct bearing on the replacement of the machine tools and in reduction of costs. This chain of operations was required in order to hold the limits on such small parts, and there were many complicated fixtures, chucks, gages and other tools required.

TABLE I—SEQUENCE OF OPERATIONS WITH OLD EQUIPMENT

Raw material: Special drawn rectangular screw rod, 0.150x0.190 in

Operation	Sequence	Machine
1	Form and cut off to dimensions shown in Fig. 2.....	Screw machine, semi-automatic
2	Face shank end, see Fig. 3...	Small bench lathe
3	Straddle mill head, see *B*, *B* and *C*, *C*, Fig. 3.....	Bench hand miller
4	Face head, see *D*, Fig. 3.....	Small bench lathe
5	Mill limit pin slot, see *E*, Fig. 3	Small hand miller
6	Hollow mill spring socket, see *F*, Fig. 3.....	Small bench lathe
7	Engrave, see *G*, Fig. 1.....	Special engraving machine
8	File burr engraved figure....	Special fixture

The present procedure in manufacturing the same part can best be understood by the new sequence of operations shown in Table II and the corresponding dimensions in Fig. 3. The first six operations in the old method have been replaced by one operation on the



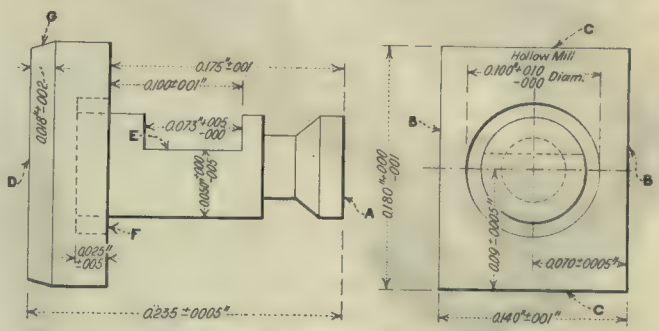


FIG. 2—SCREW MACHINE DIMENSIONS
FIG. 3—OPERATION REFERENCE DRAWING

In the contest, which closed July 5, nine prizes were given for articles telling how a shop saved by replacing old shop equipment with new equipment. Additional articles will be printed in forthcoming issues.

modern Brown & Sharpe automatic without sacrificing accuracy. In fact, the results are greater accuracy with larger output, reduced overhead and large reduction in production cost, especially the last, as can be seen from Table III, giving a comparative time study of both the old and new methods.

TABLE II—SEQUENCE OF OPERATIONS WITH NEW EQUIPMENT

Material: Free cutting round screw rod, $\frac{1}{4}$ in. in diameter

Operation	Sequence	Machine
1	Form complete and cut off..	No. 00 B. & S. automatic
2	Engrave cypher.....	Special engraving machine
3	Grind face of cypher.....	Special grinding machine

TABLE III—COMPARATIVE TIME-STUDY OF OLD AND NEW METHODS

Operation	Old Method	Time in Minutes for 1,000
1	Form and cut off.....	300
2	Face shank end.....	1,200
3	Straddle mill head.....	1,500
4	Face head.....	1,200
5	Mill limit pin slot.....	1,800
6	Hollow mill spring socket.....	1,200
7	Engrave.....	2,400
8	File burr, engraved figure.....	1,500
	Total, minutes.....	11,100

Operation	New Method	Time in Minutes for 1,000
1	Form complete and cut off.....	300
2	Engrave.....	2,400
3	Grind face of cypher.....	300
	Total, minutes.....	3,000

By Clyde G. Swartz
Owner of Machine Repair Shop, Bellefonte, Pa.

AFTER following the machinist's trade for 10 years, I connected with a company in Detroit manufacturing automobile axles, and was there for 6 years on tool work. The best and latest tools and equipment were used, and I learned the value of good tools.

In 1917 I came to Pennsylvania for a visit, and my uncle, who operated a machine repair shop, asked me to help him out for a few days. He was a machinist of the old type, known as the best for miles around. I happen to know several men who served under him, three of whom are now holding jobs as works manager, at salaries from $8,000 to $12,000 a year.

When I started to help him out the first thing I did was to burn a carbon drill. Being accustomed to high-speed drills, I used too much speed. I induced my uncle to adopt the high-speed drill on certain work, with a saving in time and money.

On a piece to be chucked true in the lathe and then machined I watched my uncle try for half an hour with a piece of chalk and then said, "Let me set it up." With my Starrett indicator I had it true in less than two minutes.

He wanted a shaft turned, one end to be the proper size for a press fit, and told me that he would do the finish turning after I had roughed it. Then he was called out of the shop, and when he returned in a half hour I had the shaft ready to be pressed into place. I showed him how, by using Brown & Sharpe inside and outside micrometers, instead of inside and outside calipers, there was no guess work.

The next move was to get an Armstrong boring bar to replace the forged tools. Then we had a lot of parts to ream to fit machined parts. For that work we bought a set of Critchley-pattern expansion reamers.

After I had worked in that shop for a year and a half and had learned many little things that are never seen in a big shop my uncle became borough manager, and I bought the shop. Then I started in to get equipment that suited our work.

Among my first jobs was a call to put a keyway, 1x$\frac{3}{8}$ in., 3 ft. long, in a shaft 5 in. in diameter. I told the customers that the job would require about two weeks with a cold chisel, but that if I might have a week before beginning the job, I'd finish it in a day. They consented and I bought a John T. Burr (Brooklyn, N. Y.) keyseating machine and easily did the job in a day. In fact an apprentice boy did it.

I bought a Gould & Eberhardt back-geared shaper to replace the old single-stroke shaper. Next I got a Cincinnati tool-post grinder for grinding centers, and for the first time in that shop had the pleasure of seeing centers ground right. I was able, also, to grind the reamers that I made for special jobs. After that I bought a back-geared drill press to replace the old machine that ran too slow on small drills and too fast on big ones. Another improvement was the purchase of a belt lacer to do away with the raw hide laces we had been using.

By experiences such as related I have found that tools which are up-to-date are time- as well as money-savers. It is true in all shops, whether the work is held to 0.0001 or $\frac{1}{64}$ in. As the contest is limited to what has been done I will not tell what I hope to do later on with my up-to-date tools and equipment.

This article won honorable mention

By Axel Halvorsen
Master Mechanic
McCormick Bros. Co., Albany, Indiana

IN OUR plant we do a great amount of countersinking on pressed steel articles. This operation until recently was done on a single spindle drill press. As many of the articles have two to six holes to be countersunk, and in a number of cases two or more of the holes equally spaced, we purchased a Buhr multiple drill-head manufactured by Nelson-Blanck of Detroit. The drill head had to be special to serve our purpose, it being a two spindle adjustable head equipped with a center spindle with vertical adjustment of the two outer spindles. This arrangement gives a range from 1 to 8 in. between spindles and enables us to countersink three holes in a straight line, equally spaced.

The drill press on which this head was fitted was equipped with a foot feed, leaving both of the operator's hands free to handle the articles, and simple fixtures were provided to hold the work in place.

On one piece having three holes to be countersunk the production was more than doubled. On another piece having six holes (of which four were equally spaced in pairs), two spindles were used on the four holes and the other two holes countersunk one at a time, the production was increased 50 per cent. On a small angle having one hole to be countersunk, the operator handled two pieces at a time, using two spindles and the production was increased 100 per cent.

The three instances show that this replacement pays good interest on the investment made and will in a very short time pay for itself.

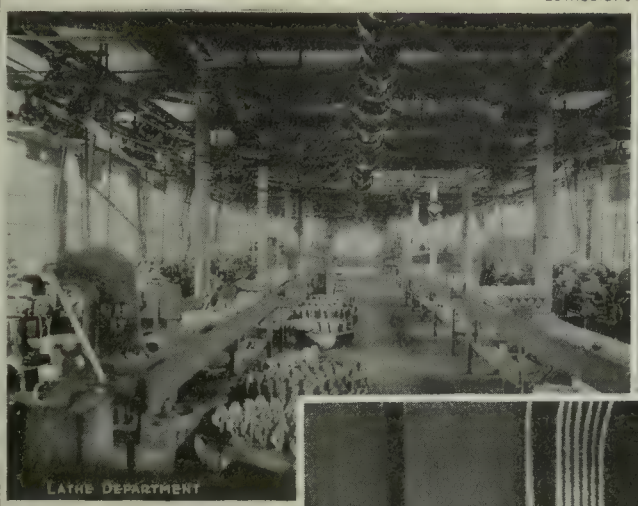




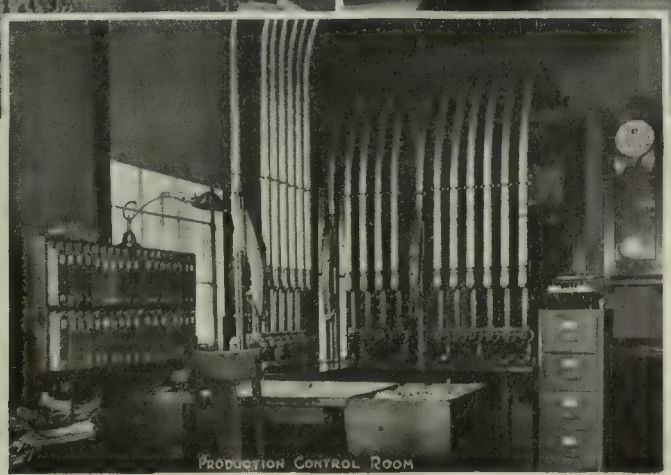
Where Machine Tools are Made



THE GEOMETRIC TOOL CO.
ESTABLISHED 1895









Z-R-1 NEARING COMPLETION



ANOTHER VIEW OF THE ZR-1

THE U.S. NAVY'S

ZR-1 ~ 680 FEET LONG ~ 80 FEET IN



Photo by W. N. Jennings

NAVY DIRIGIBLE HANGAR AT LAKEHURST



SOME OF THE 113 GAL. FUEL TANKS



PART OF 15,000 BOTTLES OF HELIUM FOR FILLING



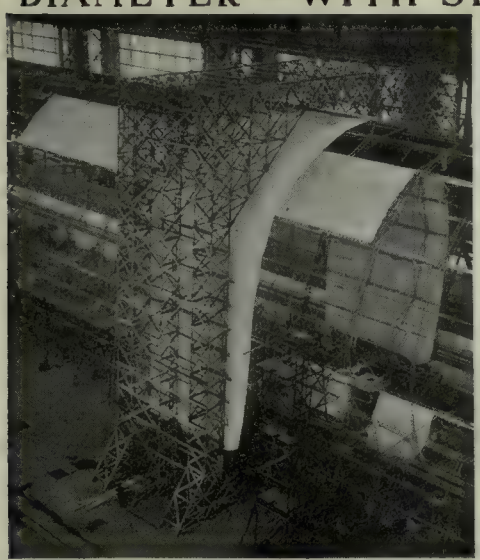
ASSEMBLING ONE OF THE MAIN FRAME RINGS



SCAFFOLDING USED IN ERECTION

NEW DIRIGIBLE

DIAMETER ~ WITH SIX 300 HP. ENGINES



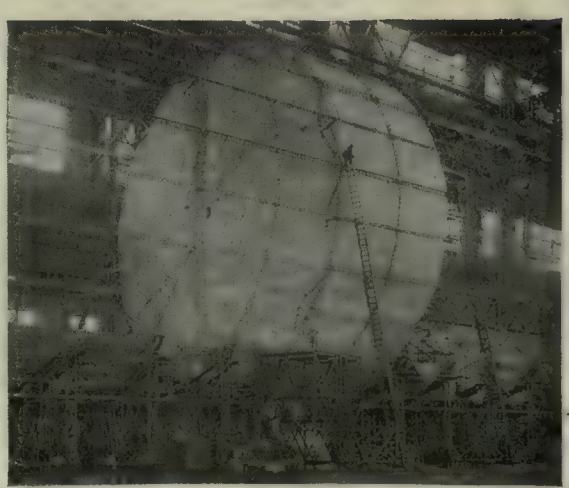
BRIDGE OVER SHIP FOR GAS BAG TEST



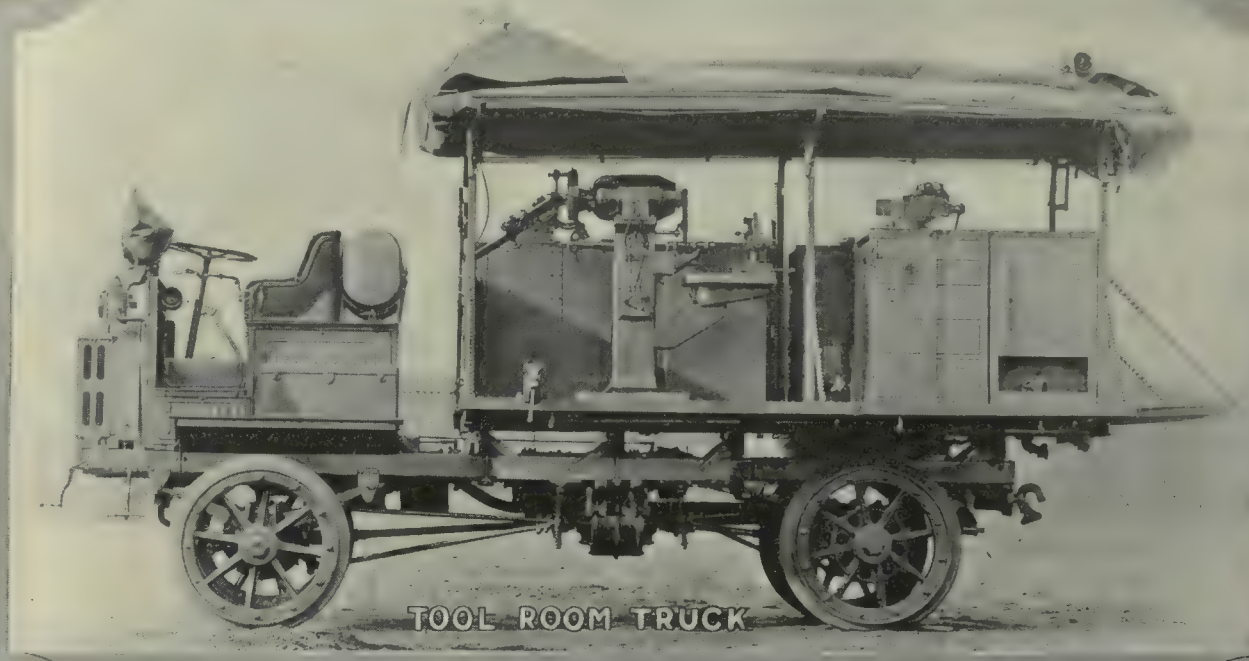
INTERIOR VIEW OF FRAME WORK



GAS BAG READY FOR TEST



ONE GAS BAG INFLATED IN PLACE



TOOL ROOM TRUCK

It carries a combination cutter and drill grinder, a key bitting machine, two vises and five cabinets of drawers containing tools

Mobile Machine Shops of U.S. Army



ARTILLERY REPAIR TRUCK

It carries an engine-motor-generator set, lathe and equipment, drill press, bench grinder, air compressor set, welding and cutting outfit

Factors Governing the Strength of Gear Teeth

By DOUGLAS T. HAMILTON

The final article—Velocity—Accuracy—Method of mounting—Measurements and allowances for backlash

THE EFFECT of velocity upon the strength of gear teeth has been the subject of much discussion. It is now generally appreciated, however, that the accuracy of the teeth in respect of involute tooth shape and tooth spacing, and the method of mounting the gears, has a great deal to do with their satisfactory operation from the standpoint of both strength and quietness of action.

In testing the accuracy of gears, the following three points must be given careful consideration:

(1) Involute tooth shape
(2) Tooth spacing
(3) Concentricity

All three factors more or less affect the proper operation of the gears, and at high speeds, their strength. The strength of a gear tooth under static load, that is at rest, is considerably greater than when it carries the same load under operation. The effective strength of the tooth decreases with an increase in velocity. The reason for this is that the impact is much greater when the gears are operated at high speeds, than is the case when the pitch line velocity is lower. Therefore, the velocity at which the gears are to be operated must be taken into consideration when calculating the strength of the teeth.

The method commonly used for dealing with the subject of velocity, is to use a safe stress for the materials from which the gears are made, and decrease the safe stress as the velocity is increased. What is known as the "Barth Formula" is used in connection with the "Lewis Formula" for the velocity, or so-called speed, factor. The Barth formula for determining the safe stress for the material at different speeds is:

$$S = S_1 \left(\frac{600}{600 + V}\right)$$

in which, S = safe unit stress for material at given velocity.

S_1 = safe static unit stress, which is generally considered as being equal to $\frac{2}{3}$ of the elastic limit.

V = velocity at pitch line in feet per minute.

The Barth formula is not considered as being satisfactory for very high circumferential speeds, because it has since been found that stresses due to impact do not increase directly with the speed, but as the square of the pitch velocity. These stresses which are imposed on the tooth are partially due to tooth deflections, but still more so to irregularities in tooth outline, and they impose an additional load on the tooth, which is known as the increment load.

If it were possible to conceive that the materials used for gears were absolutely rigid, and that the teeth could be cut absolutely correct, then gears would satisfactorily transmit the same load at high or low speeds. The capacity, however, of gears made from commercial materials, and cut to commercial limits of accuracy, decreases with the square of the pitch velocity. The so-called increment load which is created by tooth de-

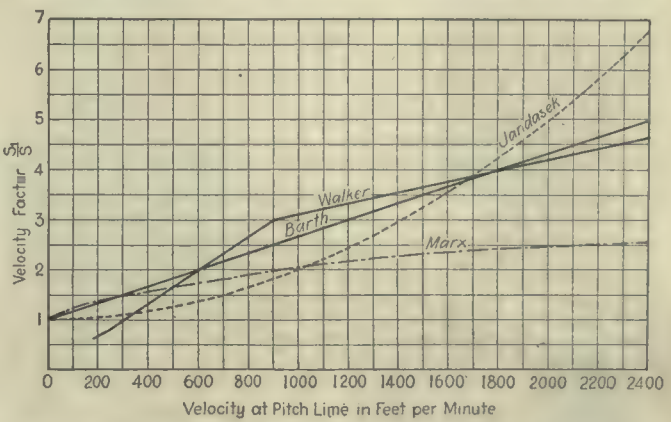


FIG. 23—COMPARATIVE VALUES OBTAINED BY DIFFERENT RULES AND FORMULAS FOR THE VELOCITY FACTOR—COMPARED FROM A QUALITATIVE AND NOT A QUANTITATIVE STANDPOINT

flections and irregularities of outline sometimes equals the applied load, and at excessively high speeds may be several times the applied load. The tooth will fracture when the combined applied and increment load produces a stress that exceeds the ultimate strength of the tooth, and the teeth will wear out rapidly when the combined load exceeds the compressive strength of the material.

Slight irregularities in pitch line velocity produce stresses which, in turn, cause deflections that wear the tooth out of shape. The fact that the strength decreases as the square of the pitch velocity, due to impact, suggests the necessity for the greatest possible accuracy in workmanship, and mathematical accuracy in calculating tooth outlines and shapes, in order that gears can be made to operate at high speeds under heavy loads.

This theory of impact helps to explain the smoothness of action, long life and efficiency of properly cut helical and herringbone gears, and especially when they are

operated at high speeds. Gears having helical teeth are superior to spur gears for the following reasons. With inclined teeth, one pair of teeth remain in mesh until the following pair is well engaged, so that at no time is there a sudden transfer of the load from one tooth to the next, as in the case with spur gears. The load is gradually put on a tooth, and just as gradually taken off, so that the strain on the teeth is almost constant, and the sudden shock of impact common to ordinary spur gears is avoided.

The subject of pitch velocity and its effect on the strength of gear teeth, was first introduced by Oscar

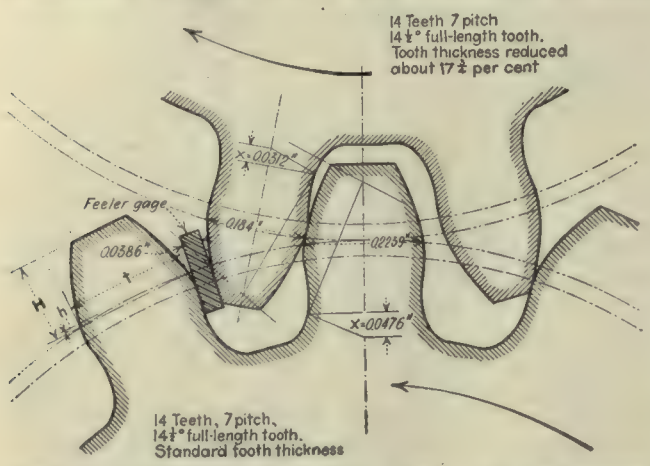


FIG. 24—DIAGRAM SHOWING HOW AN EXCESSIVE AMOUNT OF BACKLASH REDUCES THE STRENGTH OF GEAR TEETH.

Lasché of Berlin in 1899. His contention was that these irregularities in tooth shape produced an excess load on the tooth proportional to the square of the speed. That this method of reasoning was along sound lines is probably best proven by the fact that a gear which is apparently sufficiently strong will break after being in use for some time. The reason for this is that wear of the teeth has resulted in increasing variations in tooth action, producing irregularities in pitch line velocity, thus increasing the load on the tooth to such an extent that failure results.

The first definite attempt to take into account the effect of speed on the strength of gear teeth was made by E. R. Walker, who adopted safety factors. These factors varied all the way from 3 for very slow speeds up to 14 for speeds of 2,400 ft. per min. For instance, assuming a maximum safe unit stress for the material of 24,000 lb. per sq.in., these factors would give a safe load for speeds up to 100 ft. per min. of 8,000 lb. per sq.in., which would be reduced to 1,714 lb. per sq.in. for speeds of 2,400 ft. per minute.

This method of taking care of the speed factor was used by Wilfred Lewis in his paper on "Investigations of the Strength of Gear Teeth," presented before the Engineers' Club of Philadelphia in 1892.

A modification of this method was later suggested by Carl Barth, in which the safe stress was determined by a formula as previously mentioned. It will be noticed in the Barth formula that no definite limit is set for speed, as is the case with the rule just mentioned. At a surface speed of 100 ft. per min. there is a considerable difference between these two rules. For instance, if we take two-thirds of 24,000 or 16,000 lb. per sq.in. as the safe unit stress on cast-iron gear teeth, the Barth formula would give a safe load of 13,712 lb. per sq.in., which is approximately two-thirds greater than that recommended by the Walker rule for the same speed.

In actual breaking tests conducted by Prof. Guido H. Marx in 1912, it was found that a good grade of cast iron, such as would be used for gears, had a modulus of rupture of 39,000 lb. per sq.in., and that an 8-inch, 30-tooth gear having 14½ deg. involute teeth of 1¼-in. face, broke at a speed of 500 ft. per min. when a load of 1,700 lb. was applied. This is equivalent to a modulus of rupture of 48,770 lb. per sq.in. It was also shown by these tests that the Walker rule was easily on the safe side.

Investigations made at McCook Field during the late war indicated that the Barth addition to the Lewis formula could not safely be used for speeds above 2,150 ft. per min., and that the principle laid down by Lasché was by far the safer rule to follow in designing high speed, high efficiency gearing.

A comparison of the rules and formulas so far suggested, together with one other to be given later, is presented diagrammatically in Fig. 23. These curves are laid out on a qualitative and not a quantitative basis. It will be noticed that with the Walker rule, the strength of the tooth decreases very rapidly for speeds from 180 to 900 ft. per min., and beyond this, the affect of speed has a lessened value from the standpoint of strength. The Barth formula shows an almost uniform reduction, but rises higher at 1,400 ft. per min. than the Walker rule. The Marx curve, on the other hand, does not rise anywhere nearly as rapidly after 200 ft. per min., as do either the Walker or Barth curves.

A curve suggested by Joseph Jandasek, and which is based on the principle suggested by Lasché, shows more pronounced reductions in strength. It is evident that beyond 1,700 ft. per min., this curve gives lower values for the safe unit stress than any of the others.

The Jandasek curve is based on the following formula, the same terms being used as those given in the Barth formula:

$$S = 1 + \frac{S_1}{\left(\frac{V}{1000}\right)^2}$$

The formula for determining the increment load, W_1 is:

$$W_1 = P\left(\frac{V}{1000}\right)^2$$

in which, W_1 = increment load in lb. per sq.in.
P = maximum tooth pressure.
V = velocity at pitch line in ft. per min.

Table V gives the velocities at the pitch line in ft. per min. for gears of different diameters, ranging all the way from 1 to 36 in. pitch diameter and operating at speeds of from 100 to 2,400 r.p.m. Table VI gives in condensed form a collection of formulas used in calculating the strength of gear teeth.

Sufficient has been said to show that gears must be accurately made if satisfactory results are to be expected, and this is especially true if the gears are to operate at high speeds and carry heavy loads. Between the three main requirements given, involute tooth shape, tooth spacing and eccentricity, there is very little to choose, and in many cases it is difficult to gage the gears correctly, unless all of the elements are tested separately. The gaging and inspection of gears is a very important necessity if high speed, high efficiency gearing is desired.

TABLE V— VELOCITY AT PITCH LINE IN FEET PER MINUTE

Pitch Dia. In. Inches	Revolutions Per Minute											
	100	200	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,400
	Velocity at Pitch Line in feet Per minute											
1	26	52	105	157	209	262	314	366	419	471	523	628
1¼	33	65	131	196	262	327	393	458	563	589	654	785
1½	39	78	157	235	314	393	471	550	628	707	785	942
1¾	46	91	183	275	366	458	550	641	733	824	916	1,099
2	52	105	209	314	419	523	628	733	838	942	1,047	1,256
2½	65	131	262	393	524	654	785	916	1,047	1,178	1,309	1,571
3	78	157	314	471	628	785	942	1,109	1,257	1,414	1,571	1,885
3½	92	183	366	560	733	916	1,099	1,283	1,466	1,649	1,832	2,199
4	105	209	419	628	838	1,047	1,256	1,466	1,675	1,885	2,094	2,513
5	131	262	523	785	1,047	1,309	1,571	1,833	2,094	2,365	2,618	3,142
5½	144	288	576	864	1,152	1,440	1,728	2,016	2,304	2,592	2,880	3,456
6	157	314	628	942	1,257	1,571	1,885	2,199	2,513	2,827	3,142	3,770
6½	170	340	681	1,021	1,361	1,702	2,042	2,382	2,763	3,063	3,403	4,084
7	183	366	733	1,099	1,466	1,832	2,199	2,566	2,932	3,299	3,665	4,398
7½	196	393	785	1,178	1,571	1,963	2,356	2,749	3,142	3,534	3,927	4,712
8	209	419	838	1,256	1,675	2,094	2,513	2,932	3,351	3,770	4,189	5,026
8½	222	445	890	1,333	1,780	2,225	2,670	3,115	3,560	4,005	4,451	5,341
9	235	471	942	1,441	1,885	2,356	2,827	3,299	3,770	4,241	4,712	5,655
9½	249	497	995	1,492	1,989	2,487	2,984	3,482	3,979	4,477	4,974	5,969
10	262	523	1,047	1,571	2,094	2,618	3,142	3,665	4,189	4,712	5,236	6,283
11	288	576	1,152	1,728	2,304	2,880	3,456	4,032	4,608	5,184	5,759	6,911
12	314	628	1,256	1,885	2,513	3,142	3,770	4,398	5,026	5,655	6,283	7,540
13	340	681	1,361	2,042	2,723	3,403	4,084	4,765	5,445	6,126	6,807	8,168
14	366	733	1,466	2,199	2,932	3,665	4,398	5,131	5,863	6,597	7,330	8,796
15	393	785	1,571	2,356	3,142	3,927	4,712	5,498	6,283	7,069	7,854	9,425
16	419	838	1,675	2,512	3,350	4,189	5,026	5,864	6,702	7,540	8,377	10,053
17	445	890	1,781	2,670	3,560	4,451	5,341	6,231	7,121	8,011	8,901	.....
18	471	942	1,885	2,827	3,770	4,712	5,655	6,597	7,540	8,482	9,425	.....
19	497	995	1,989	2,984	3,979	4,974	5,969	6,964	7,960	8,953	9,948	.....
20	523	1,047	2,094	3,142	4,189	5,236	6,283	7,330	8,378	9,425	.....	.....
22	576	1,152	2,304	3,456	4,608	5,759	6,911	8,063	9,215	10,367	.....	.....
24	628	1,256	2,513	3,770	5,026	6,283	7,540	8,796	10,053	.....	.....	.....
26	681	1,361	2,723	4,084	5,445	6,807	8,168	9,529	.....	.....	.....	.....
28	733	1,466	2,932	4,398	5,864	7,330	8,796	10,262	.....	.....	.....	.....
30	785	1,571	3,142	4,712	6,283	7,854	9,424	.....	.....	.....	.....	.....
32	838	1,675	3,351	5,026	6,702	8,378	10,053	.....	.....	.....	.....	.....
34	890	1,781	3,560	5,341	7,121	8,901	.....	.....	.....	.....	.....	.....
36	942	1,885	3,770	5,655	7,540	9,425	.....	.....	.....	.....	.....	.....

In calculating the strength of a gear tooth, the width of face is always considered as one of the important factors. If the gears are so mounted, however, that a full-width tooth bearing is not obtained, then the gear tooth will be carrying a greater load than that for which it was designed. It is, therefore, generally advisable to consider that only three-quarters of the full face actually contacts. This provides a factor of safety that is found advantageous when the bearings become worn so that the gears are not held in perfect contact across their entire face.

Backlash in gearing is provided so that slight in-

TABLE VI—RULES AND FORMULAS FOR DETERMINING THE STRENTH OF GEAR TEETH

Rule No.	To Find	Rule	Formula
1	Torque (T) in lb.	Multiply 63,025 by the hp. and divide the result by the r.p.m.	$T = \frac{63.025 \times hp.}{R}$
2	Tangential Force (F)	Divide torque in in. lb. by pitch radius of driving gear	$F = \frac{T}{r}$
3	Velocity (V) at pitch line in ft. per min.	Multiply product of pitch diameter of gear in in. and r.p.m. by 0.2618	$V = 0.2618\,DR$
4	Maximum tooth pressure (P)	Multiply secant of pressure angle by tangential force in lb. per sq. in.	$P = \sec \alpha \times F$
5	Allowable unit stress (S) at given velocity	Multiply allowable static stress by 600, and divide result by velocity in ft. per min. plus 600 (Barth Formula)	$S = S_1 \left(\frac{600}{600 + V}\right)$ *
6	Allowable unit stress (S) at given velocity	Divide the safe stress (S_1) by 1 plus the square of velocity in ft. per min. divided by 1000	$S = \frac{S_1}{1 + \left(\frac{V}{1{,}000}\right)^2}$ †
7	Increment load (W)	Divide velocity at pitch line in ft. per min. by 1,000; square result and multiply by maximum tooth pressure (P)	$W_1 = P\left(\frac{V}{1{,}000}\right)^2$
8	Maximum safe tangential tooth load (W) at pitch line	Multiply the allowable stress (S) (Formula 6) by the face width of the gear in in. and the value of x. Then multiply result by 2 and divide by 3	$W = 2\,\frac{(Sfx)}{3}$ ‡
9	Horsepower (hp)	Multiply maximum safe tangential load by velocity in ft. per min., and divide product by 33,000	$hp = \frac{WV}{33{,}000}$

*This formula is not safe for speeds of 2,000 surface ft., and over, per min.
†This formula is preferable for high speed, high efficiency. gearing—see text.
‡This is the Lewis formula in a simplified form.

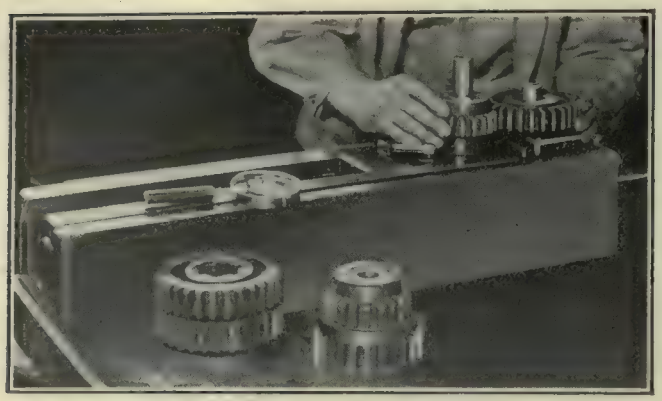


FIG. 25—MEASURING BACKLASH BY THE "VARIATION" IN CENTER DISTANCE METHOD.

accuracies in tooth shape and tooth spacing will not interfere with the free operation of the gears. This factor seldom needs to be considered, unless an excessive amount of backlash is allowed, or when the gears must stand reversal of motion while under load. Fig. 24 shows what effect an excessive amount of backlash has on the strength of gear teeth. Here we have two 14-tooth gears of 7-pitch, full-length tooth form operating at the standard center distance. To simplify the problem, only the teeth of one gear have been reduced in thickness, although of course, in actual practice this would not be the case, unless a small pinion was to operate with a much larger gear and the teeth of the gear only were reduced in thickness, so that the pinion

TABLE VII.—CHORDAL TOOTH THICKNESS AND CORRECTED ADDENDUM FOR GEARS OF ONE DIAMETRAL PITCH, FULL-LENGTH TOOTH

(For Notation, see Fig. 24)

No. of Teeth	Chordal Tooth Thickness, t	Corrected Addendum, H	Correction, h	No. of Teeth	Chordal Tooth Thickness, t	Corrected Addendum, H	Correction, h
8	1.56072	1.07686	0.07686	32	1.57016	1.01927	0.01927
9	1.56283	1.06836	0.06836	33	1.57020	1.01869	0.01869
10	1.56434	1.06158	0.06158	34	1.57024	1.01814	0.01814
11	1.56546	1.05597	0.05597	35	1.57027	1.01762	0.01762
12	1.56631	1.05133	0.05133	36	1.57030	1.01713	0.01713
13	1.56697	1.04733	0.04733	37	1.57032	1.01667	0.01667
14	1.56750	1.04401	0.04401	38	1.57035	1.01623	0.01623
15	1.56793	1.04109	0.04109	39	1.57037	1.01581	0.01581
16	1.56827	1.03852	0.03852	40	1.57039	1.01541	0.01541
17	1.56856	1.03623	0.03623	41	1.57041	1.01504	0.01504
18	1.56880	1.03425	0.03425	42	1.57043	1.01468	0.01468
19	1.56901	1.03245	0.03245	43	1.57045	1.01435	0.01435
20	1.56918	1.03083	0.03083	44	1.57046	1.01401	0.01401
21	1.56933	1.02936	0.02936	45	1.57048	1.01371	0.01371
22	1.56946	1.02803	0.02803	46	1.57049	1.01318	0.01318
23	1.56957	1.02681	0.02681	47	1.57050	1.01312	0.01312
24	1.56967	1.02569	0.02569	48	1.57051	1.01285	0.01285
25	1.56976	1.02466	0.02466	49	1.57052	1.01259	0.01259
26	1.56984	1.02372	0.02372	50	1.57053	1.01234	0.01234
27	1.56991	1.02284	0.02284	51	1.57053	1.01209	0.01209
28	1.56997	1.02202	0.02202	52	1.57055	1.01186	0.01186
29	1.57003	1.02126	0.02126	53	1.57056	1.01164	0.01164
30	1.57008	1.02056	0.02056	54	1.57057	1.01142	0.01142
31	1.57012	1.01989	0.01989	55	1.57058	1.01121	0.01121

would have the greatest possible strength. These teeth have been thinned from a standard chordal tooth thickness of 0.2239 in. (see Table VII), to 0.184 in. This gives 0.0386 in. backlash as measured with a feeler gage. It should be noted here that the backlash between the teeth is measured in a plane containing the line of action.

A comparison of these teeth from the standpoint of strength, shows that the teeth which are made to standard tooth thickness have an "x" value of 0.0476, whereas, the teeth which have been reduced to 0.184 in. have an "x" value of only 0.0312. In other words 0.0386 in. backlash has in this case reduced the strength of the teeth, so thinned, 34½ per cent as compared with a reduction in tooth thickness of only 17¾ per cent. Or, looking at it from still another standpoint, this 7-pitch, 14-tooth gear has been reduced in strength, so that it equals that of a 14½ deg. full-length 9-pitch tooth.

There are two common methods of obtaining backlash when cutting gears by the generating process. One is to feed the cutter in to a greater depth than standard; the other is to use a cutter having teeth which are thicker than standard, and to feed the cutter in to standard depth. The second method necessitates the

TABLE VIII.—CHORDAL TOOTH THICKNESS AND CORRECTED ADDENDUM FOR GEARS OF ONE DIAMETRAL PITCH, FULL-LENGTH TOOTH

(For Notation, See Fig. 24)

No. of Teeth	Chordal Tooth Thickness, t	Corrected Addendum, H	Correction, h	No. of Teeth	Chordal Tooth Thickness, t	Corrected Addendum, H	Correction, h
56	1.57059	1.01102	0.01102	80	1.57068	1.00771	0.00771
57	1.57059	1.01082	0.01082	81	1.57068	1.00762	0.00762
58	1.57060	1.01063	0.01063	82	1.57069	1.00752	0.00752
59	1.57061	1.01045	0.01045	83	1.57069	1.00743	0.00743
60	1.57062	1.01028	0.01028	84	1.57069	1.00734	0.00734
61	1.57062	1.01011	0.01011	85	1.57069	1.00725	0.00725
62	1.57062	1.00995	0.00995	86	1.57070	1.00717	0.00717
63	1.57063	1.00979	0.00979	87	1.57070	1.00713	0.00713
64	1.57064	1.00964	0.00964	88	1.57070	1.00701	0.00701
65	1.57064	1.00949	0.00949	89	1.57070	1.00693	0.00693
66	1.57064	1.00934	0.00934	90	1.57070	1.00685	0.00685
67	1.57065	1.00921	0.00921	91	1.57071	1.00678	0.00678
68	1.57065	1.00907	0.00907	92	1.57071	1.00671	0.00671
69	1.57065	1.00884	0.00884	93	1.57071	1.00664	0.00664
70	1.57066	1.00881	0.00881	94	1.57071	1.00657	0.00657
71	1.57066	1.00869	0.00869	95	1.57072	1.00649	0.00649
72	1.57066	1.00857	0.00857	96	1.57072	1.00641	0.00641
73	1.57067	1.00845	0.00845	97	1.57072	1.00634	0.00634
74	1.57067	1.00834	0.00834	98	1.57072	1.00631	0.00631
75	1.57068	1.00822	0.00822	99	1.57072	1.00623	0.00623
76	1.57068	1.00812	0.00812	100	1.57073	1.00617	0.00617
77	1.57068	1.00801	0.00801	110	1.57074	1.00561	0.00561
78	1.57068	1.00791	0.00791	120	1.57075	1.00514	0.00514
79	1.57068	1.00781	0.00781	Rack	1.57080	1.00000	0.00000

use of special cutters, but is to be preferred when a large number of gears of one particular size is to be cut. A third method, but one that is not generally used, is to cut the teeth to standard depth and thickness, and then increase the center distance, so that the gears are pulled apart to give the necessary backlash.

There are also two common methods of measuring backlash. One is to use a feeler gage, as illustrated in Fig. 24, and place it between the opposing involute faces of the teeth when the gears are held at the standard center distance. By this method, it will be noticed, the backlash is measured in a plane containing the line of action. In calculating the chordal tooth thickness of gears, so that backlash can be measured by means of the gear tooth caliper, Tables VII and VIII will be found convenient. In order to find the chordal tooth thickness and corrected addendum for any pitch, the values given in the table are divided by the pitch. For instance, the chordal tooth thickness and corrected addendum for a 7-pitch, 14½- deg. full-length gear having 14 teeth, would be 1.56750 ÷ 7 = 0.2239 in. for the

chordal tooth thickness; and 1.04401 ÷ 7 = 0.1491 in. for the corrected addendum.

For stub-tooth gears these tables are used somewhat differently. The chordal tooth thickness is found as explained above, using the numerator of the pitch fraction as the divisor; but, in order to find the corrected addendum, the "correction" for the required number of teeth is also divided by the numerator of the pitch fraction, and the result added to the addendum.

CHORDAL TOOTH THICKNESS OF STUB-TOOTH GEAR

For example, the chordal tooth thickness and corrected addendum of a 15-tooth, 4/5-pitch gear, would be found as follows:—The chordal tooth thickness would be equal to 1.56793 ÷ 4 = 0.39198 in. To find the corrected addendum, divide the correction for 15 teeth, or 0.04109 by 4 giving 0.01027 in. for the correction; then add this correction to the standard addendum for a 4/5-pitch gear, which is 0.200 + 0.01027 = 0.21027 in. for the corrected addendum.

The other method of measuring backlash is to place the gears on studs on a gear testing fixture in a similar manner to that illustrated in Fig. 25. The slide carrying one of the pins must be movable, and the movement of this slide can be determined either by a vernier scale or a dial indicator. When a dial indicator is used, the pins are set at the correct center distance by measuring across them; then the gears are placed on the pins and brought into close mesh with each other. The movement of the indicator needle from the zero point indicates the amount of backlash, but it is not measured directly, and must be computed by means of the following formula, the results of which for convenience are given in Table IX.

TABLE IX—DIFFERENCE BETWEEN STANDARD AND MEASURED CENTER DISTANCE, AND AMOUNT OF BACKLASH BETWEEN GEAR TEETH THAT THIS DIFFERENCE REPRESENTS

Backlash in Inches	Difference between Standard and Measured Center Distance	
	14½ deg. Full-length Tooth	20 deg. Stub Tooth
0.0010	0.0019	0.0014
0.0015	0.0029	0.0020
0.0020	0.0038	0.0028
0.0025	0.0048	0.0034
0.0030	0.0058	0.0043
0.0035	0.0068	0.0049
0.0040	0.0077	0.0057
0.0045	0.0087	0.0062
0.0050	0.0097	0.0070
0.0060	0.0116	0.0082
0.0070	0.0135	0.0096
0.0080	0.0155	0.0110
0.0090	0.0174	0.0124
0.0100	0.0192	0.0136
0.0110	0.0211	0.0150
0.0120	0.0230	0.0164
0.0130	0.0250	0.0178
0.0140	0.0270	0.0192
0.0150	0.0290	0.0200
0.0160	0.0308	0.0220

$$b = 2 \tan \alpha \times c$$

in which b = backlash in in.

c = difference between standard and measured center distance.

α = pressure angle of the teeth.

For example, assume that we want to determine the backlash between two gears of 14 and 28 teeth, 14½ deg. pressure angle. Suppose the indicator needle shows 0.0155 in. movement, then the backlash would be:

2 tan 14½ deg. × 0.0155 = 0.51724

× 0.0155 = 0.008 in. backlash.

The amount of backlash to allow is governed by several conditions, three of the most important of which are:

(1) Accuracy of the gears
(2) Diametral pitch
(3) Nature of load

It is evident that sufficient backlash must be provided so that the gears will operate freely. If the teeth are unevenly spaced, eccentric, or imperfect as to involute shape, then sufficient backlash must be provided to take care of these inaccuracies.

As a general rule, the amount of backlash allowed is based on the diametral pitch of the gear tooth more than any one other factor, although the others mentioned must also be considered. The coarser the pitch, the greater the amount of backlash allowed. Several formulas have been suggested for obtaining the necessary backlash, but it is evident that, since the accuracy of the gears and other requirements determine the amount to allow, a formula which will cover all conditions is impracticable. For standard gearing, cut to commercial standards of accuracy, the values listed in Table X are sometimes used. For gears which are casehardened, greater allowances than those listed in the table are generally necessary.

TABLE X— AVERAGE BACKLASH FOR ACCURATELY CUT SPUR GEARS

Diametral Pitch	Backlash in Inches
2	0.012 to 0.015
3	0.010 to 0.012
4	0.008 to 0.010
5	0.008 to 0.009
6	0.006 to 0.008
7	0.006 to 0.007
8	0.005 to 0.006
9–10	0.0045 to 0.005
11–16	0.004 to 0.0045
18–20	0.0035 to 0.004

If the load on the teeth is constant, backlash has no direct affect on the strength of the tooth, unless an excessive amount is allowed, as previously mentioned. On the other hand, when the load is not constant or when reversal of motion is necessary, the amount of backlash should be kept to the minimum amount which will permit freedom of rotation. The use of helical timer gears on an automobile engine is a case in point, where the minimum amount of backlash should be allowed because of the irregularity in load. In this case, however, the amount of backlash is reduced to the minimum, not so much to increase the strength, as to make the gears run as quietly as possible. For a 9-pitch gear, the backlash is generally held to about 0.002 inch.

Patents and Trade Marks

Receipts of patent and trade mark applications during the past two years have been the greatest in the history of the patent office of the Department of the Interior.

The number of applications received has averaged 9,000 patent and trade marks per month. A year ago the technical divisions of the patent office were from ten to fifteen months in arrears in handling these applications. Today not one of the 500 technical examiners in the 49 divisions is more than ten months behind in examining the applications.

Keeping up with the tremendous inflow of applications has been accomplished by revolutionizing the methods employed in ten clerical divisions of the patent office of the United States.

Testing Definitions

A tentative standard proposed at the 26th annual meeting of the American Society for Testing Materials, held at Atlantic City, June 25 to 29, 1923, concerns methods for the verification of testing machines. The definitions, as in the case of those for terms relating to methods of testing, have not been adopted by the Society and are published for the purpose of eliciting criticism and suggestions.

The definitions are:

Testing Machine—A mechanical device for applying a load (force) to a specimen.

Error—In the case of a testing machine, the value obtained by subtracting the correct value of the quantity measured (usually load) from the indicated value as given by the testing machine.

NOTE—The error may be positive or negative.

Percentage of Error—In the case of a testing machine, the ratio, expressed in per cent, of the error to the correct value of the quantity measured.

Correction—In the case of a testing machine, the value obtained by subtracting the indicated value from the correct value of the quantity measured.

NOTE—The correction has the same magnitude as the error but the opposite sign. It is recommended that, except for special cases, no corrections be used on machines tested and found to have errors within the tolerances given in these methods.

Tolerance—In the case of a testing machine, the maximum allowable error in the value of the quantity indicated.

NOTE—It is convenient to express tolerance in terms of percentage of error. The numerical value of the tolerance for a testing machine is so stated hereafter in these methods.

The word "accurate" applied to a testing machine shall be used without numerical values. The word "error" shall be used with numerical values. For example: "An accurate testing machine was used for the investigation"; but "The error of the testing machine at a load of 30,000 lb. was 15 lb." A testing machine is said to be accurate if the indicated load is within the specified tolerance of the actual load. The *accuracy* of a testing machine should not be confused with *sensitiveness*.

Loading Range—In the case of a testing machine, the range of indicated loads for which the testing machine gives results within the specified tolerances. The loading range shall not include loads either greater than the largest load or less than the smallest load applied in verifying the testing machine.

How Testing Machines Should Be Checked

Wherever practicable, testing machines shall be verified by direct methods, that is, by applying standard weights directly to the weighing mechanism of the testing machine, or by the use of standardized proving levers in connection with standard weights. The test loads selected shall be applied in both ascending and descending order, and the indications for both the ascending series and the descending series of loads shall be considered in the application of tolerances.

For any loading range, the testing machine shall be verified by at least four test loads. Special recommendations for the test loads were made in the report.

All testing machines that measure load shall conform to the following tolerances:

New Machines—The error for loads in the loading range shall not exceed ±1.0 per cent for new machines or for those which have had any of the knife edges in the weighing mechanism repaired or renewed.

Used Machines—The error for loads in the loading range shall not exceed ±1.5 per cent.

The indicated load of a testing machine shall not be corrected either by computation or by the use of a calibration diagram to obtain values within the required tolerance.

It is recommended that testing machines, when in constant use, be verified at intervals of six months and, when used intermittently, at intervals of two or three days. Testing shall, however, be verified immediately after making repairs or adjustments of the weighing mechanism, and whenever there is reason to doubt the accuracy of the results, without regard to the time interval since the last verification.

A clear and complete report shall be prepared of each verification of a testing machine. This report shall contain all data necessary to verify the accuracy of the report, and shall be filed for future reference. This report shall state clearly the method of verification used.

A certificate giving the maker's serial number and a brief description of the testing machine, the maker's name, the date of verification and the loading range, shall be signed by the person responsible for the maintenance of the testing machine, and this certificate shall be posted in plain view of a person operating the testing machine.

Book Reviews

The Design of Steam Boilers and Pressure Vessels. By George B. Haven and George W. Swett. Published by John Wiley & Sons, Inc., 432 Fourth Ave., New York, N. Y. Cloth binding, 435 pages, 6x9 in., price $4.

The authors of this textbook on boiler design are members of the faculty of the Massachusetts Institute of Technology. Mr. Haven is professor, and Mr. Swett associate professor, of machine design at that institution. The book offers nothing particularly novel in the field of boiler design, the aim of the authors apparently being rather to rationalize the present standard practices and base the work on sound engineering reasoning. The use of empirical data in the design of pressure vessels is common procedure at present and this book attempts to present rational methods for arriving at the results already obtained by empirical methods. It is, therefore, a forward step in this important art and of especial interest to the student and engineer.

After a general discussion of the factors governing the design of boilers and the materials used in their construction, the matter of stresses in various parts of pressure vessels is taken up in detail. This portion of the work has been done in a logical and analytical manner commensurate with its importance.

Riveted joints next receive attention, and the chapters on riveting and the efficiency of joints contain a great mass of important information, logically and clearly presented. A feature of the work is the continual attention paid to the factor of safety in the matter of design. Tubes, sheets, flues, grates and settings are all covered well and the present state of the art as regards staying and mountings is well presented.

The text is well illustrated and numerous tables of various design factors are included. Among these the tables of pitch and efficiency values for various riveted joints should be particularly noted. The latter chapters contain examples of the design of several types of boilers and other pressure vessels. All of the examples have been worked out in detail.

Building Motor Trucks in a Southern California Shop

By FRED H. COLVIN
Editor, *American Machinist*

A modern shop building in an ideal location—Electric furnaces and good foundry equipment—Modern machinery and progressive shop methods—Careful inspection of parts

THE LONG distances between centers of population on the Pacific Coast make the problem of transportation a very live one in every particular, and the use of motor trucks for both long and short hauls is imperative. In order to meet the local demand, the Moreland Truck Co. began some years ago to assemble trucks in Los Angeles, Calif., for local use. These trucks proved so popular that the shop in Los Angeles became too small to accommodate the increasing business, and about three years ago the Moreland Co. moved to Burbank, a suburb about ten miles out of Los Angeles, and erected a modern factory of its own. This increased the machine-shop capacity, and instead of buying all its units, it is now manufacturing transmission and other essential parts in its own shop. The location in the San Fernando valley is a location which has many advantages and gives ideal working conditions practically all the year round.

Although the foundry is comparatively small, it has two electric furnaces, one of 2-ton capacity for steel, and the other with a capacity of 1,000 lb. for use in making gray-iron castings. The large furnace takes about 4,000 amperes at 110 volts.

There are five sizes of Moreland trucks, ranging from 1- to 5-ton. Frames and bodies are fabricated in the plant to meet the demand of local conditions, and each unit in the whole truck is carefully inspected before final assembling. The output is about 30 trucks per month.

Some idea of the extent of the machine shop and its equipment can be had from Fig. 1. This view shows a Potter & Johnston manufacturing milling-machine in the foreground, as well as a number of other modern machine tools, the equipment being noticeably good as a whole.

A corner of the foundry is shown in Fig. 2, the molds for the brake drum being prominent at the extreme left. Fig. 3 shows the 2-ton electric furnace in its normal position. The gear segment and rack used in tilting it for pouring may be seen at the bottom, while the large carbon electrodes are shown at the top.

A corner of the gear-cutting department is shown in Fig. 4, in which appears two of the battery of Fellows gear shapers at work on clutch and transmission work. A section of the radiator department is seen in Fig. 5, with the testing tank at the left. The radiator is built up from six units so that radiator leaks can usually be localized and a new section put in place

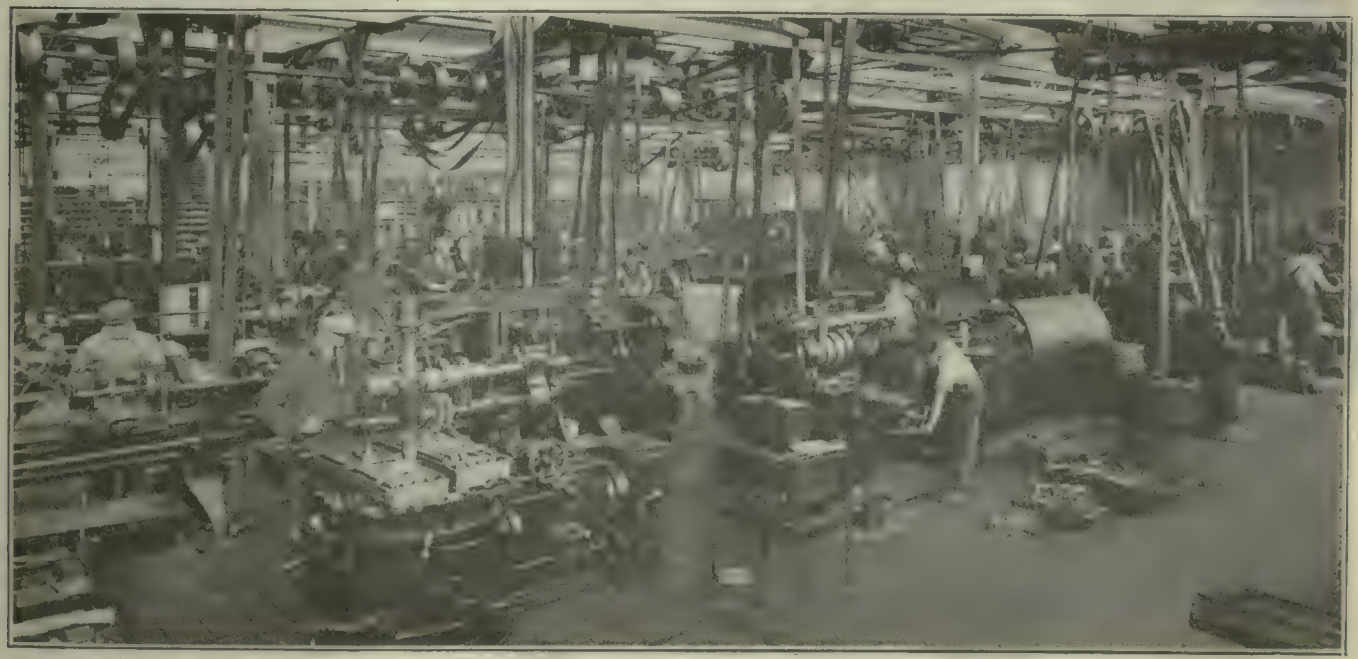
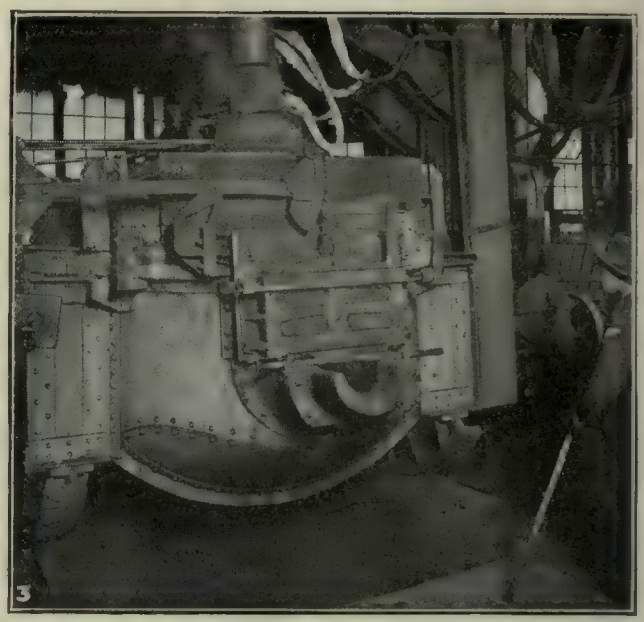
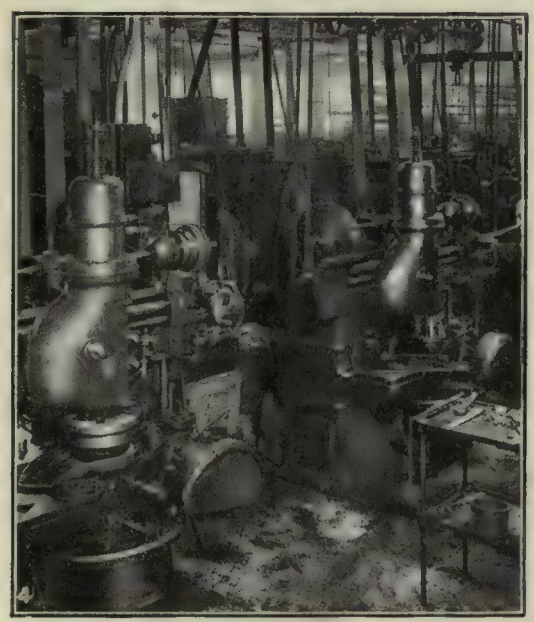


FIG. 1—GENERAL VIEW OF MACHINE SHOP









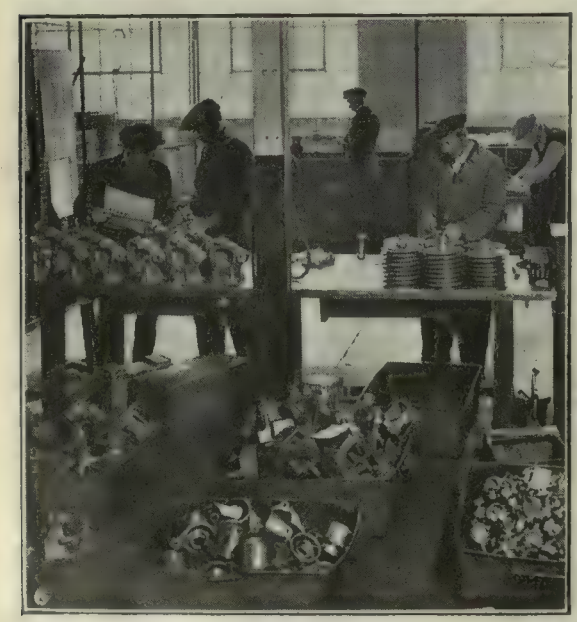




FIG. 2—CORNER OF FOUNDRY. FIG. 3—THE LARGE ELECTRIC FURNACE. FIG. 4—IN THE GEAR CUTTING DEPARTMENT. FIG. 5—BUILDING THE RADIATORS. FIG. 6—THE INSPECTION DEPARTMENT
FIG. 7—ASSEMBLING FRONT AND REAR AXLES

in a very short time. This construction helps to keep the motor out of service as little as possible while repairs are being made to the radiator.

The inspection previously referred to extends to every part of the truck. Fig. 6 shows part of the inspection department, the parts shown being built in the Moreland plant. The same care, however, extends to parts purchased outside, so that every reasonable precaution can be taken against either defective material or workmanship.

Fig. 7 shows a portion of the assembling department, and also gives an idea of the very modern construction of the shop itself. As can be seen, there is a large proportion of window area in the walls, which are of concrete.

This view also shows the type of stand used for assembling both front and rear axles. These stands in reality consist of two substantial wooden horses connected by a long tray with a bin in the center. This not only makes a very rigid construction, but affords an excellent place for the small parts used in assembling. The whole plant is modern in every way, and careful attention is paid to the practice of modern methods.

The Oiler

By George Walter
In Charge of Maintenance Dept., Millholland Machine Co.

THE machine shop oiler as a rule seems to consider his the most thankless of all tasks. Day after day he goes through the humdrum routine of oiling shafts and shafts, doing the same work over and over again and getting nowhere. Yet an oiler who will take an interest in his work, put it on a systematic basis and make an effort to do something besides just oil, may find himself among the most valuable men in the shop.

The day of the old-fashioned repair gang is rapidly coming to a close. The watchword of the present-day maintenance department is "prevent" and not "repair." A bearing burned for want of oil is no longer easily explained. The old excuse of, "There was a crack in the reservoir," is no longer accepted. The reply is apt to be, "It should have been reported when first discovered."

Still, machinery and equipment will wear and because of this, provisions have been made for taking up the wear. Of course this adjustment can be made after the repair job has been completed, but if it had been made before, might not a repair job have been unnecessary? Who is in a better position to know when this excessive wear is taking effect, than the oiler?

The trouble with the average oiler seems to be his haphazard way of doing things. On Monday he starts in the week trying to oil the entire shop in a day. He rushes through his work noticing nothing, save that he has filled all the bearings. The remainder of the week he dabs here and there trying to seem busy when the boss is around. Bearings requiring hard oil need attention only once every few weeks. Yet they are neglected because the oiler forgets just when he looked at them last. He decides that they are running all right and that he can let them go for another week. Oiling at best is a disagreeable task, and it is far from hard to put off such things until another day.

Once a week is about as often as an ordinary oil bearing needs attention, as present-day manufacturers build them with that point in view. It is therefore obvious that the oiler who rushes through his work on Monday has little to do the remainder of the week. He gets his disagreeable work over with as soon as possible, and then puts in time until Saturday noon. I used to do it myself.

I have found it the best policy, where the oiler will not do it upon his own initiative, to outline a system of oiling which will extend over the entire week, not only insuring that the work is done with thoroughness, but giving the oiler an opportunity for inspecting the shafting and parts at the same time.

First the shop should be divided into sections, and certain sections set aside for attention on certain days. These sections may be laid off in conjunction with the line shafts, as in Fig. 1. It will be noted that the sections are not grouped, but scattered. Thus every morning the oiler travels the entire length of the shop while doing his work. Should anything run hot unexpectedly, he is apt to come close enough to it for his attention to be attracted.

No routine oiling is done on Saturday. It is a half day in most shops, and a good time for looking after

Section 1 Turret Lathes Monday	Section 2 Screw Machines Wednesday
Section 3 Engine Lathes Thursday	Section 4 Lo-Swing Lathes Tuesday
Section 5 Tool Room Wednesday	Section 6 Wet Grinding Machines Friday
Section 7 Tool Room Tuesday	Section 8 Wet Grinding Machines Monday
Section 9 Tool Crib	Section 10 Shop Office
Section 11 Boring Mills Friday	Section 12 Boring Mills Wednesday
Section 13 Milling Machines Thursday	Section 14 Radial Drilling Machines Friday
Section 15 Milling Machines Friday	Section 16 Planers Tuesday
Section 17 Planer-Type Milling Machines Monday	Section 18 Planers Thursday

FIG. 1—PLAN OF SHOP, WITH OILING SCHEDULE

chain belts, filling grinding wheel bearings, filling cups with hard grease, and the like. It is a good plan to have a drawing made in the drafting room after the system has been worked out for the individual shop. This drawing should then be posted over the oiler's bench where it will attract his attention every morning. Another copy should be given to the millwright or the maintenance engineer, for the purpose of checking up.

A second drawing should then be made as a schedule, such as shown in Fig. 2. This schedule outlines the work to be done each day; and blank spaces may be left where check marks may be made by the oiler, indicating that the oiling was actually done and not just supposed to have been done. Thus each day the oiler has his work planned out before him. If trouble appears unexpectedly he can refer to his charts and see just when the equipment in question had last atten-

tion. If the check-off system is used it will not be necessary for the millwright or the maintenance engineer to quiz the oiler as to when certain equipment was last oiled. It is easy for an oiler to stretch a point when he knows that no one can gainsay him.

The third item in the system is a daily report from the oiler, which should be made out in triplicate. One copy goes to the maintenance engineer, one to the millwright and one to the oiler himself. Forms for this report may be made out after the plan shown in Fig. 3. It takes Simon Pure nerve for an oiler to make out this sort of a daily report when the work has not actually been done. Of course there may be some who would, but I do not believe that the American workman has quite reached that level.

OILER'S DAILY WORK CHART

Monday
Sections 1-8-17
Tuesday
Sections 4-7-16
Wednesday
Sections 2-5-12
Thursday
Sections 3-13-18
Friday
Sections 6-11-14-15
Saturday
Chain Belts, Tool Grinder Bearings, Grease Cups, Etc.

FIG. 2—SCHEDULE OF OILER'S WORK

With this system in force I have found that the oiling has been done in less time and much more thoroughly. Under it the oiler will generally find his work done at noon. During the remainder of the day he may be pressed into service helping the machine repairman or the millwright, and incidentally learn a trade. It should be remembered at all times, however, that his business is to oil, and his oiling should not be neglected under any circumstances. To put off today's oiling until tomorrow so as to use the oiler as a millwright's helper is too apt to be the beginning of the put-off habit.

OILER'S DAILY REPORT SHEET

Jan. 30, 1923.

Oiled sections ..... *4-7-16* .....

Remarks:

Friction pulley on countershaft No.11 Machine showing wear. Can be taken up by adjustment. Other equipment O.K.

J. Williams
Oiler

FIG. 3—DAILY REPORT TURNED IN BY OILER

Oiling should never be done in a hurry. This practice results in not only carelessness but waste, with bearings overflowing at one end of the shop and running dry at the other. The oiler should take his time without loafing. He should while oiling note carefully the running condition of the shop's equipment. If a pulley or shaft is showing wear he should make a note of the fact at once.

Thus may shut-downs be avoided. This system represents preventative maintenance, the kind of maintenance that every maintenance engineer should try to put into effect in his shop, and the kind of maintenance the present-day employer is looking for. It is needless to say that this employer is not in any measure as much interested in a repair job well done, as he is in a repair job prevented.

Opportunities in India

By R. J. Nott

SOME notes, made on the eve of leaving this country and resulting from four months' study of the American machine shop and American machine tools may be of interest, and coming from a foreign engineer, as they do, may give a different viewpoint on trade in the Far East.

I find the American machine tool frequently more suitable in type and construction than those we now have in India, but at the same time, I find America going into foreign markets as a dilettante, talking about its desirability from the comfortable chair of a vividly living home market that has kept pace with America's mighty general progress. I find the machine tool manufacturer talking of highly competitive trade and small profits; yet I see little men in the Middle West going into it on a dozen-hands basis that would spell suicide in a month in Europe.

One day the American machinery man will find that to keep in the game at all he must export. Not by selling to an export house in New York and forgetting the matter, but selling in the characteristic American fashion that has cultivated a great foreign field for other products, selling with organization and service. All over the world these are features that distinguish successful American business.

Commercial India No Longer Provincial

When that day arrives, he will find in his survey of the world that India has, commercially, become Indian and is no longer controlled from Europe. India has more than three times the population of Japan. Its sanest national leaders believe that it is on the verge of such a rush of modernization as Japan never knew, and this rush, like Japan's, may be less than a generation long.

Is the American machine tool trade going to wait and spend that generation in educating South Asia in its product—in sowing at harvest time, or will it start getting and giving the necessary knowledge now? One does not learn how to handle a specialized Eastern market in five minutes, neither does that market quickly learn how to utilize you for its progress. I am aware that some firms have in recent years sent men to India to report; men born and bred in Middle West and New England industrial areas, educated in local business methods and habits of thought. They might have saved their money. Most of these worthy gentlemen, working on the western experience they should have pitched overboard in the Suez Canal, spent their time nursing people unable to influence a single rupee of capital expense. Some of them now back home have even yet not discovered their mistake.

Actual Participation Necessary

Don't send for reports. Get in the business and have relations with those who have been in it a lifetime.

The experiences of actual participation will be an excellent training for continued and growing business.

You will learn far more of trade in the East in five years by controlling it than by helping a man however clever and earnest, to five months of joy-touring. I want to see American machine tools and American sales engineering methods in India for educational reasons, and I hope to live to hear of India-made machinery in Far Eastern markets, with American help or without it.

Industrial Cost Accounting for Executives

By PAUL M. ATKINS

Article twenty takes up earned and unearned burdens—Ascertaining the earned burden—Methods of disposing of the unearned burden—The problem of the seasonal industry

IT WAS pointed out in the preceding article how the expenses of the various auxiliary manufacturing departments together with a certain portion of the expenses of the administration departments could be added to the expenses of the direct manufacturing departments to form what was termed departmental burdens and also how the whole was summarized in the general ledger in what was called a manufacturing burden account. It was stated in addition that the process was the first of two steps in the distribution of the expenses to the product. No definition was given of the term "burden" and nothing was said concerning its nature or the methods of dealing with the subject and it now becomes our task to deal with the question which was thus left open.

Burden, as the term is used here, is the total expense of operating the business looked at as the load which the business must carry either as a part of the cost of making the product or in some other way. Expenses are the cost of operating the several departments of the concern, and hence we may say that burden and expenses are two names of the same thing looked at from opposite sides. From some aspects the differentiation seems needlessly complicated, but it is often very convenient to be able to discuss the topic and to indicate by a word just the standpoint taken at the moment. The utility of this differentiation will be more apparent as the discussion proceeds.

Down to the present it has appeared as though all the expenses—all the burden as we shall term the amount from now on—were to be apportioned to the product. At first glance the apportionment seems to be the perfectly natural and appropriate, in fact only, thing to do with it. If the burden for a period is a certain sum and the output for the same period is a certain quantity, then the burden should be added to the direct costs to find the total costs of the goods turned in the time involved. To take a concrete example, if the direct costs are $100,000 and the total burden is $100,000, then the total cost should be considered as $200,000, and if 100,000 units are turned out the unit cost should be $2 a piece.

> BURDEN is the total expense of operating the business looked at as the load which the business must carry either as a part of the cost of making the product or in some other way.
>
> Essentially the burden caused by the idle factory is a measure of the cost of unutilized plant capacity and is a loss to the business, a loss which, it is true, may be more than offset by the profits made from the goods turned out during a period, but a loss nevertheless.
>
> Under most conditions the best method of treating the unearned burden is like any other loss and to charge it directly to the profit and loss account by means of a general journal entry.

Let us assume that this quantity is the normal output for two small factories of the same size both belonging to the same company but in different parts of the country. Let us assume also that a period of depression comes and the business falls off to one-half its former amount and as a result it is decided to close one factory and operate the other at full time. It would be expected that the costs of operation of the active factory would continue about the same, though probably they would fall slightly due to decreasing prices of material and probably also of labor. The latter aspect of the question does not concern us here and to simplify the example somewhat let us assume that the costs run along as before and we have $50,000 of direct costs and $50,000 of burden for 50,000 units of product. There is no question about the appropriateness of this figure.

But what about the non-operating factory? A little thought will make it clear that the fixed charges continue to run there and that even if all the workers are laid off, it will be necessary to retain a watchman and someone to look after the machinery to keep it from being too badly damaged by neglect. Let us say that all the charges amount to $10,000. Can it be truly said that the $10,000 is a part of the cost of producing the units made by the factory which is running? If we are to be logical and follow out the rule laid down in the article discussing the distribution of expenses—to allocate expenses according to the service rendered—then it would not be proper to allocate to the product any of the $10,000 for it represents the cost of no service to the goods. At the same time, however, it is part of the expense of running the production end of the business and as such forms a part of the total burden, which, it was suggested above, it would seem necessary to allocate to the product.

It should be evident from what has been said that it is not always appropriate to charge to the output all of the burden incurred by the factory while that output was in process of fabrication. It is proper, rather to apportion to it only such portion of the burden as represents a fair measure of the value of the service rendered to the product by the several departments

For the author's forthcoming book. All rights reserved.

during production. In the instance in hand this is evidently the portion of the burden incurred by the operating factory.

The question then arises as to the nature of the burden caused by the idle factory. If it is not a cost of production and is not to be charged to the output, what is it and what shall be done with it? Essentially it is a measure of the cost of unutilized plant capacity and is a loss to the business, a loss which, it is true, may more than be offset by the profits made from the goods turned out during the period, but a loss nevertheless. To charge it to the goods means an incorrect cost for them and the results of incorrect costs are always unfortunate.

The Effects of the Inclusion of Unearned Burden

In the first place, to include this portion of burden would mean that the unit costs would increase over and above what they should be and the more business falls off the higher the unit cost. When goods are placed in the inventory at cost or at an estimated price based on actual cost, the result would be to inflate the inventory by the amount of the "unearned" burden as the part of the burden not properly chargeable to the product is commonly called. It is well recognized that inventories need careful watching during a time of falling business in order to prevent them from becoming valued at too high rate and so bring about an apparent profit when really none exists. Yet to include the unearned burden would result in just the thing that the wise manager is most anxious to avoid.

It should be remembered that emphasis has been laid on the use of the cost records as a means of executive control of the business. To be of any worth for such a purpose it is quite essential that they be correct. One of the reasons why executives have often refused to use their cost figures and have finally relieved themselves of the entire cost system is due to its failure at just this point. They know perfectly well that when business is falling off and the cost of materials which they purchase is decreasing their own costs of production ought to decrease, or at least, ought not to increase. As was pointed out above, unit costs of the product increase when the unearned burden is included. After trying to find the inefficiencies in his business that could bring about such a state of affairs and not finding enough to account for such an increase—and in general, efficiency increases as business falls off for only the better workers are retained—it is not strange that the manager is inclined to reject a system which provides him with such misleading data.

Disposing of the Unearned Burden

In general, there are three different ways of disposing of the unearned burden after it has been ascertained. The first was developed by Mr. A. H. Church, one of the pioneers in modern cost-accounting to whom many important contributions in the field are due. This method was to determine an earned burden rate—as the part of the burden properly applicable to the product is commonly called—and after the earned burden had been applied to the product by the rate, to apply the unearned burden by means of a supplementary rate as he called it.

In this way he avoided the second important difficulty which was described above, for the unit cost could easily be prepared in such a way as to show the part made up by the supplementary rate. The manager who was familiar with the development of the unit costs would not be deceived but would even be helped by seeing how much the cost of unused plant capacity was per unit of product. The method, however, completely ignores the first difficulty—the inflation of the inventory and hence it is seldom used at the present time having been superseded by other methods which deal with the problem in a more satisfactory fashion. All due credit should be given to Mr. Church, however, for the attention which he has given the problem of measured burden and for laying a foundation on which others have built.

The second method is to treat the unearned burden like any other loss and charge it directly to the profit and loss account by means of a general journal entry. Under most conditions this method is the best way to handle the matter for it shows the measured burden in its true light—a loss which the business as a whole must bear and not a part of the cost of production. It is a figure of the greatest interest to the executive for it tells him how much loss the business is sustaining through the unused capacity of the plant. With this information on hand together with his unit costs, the progressive business manager is in a position to base his action on sound judgment. It is quite possible that the wise course to take is to lower prices so as to get a larger volume of production and so permit the burden to be absorbed or carried and hence eliminate the loss even though the margin of profit on each unit made and sold is reduced. It is reasonable under some circumstances to increase the selling expense in order to increase the amount of business and, of course, sometimes the only thing to do is to accept the loss which the unearned burden entails. In any event, however, the manager's decision will be made in the light of the essential facts and not in the darkness of ignorance of the cause of his losses.

Determining the Unearned Burden

There is one special set of conditions whose effect on the problem of unearned burden must be considered for it alters somewhat the latter's disposition. Before this phase of the problem can be discussed adequately it is necessary to take up the matter of ascertaining the amount of the unearned burden. The simplest method is to find out how much the earned burden is and deduct it from the total burden. The remainder is the unearned burden. Such a reply to the question does not really answer it but simply pushes off a step. Hence we must turn our attention to the problem of calculating the earned burden. The next two articles will be devoted to the subject so only a brief, general summary is given in the following paragraphs:

It will be remembered that, as was stated in the illustration given above, the cost of operating the active factory was said to be the proper amount of burden to be charged to the product. In other more general terms it may be stated therefore that the cost of operating a factory turning out a normal quantity of goods may be considered as the burden which should be allocated to that product as earned burden. The proper way to establish an earned burden rate is to ascertain the ratio of normal expenses to normal production. The result is a ratio which can be applied to all orders going through the factory at all times whether conditions are normal or sub-normal.

The significance of the above is that all work will be charged at the same rate for the same service whether

business is brisk or dull. The only cause for a difference in the burden charge to an order would be the variation in the amount of service which it receives, a result which is both theoretically and practically correct.

The basis for working out any burden rate is the measure of the plant capacity by the manufacturing standards department. From the standards set by the department it is possible to determine what may be called a normal schedule of production. It will sometimes happen that the normal schedule will be the actual schedule for each period—it should be the aim of the managers to make it so—but it will often be impossible to accomplish this, so that the actual schedule used in making up the master schedule and in planning and scheduling production may not coincide with the same schedule employed in the preparation of burden rates.

On the basis of a normal production schedule, a normal expense schedule should be prepared and from the latter it is easy to obtain normal total and departmental burdens. The next step is to calculate the normal departmental burden to the normal production and this ratio is the burden rate.

The Problem of the Seasonal Industry

If a business is of the kind which is not subject to any marked seasonal fluctuations, it is evident that the flow of production may be taken as relatively constant and not variable from month to month. Under such conditions, if the burden is not earned with any period it is a loss which cannot be regained later though it may, of course, be offset by subsequent profits. In the case of seasonal industries, however, the problem takes a somewhat different aspect. The normal schedule should be worked out on the basis of an entire year and hence the actual output will correspond to the scheduled output for only brief periods when the schedule is reduced to a weekly basis. The result is that when the burden rate is applied to the orders going through the factory the burden will be under-earned during the slack periods and over-earned during the busy season.

Under such conditions it is evident that the under-earned burden during slack times is different from the unearned burden, for it is something that must be expected from the nature of the business, unfortunate as it may be. Hence, it does not represent a loss to the concern if it is essential for the satisfactory operation of the business for the concern to have a plant capacity which cannot be fully utilized at all seasons of the year. The proper way to handle the matter seems rather to debit the under-earned burden to a burden variation account and to credit the same account with the over-earned burden during the busy season. If expenses have not exceeded the scheduled amount and the entire cycle of periods is really normal then there will be no balance left in the account for the over-earned and under-earned burden will cancel each other for the fiscal period. If the year proves to be abnormal and a balance is left in the account at the end it should then be closed into profit and loss.

There is one more point which deserves attention. It will probably have occurred to some readers that there may well be another source of the measured burden in actual practice in addition to the loss accruing from unused plant capacity. Let us take the case for a moment, of a business which is entirely normal, where the plant capacity is being fully employed, but not more, and hence the conditions are such that it might be assumed that all the burden would be earned or applied to the product. It is quite possible, however, that there would be some unearned burden still and investigation would probably show the cause to be an excess of actual over the scheduled normal expenses. Part of the excess might be due to an increase in material or labor costs over the estimates used in preparing and a part to inefficient operation of the business.

It is quite easy to separate the unearned burden into two accounts, one representing the actual net loss due to unused plant capacity and the other to the excess of actual over scheduled expenses. The actual expenses may be compared with the scheduled and the excess of the former over the latter indicates the inefficiency of operation. The difference between the earned burden and the scheduled burden indicates that portion of unearned burden which is due entirely to unused manufacturing facilities. It will usually be found, if the burden rates have been properly worked out, that the latter amount is by far the larger part of the unearned burden.

It needs also to be pointed out that the actual loss is represented by the unearned burden and not any amount in excess of it. The actual expenses are noticeably less during a dull period and as the debit to the manufacturing burden account is made from their summation and not from the normal scheduled expenses, it is evident that the account represents the facts of the case as well as may be done under the circumstances.

Space has permitted the presentation of only a few of the more salient features connected with burden both earned and unearned. It is a topic of fundamental importance to the executive for if he does not thoroughly understand it, he is in no position to utilize to the best advantage the information which his cost records contain for him. The summation of the burden also marks an important stage in the allocation of the proper share of the cost of operating the business to each unit of product which passes through the factory. The next two articles will be given over to a discussion of various methods of accomplishing this final distribution.

Welding Pipe

In an article concerning the welding of pipe, published in the *Journal* of the American Welding Society, the following statements are made by J. A. Osborne, Chief Electrical Engineer of the American Car and Foundry Co.:

"On our work, the requirements are that standard pipe must be welded to extra-heavy, and extra-heavy pipe must be welded to double-extra heavy. Also, it is necessary to weld double-X pipe. In welding two samples of pipe, one extra-heavy and the other double-X, difficulty was experienced in producing a satisfactory weld, due to the fact that the lighter pipe would heat up and melt before the heavier attained the proper heat.

"We resorted to the expedient of clamping the end of the heavier pipe between the jaws and applying the current long enough to bring the pipe to a bright red heat. The two ends were then moved and clamped between the welder jaws in the usual manner, and a perfect weld was formed without damage to the lighter pipe."

Checking Outline for Tool Drawings

By Herbert W. Cable

THE value of a suggestive outline for checking drawings cannot be overestimated. While every drafting room might have an outline suited to its own peculiar needs, a general outline for any one line of work is applicable wherever the work is similar.

Having had considerable experience in checking special tool drawings and designs, the outline below in the writer's opinion covers the majority of points to be investigated in this class of work and is particularly applicable to tools for automobile production.

An excellent way for using the outline is to have the titles and subtitles typed on a card, which is placed conveniently near the checker, so that a glance serves as a reminder of each point in its turn. A more elaborate and explanatory outline should be available for designers and detailers, calling their attention to the course of the checker's investigation. The designer's outline follows:

Check Design

1—See that work can be easily loaded into fixture, not too close to moving machine parts and without unnecessary handling of fixture or jig.

2—See that tool can be quickly operated with minimum number of clamps but with no complicated mechanism to require frequent repair; that there are no unnecessary loose pieces and that one wrench will fit all clamp nuts; and that clamps and adjustments are readily accessible.

3—See that chips are easily disposed of, easily cleaned from locating points and will not interfere with or clog mechanism.

4—See that all parts are of sufficient strength to withstand any stress they may be subjected to, carefully considering all possible stresses.

5—See that all wearing points are hardened when practicable and adjustment is provided when necessary.

6—See that no strains will be set up while machining work or while clamping; that part is rigidly clamped and will always be clamped in the same position; and that means are provided for an accurate set up.

7—See that tools can be readily assembled and disassembled without destroying accuracy.

8—See that proper locating points are used and that tool is designed for the correct sequence of operations.

9—See that all castings can be made with minimum number of cores, with no wide variation in metal sections; that they can be easily machined; that machining will not release strains which will cause warping; and that proper ribs are used for strength and rigidity.

10—See that there is ample provision for lubrication.

11—See that design is such that standard cutting tools can be used wherever practicable.

12—See that tool will utilize full capacity of machine for which it is designed.

Check System

1—Check stock list for reference numbers to assembly and details. See that sizes of standard parts are correct and the number required of each part is correct.

2—See that tool numbers and drawing numbers are entered.

3—See that all castings have correct pattern numbers.

4—See that tool will be properly marked.

5—See that titles are complete and correct.

Check Dimensions

1—See that work is drawn to scale on assembly.

2—See that work clears fixture at all points, ½-in. minimum clearance for rough surfaces, ¼-in. for finished surfaces.

3—See that quick change tools can be entered and removed within the limits of the machine.

4—See that whole assembly has proper clearance of the machine.

5—See that fixture fits machine and is within range of adjustment.

6—See that all dimensions for an accurate assembly are given.

7—See that all details are taken care of; that they are completely dimensioned; that they are to scale with assembly drawing, underlined when out of scale; that they correspond with each other regarding fits, etc., and that all fits, transferred holes, reaming, drilling, tapping, etc., are specified.

8—See that all necessary finish marks are on castings or forgings and on all views.

9—See that proper material is specified.

10—See that proper treatment is specified such as heat treatment, nickel plate polish, etc.

11—See that grinding marks are on all views of ground surfaces, lapping specified when required, and that centers for grinding are shown on round parts where possible.

12—See that details can be easily machined to dimensions given.

13—See that all projections, particularly on castings, are correct.

A list of titles suggesting the points in the above outline may be arranged as follows for use by the checker:

Design	3—Pattern numbers
1—Loading	4—Marking
2—Speed	5—Titles
3—Chips	Dimensions
4—Strength	1—Assembly scale
5—Wear	2—Clearance of work
6—Accuracy	3—Clearance of tools
7—Assembly	4—Clearance of machine
8—Locating	5—Fit to machine
9—Casting	6—Assembly dimensions
10—Lubrication	7—Detail dimensions
11—Standard Tools	8—Finish
12—Capacity	9—Materials
System	10—Heat treatment
	11—Grinding
1—Stock	12—Ease of Machining
2—Tool numbers	13—Projections

Heavy Spot Welding

In the *Journal* of the American Welding Society, R. E. Wagner, Assistant Manufacturing Superintendent, Pittsfield Works, General Electric Co., says: "The welding together of two pieces of ½-in. steel is considered as the maximum capacity of the heavy spot welder now in use on commercial work in our machine shop. When this weld is made 40,000 amperes are required and the current is applied for 7 seconds. There is a pressure on the electrodes of 20,000 lb. The points of contact on these electrodes are ¾ in. in diameter. The electrodes are fitted with tapered caps that can easily be removed, and that are replaced after every five spots are made.

"We grind the surface of the steel plate where it comes in contact with the electrode, but where the plate comes in contact with the other plate we do not remove the scale, as we have found in spot welding that, as a rule, a stronger joint is made when this scale is not removed. The scale raises the resistance at the point of welding contact, thereby giving greater assurance that the metal is at welding heat."

Evolution of the Self-Opening Die

By O. S. MARSHALL

Four stages of evolution — Early experiments with split dies — The Sellers bolt-threading machine — The modern self-opening diehead

THE HISTORY of the self-opening die may be divided roughly into four stages, beginning with the development of machinery for threading bolts in which a single-piece, or "solid" die was mounted in a head provided with forward and reverse movements and a slide by means of which the work was held in position to be presented to the die. The second stage may be said to begin at that point where it was recognized that the time of "unscrewing" the threaded bolt from the die was a useless waste and efforts were commenced to

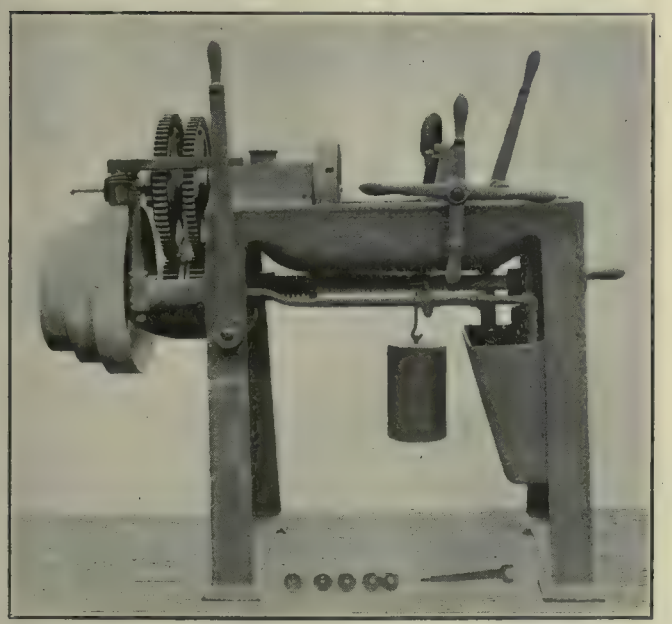


FIG. 1—THE SELLERS "BOLT AND NUT SCREWING MACHINE"

provide a die in two sections, so that the parts could be separated to allow the immediate and unrestricted withdrawal of the finished work.

The third stage includes the period of experimentation with machines having two-piece, or sometimes three-piece, dies in which the duty of opening the die devolved upon the machine, while the fourth stage is that in which the efforts of the designers were concentrated upon the development of a tool that should be self-contained and capable of exercising its functions independently of the machine upon which it was used, resulting in the modern self-opening diehead.

The first, or solid-die stage need not be considered and we will take up our story with the appearance of the first of the machines having two-piece dies. Prior to 1894, the date of the first Hartness automatic die, there was but one such machine on the market, and that was the Sellers "Bolt and Nut Screwing Machine," illustrated in Fig. 1, a description of which venerable machine may be of interest.

In this machine the die occupies the familiar position of the ordinary chuck on a lathe, suggesting the stages of development from lathe to bolt threader. Power is delivered to the spindle through the cone pulley on the left, on the shaft of which is keyed a pinion to drive the outer one of the two large gears on the main spindle. Just inside the first pinion and meshing with the inner one of the large gears is a similar, but somewhat larger pinion, not fastened to the driving shaft but free to rotate thereon and to slide endwise within restricted limits for a purpose presently to be described.

The main spindle of the machine is composed of two sleeves, one within the other, each capable of rotation within definite limits but neither having end movement. To the smaller or central sleeve is keyed the outer one of the large gears, while the inner gear is similarly keyed to the outside sleeve. To the inner or work end of the smaller sleeve is attached a die body having four

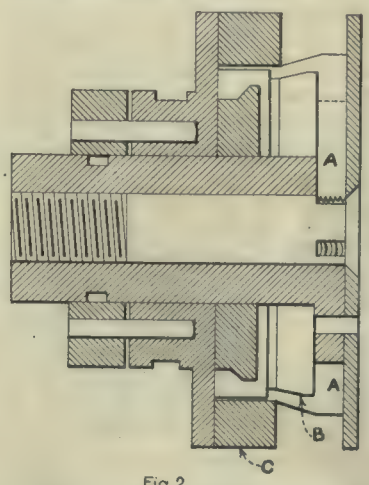


Fig. 2

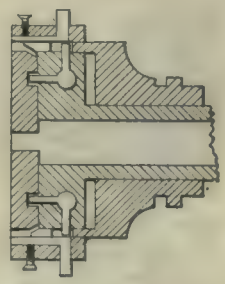


Fig. 3

FIG. 2—THE THOMAS SELF-OPENING DIE. FIG. 3—PHILLIPS' LEVER-OPERATED DIE

chambers or pockets for the chasers. To the same end of the outer sleeve is attached a cam ring to actuate the chasers, closing or opening them as the rotative movement of the outer sleeve runs ahead or lags behind that of the inner one.

The two pairs of gears (or gears and pinions) are of slightly different ratio, so calculated that with equal speed of pinions the inner gear, keyed to the outer sleeve of the spindle will rotate somewhat faster than its mate.

But it will be remembered that the inner pinion is not keyed to the driving shaft, therefore it is the outer pair that ordinarily does the driving and the inner pinion will lag behind its true relation to the driving shaft.

The inner pinion is made with a conical friction surface upon the side next to the leg of the machine and a corresponding stationary friction member is a part of that leg. A weight holds these friction members together so that as the composite spindle of the machine

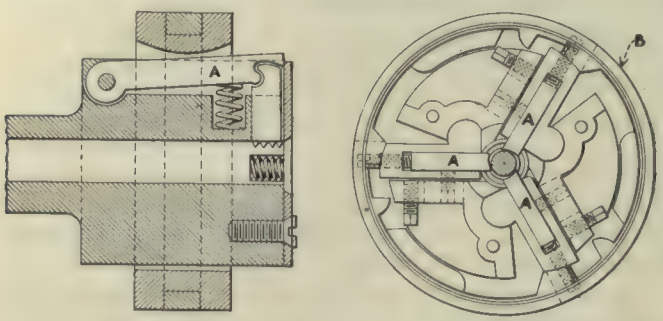


Fig.4 Fig. 5

FIG. 4—THE GOLDTHWAITE DIE. FIG. 5—AN EXAMPLE OF CAM-ACTUATED DIE

revolves, the cam ring tends to lag behind the body of the die as far as the limitation of its independent rotative movement will allow; in which position the die is open.

To close the die, the operator grasps the lever at his left and pushes it from him; a movement that overcomes the pull of the weight, disengages the pinion from the stationary friction-member and forces it into contact with the outer pinion. Now, running at equal speed with the outer pinion, the inner pinion, by virtue of its higher driving ratio, tends to drive the outside sleeve and with it the cam ring, ahead of the inner sleeve and die body as far as the limitation of the movement will allow, thus causing the chasers to close.

The operating lever is held to the left by a latch, thus holding the loose pinion in frictional engagement with the outer one by the pressure of an adjustable spring. By reason of the different gear ratios, the inner pinion

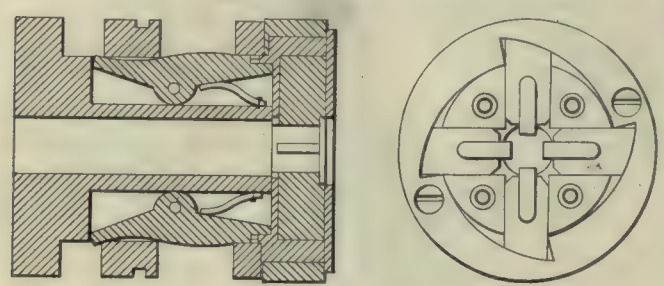


FIG. 6—A CAM AND LEVER COMBINATION

cannot continue to run at the same speed as the outer one, for the cam ring having reached its forward limit, the two sleeves of the main spindle must revolve as a unit and therefore the inner pinion must slip. The tendency is, however, to hold the outer sleeve in its advanced position and the chasers remain closed.

When a piece of work is introduced into the die and has been threaded up to the predetermined length, the end strikes a movable stop within the spindle, disengages the latch and allows the weight to bring the inner pinion in contact with the stationary friction. The inner sleeve, and with it the body of the die, now runs ahead of the cam ring and the chasers are opened.

The opening is not instantaneous but is the resultant of the differential rate of rotation. It is positive, however, and so long as the machine continues to revolve it must act without hesitation. The amount of opening may be regulated by the adjustment of certain stops on the gears, which stops determine the amount that one gear may run ahead of the other.

The original of this machine is the invention of Wm. Sellers and was first patented in 1857. In 1859, he secured a re-issue and in 1871 was granted an extension. In 1874, Coleman Sellers designed an oiling system and added some parts to make the machine self-opening; for the Wm. Sellers machine was originally manipulated by hand. It is the Coleman Sellers machine, patented in 1874, that we have described.

Though the Sellers was the only practical machine on the market, there were many inventors working upon the problem and during the long period intervening between the years 1874 and 1894, a number of patents were granted upon self-opening dies or upon machines involving the principle. A survey of the many inventions shows that they may roughly be classed in three groups, having respectively, cam-actuated, lever-operated and wedge-controlled chasers. In some instances two or more of these principles were combined.

In Fig. 2 is shown a drawing of a die upon which a

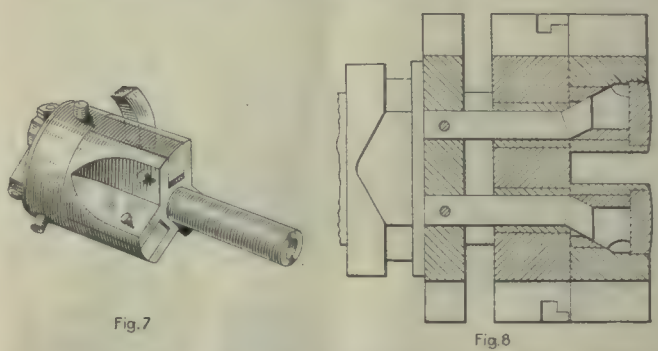


Fig.7 Fig.8

FIG. 7—A DIE FOR THE B. & S. SCREW MACHINE. FIG. 8—A WEDGE-OPERATED DIE

patent was granted to Nicholas Thomas in 1870, in which the wedge and cam combination is the actuating principle. The chasers *A*, of which there were four, each had a rearward projection *B* that was engaged by the cam ring *C*, the latter being given a partial rotation to open and close the die. The wedge feature was introduced by moving the die body lengthwise upon the shank and was for the purpose of adjusting the size to which the die would cut.

Of the class of lever-operated die, that of A. & A. Phillips, patented in 1873 and shown in Fig. 3, is a fair sample. The chasers were operated by L-shaped levers, one end of which engaged a slot in the back of the chaser while the other end entered an annular groove on the inner surface of a ring of steel that surrounded the body of the tool. The chasers were opened and closed by a movement of this ring lengthwise of the body, which movement was under control of levers operated by the machine upon which the die was mounted.

Another lever-controlled die was the subject of a patent granted in 1890 to E. Goldthwaite, and is shown in Fig. 4. The drawing shows the principle of the tool very clearly. The lever *A* is fulcrumed at the rear end of the die body and at the other end engages the

chasers by means of a rounded projection somewhat like the tooth of a gear. This tool was also made to close by sliding the outer ring lengthwise toward the front of the die-body. When the ring was moved back, the chasers were thrown open by the pressure of coil springs.

An example of the cam-controlled die is shown in Fig. 5. This die was patented in 1875, by E. W. Green and J. Thomas, and is a fair sample of this class of tool. The chasers *A* are supported in rocking holders, the outer ends of which engage the cam surfaces upon the inner circumference of the cam-ring *B*. Opening and closing was accomplished by a partial rotation of the ring, which movement was derived from the machine. This die used an internal stop of a form which limited its application to short lengths, and its somewhat complicated mechanism was likely to become clogged with chips.

A cam and lever type of die that more nearly approaches the modern self-contained tool is shown in Fig. 6. The chasers, four in number, were held in separate jaws, or slides, which were susceptible to a radial movement under control of the cam-ring surrounding the body. This die was provided with a positive opening-device in the shape of a sliding collar which, when moved back upon the body, compressed the inner ends of the rocking levers and thus forced the jaws outward. This device was patented in 1888, by P. A. Sanderson.

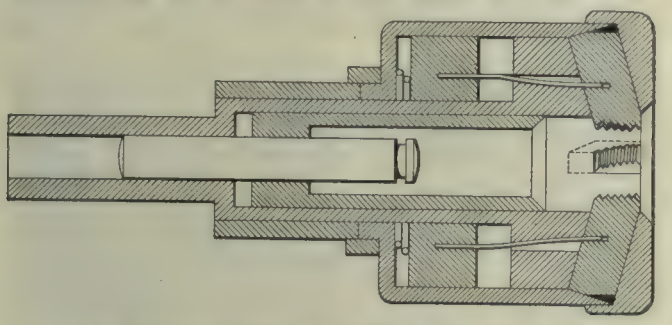


FIG 9—DIFFERENT APPLICATION OF THE WEDGE PRINCIPLE

Another cam and lever die is shown in Fig. 7, the invention of J. N. Severance, patented in 1889, and was adapted for use on the Brown & Sharpe screw machine. The chasers were in the form of long levers lying parallel with the axis of the tool and pivoted at the rear end. A cam-ring surrounded the body of the tool and bore upon the outer ends of the levers, closing them as it was moved forward. This tool depended in large measure upon various other parts attached to the machine and its application was very limited.

The Adams die, shown in Fig. 8, is of the wedge-controlled type. Four pins having one end upturned at a sharp angle are attached to a collar that slides upon the shank of the tool. The angular ends of the pins entered correspondingly shaped holes in the jaws that held the chasers, and an endwise movement of the pins thus caused the jaws to move inward or outward as the sliding collar was moved back and forward. This die also was operated by the machine through the medium of levers that engaged the annular groove in the sliding collar.

A somewhat more elaborate and practical die of the same class is shown in Fig. 9. It was patented in 1890, by Charles A. Johnson of Bridgeport, Conn. The wedge principle is applied in this case by the bell-shaped end of the outer sleeve, which, as it slides forward, closes over the outer ends of the chasers. The internal stop, from which many of the inventors find it hard to get away, places an arbitrary restriction upon the tool in the matter of length of work that can be threaded, and the flat springs upon which the opening of the chasers depend do not provide the most assured means of accomplishing the purpose.

Johnson Refuses to Buy at Too Low a Price

By John R. Godfrey

"Come on in Godfrey, I want you to meet a modern philanthropist. Wants to sell me stuff for less than it cost him to make it. Meet John R. Godfrey, Mr. Smithers."

'Twas Johnson doing the introducing, as you may guess—and Smithers wasn't overly happy. Not that he objected so much to meeting yours truly, as to have Johnson poking fun at him.

"Smithers here has just started a tool shop," Johnson explained, "and he's been figuring on some tools and fixtures to help us cut production costs, but his prices are so low that I'm afraid he isn't thoroughly acquainted with our friend, old man Overhead."

"But if I'm satisfied, Mr. Johnson—."

"Just wait a minute, son, and let me spout a little. It's none of my business if you want to work for nothing and live on one meal a day—though I'm not anxious to be a party to it. But I am interested in getting fixtures and tools made right and when I want 'em. Now I know dern well neither you nor anyone else, can make them at the price you quoted, and get enough for three meals a day. It can't be did.

"How does that affect me? Why this way. You'll fool along till you've used up what capital you have and then you'll quit. I may have saved a little money by helping you loose yours, but I'll also have helped to put every good tool shop in this town where the sheriff is within speaking distance. If everyone gave you their work, the other fellows would be down and out in a hurry.

"Now I want tools and fixtures next year as well as this. And I'm not going to be a party to the crime of making it impossible for the real tool shop to make a living. You tell me you only figure on charging me thirty cents an hour more than you pay your men. A good tool maker gets ninety cents or a dollar and you'll do this work for a dollar and twenty or a dollar and thirty cents an hour. My boy, you aren't even on speaking acquaintance with 'overhead,' at any rate.

"I'm not a bit fond of wasting money. I was born in New England you know. But I can't afford to take chances on killing my tool and fixture supply by encouraging you to lose money that way.

"I'm going to give you this fixture to make just to see what you can do. I'm going to pay you a fair price for it. Not so much on your account as on my own. I'll want more work done next year and the next. And I don't want to find that the older shops that have helped me in the past, are being driven out by newcomers before they themselves fail. Study your costs my boy—all of 'em, before you go to cutting prices."

Just a bit unusual, but isn't it horse-sensical?

Ideas from Practical Men

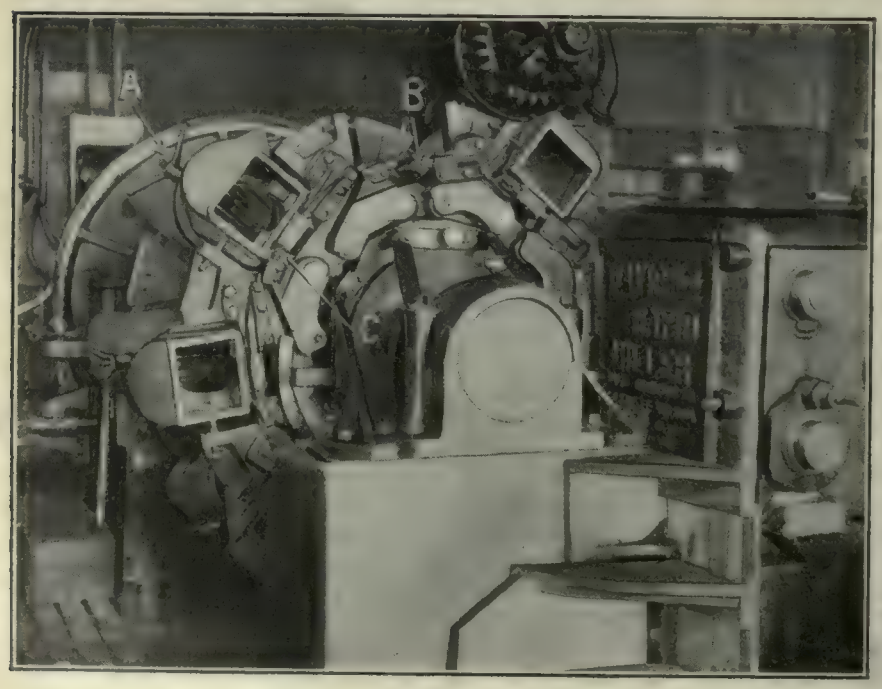
Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Face Milling Journal-Boxes

By Robert Brainard

The operation of face-milling journal boxes for railway cars is shown in the illustration herewith. The boxes are steel castings and there is approximately $\frac{1}{8}$ in. of stock on each to come off. The machine in use is a Davis No. 3 Rapid Milling machine of the drum type. Provision is made for carrying eight boxes on each end of the drum, or 16 boxes in all. Each box is held in position by a clamp *A* and the two pins *B*, which fit into a hole in a lug as shown at *C*. The right-hand pin is stationary but the left-hand one is attached to a pivoted lever. On the lower part of the lever is a cam roller which rides on a large stationary cam.

To load the machine, the operator places a box in position with the stationary pin inserted in the hole *C* and the box is clamped, using the clamp *A*. As the drum revolves, the cam roller strikes the high part of the cam and rises, forcing the other pin into the hole. Thus the box is held solidly while the machining is done. After the box has passed the cutters and nears the operator, a low spot on the cam allows the movable pin to be released. The operator then unscrews clamp *A* and removes the box, immediately replacing it with another. There are four cutters on the machine, two at each end of the drum. Each cutter removes $\frac{1}{16}$ in. of stock, this method lightening the power load and producing a better finish. Each cutter is 12 in. in diameter and runs at a speed of 15 r.p.m., or approximately 47 ft. per min. The drum makes one complete revolution in 12 min., which would account for a production of 40 pieces per hour at each end of the drum if the machine were kept filled. The production however, is limited by the ability of the operator, 30 per hour being the usual production for one operator, or 60 per hour if two operators are used. The photograph was taken at the plant of the Northwestern Malleable Iron Co., Milwaukee, Wisconsin.

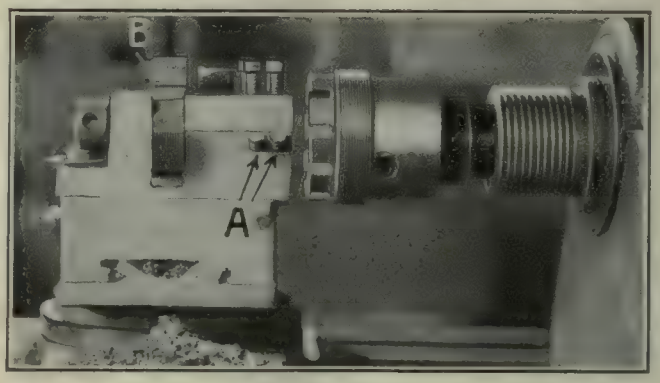


FACE-MILLING JOURNAL BOXES

Turning and Threading in One Pass

By Charles Howard

The set-up shown in the illustration is for turning and threading the outside of an adjusting nut. The nut is held by being screwed onto a stub arbor in the spindle of the lathe, as shown. Two toolbits *A*, both



SETUP FOR TURNING AND THREADING AT ONE PASS

of which can be seen clamped in the toolblock, serve as roughing and finishing tools and perform at the same time. The threading tool *B* was made out of a tool-steel disk, approximately $3\frac{1}{2}$ in. in diameter and $1\frac{1}{8}$ in. thick, cut with the same thread as that desired on the work, and milled so as to have four cutting edges. It is clamped in the toolblock, being located in a slot of the proper width. When the tool gets dull, the face of the cutting edge is ground and as there are four cutting edges, the tool will last almost indefinitely. The tool is chamfered so that the first thread barely scratches the work, the second one cuts a trifle deeper, and so on, the last couple of threads on the tool producing finished threads on the work. Thus the toolblock is fed past the work only once to produce a finished piece.

Without the setup described, three distinct operations would have been necessary to complete each piece.

Boring a 78-Inch Casting on a 54-Inch Horizontal Boring Mill

By Harold Brown

The illustrations show how large a casting was set up and bored on a comparatively small machine.

The method used to true the work on the machine,

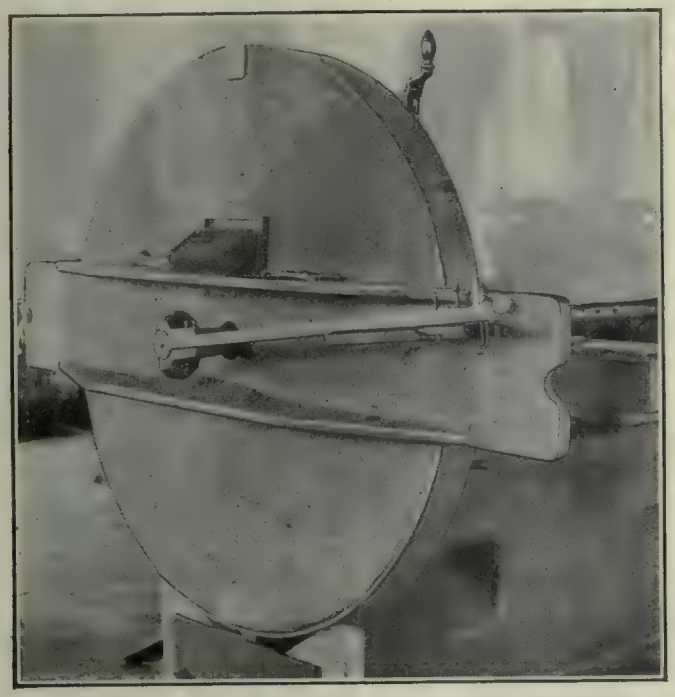


FIG. 1—TRUING WORK BY TRAM AND INDICATOR

by an indicator mounted on a tram, is shown in Fig. 1, while Fig. 2 shows how the work was mounted.

The hole was bored to within $\frac{1}{32}$ in. of size, after

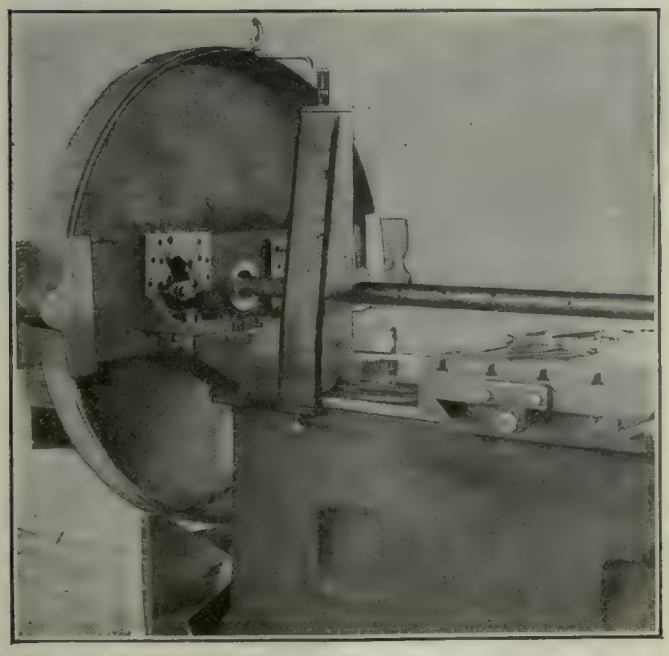


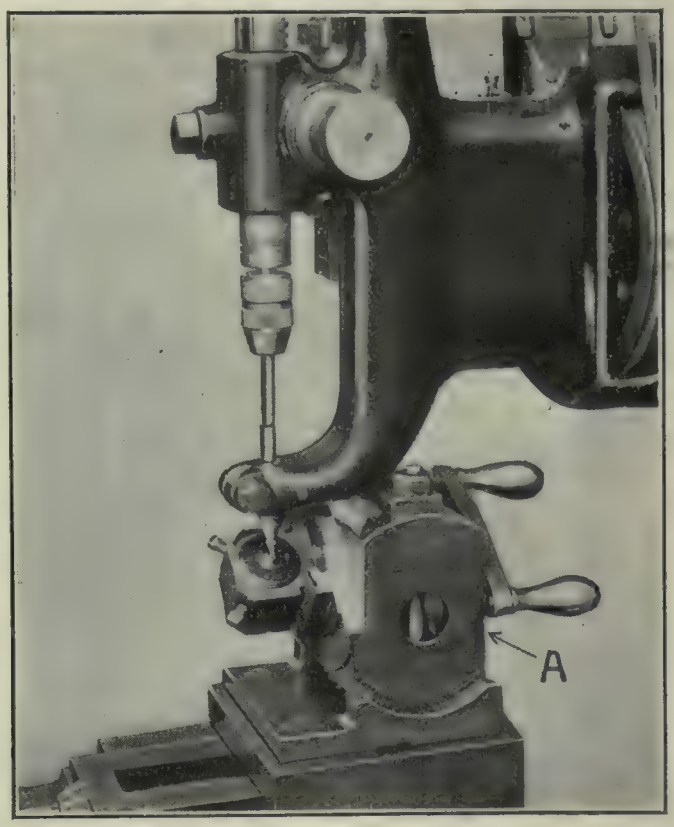
FIG. 2—HOW THE WORK WAS MOUNTED

which the work was rechecked by the indicator. The hole was then finish-bored, the accuracy of location being within the limits required.

A Delicate Drilling Job

By Henry M. Clary

The photograph herewith illustrates a set-up for a very delicate drilling job. The operation is that of drilling three 0.028-in. holes at an 80-deg. angle through $\frac{1}{16}$ in. of tool steel, using a K-N drilling and routing machine for the job. The piece, which is a spray nozzle for an oil engine, is held in a block that can be swung to any angle up to 80 deg. in either direction. The section *A* is locked at the desired angle by means of two bolts, as shown. The section in which the work is



A DELICATE DRILLING JOB

located is locked in position by means of the bar to which the handles are attached, at the back of the fixture. The bar is pinned to a bolt that screws into the section referred to, so that the section can be drawn tightly against the block *A* and thus held in position by friction. Two setscrews are used to hold the piece in the fixture, as shown. The drill is held in a special shank that revolves in a bushing in the lower arm of the machine, the support thus obtained tending to eliminate vibration.

An Easily Made Floating Drive

By I. B. Rich

We had to get a boring fixture at work in a hurry and there wasn't a floating joint to be had in the place. So the boss told us to wrap a layer of heavy wrapping paper around the taper shank of the tool, put it in the socket and drill through for a drive pin.

Then we took off the paper, put the next sized larger drill through the holes we'd drilled in the socket, used a pin that was a light drive fit in the shank, and we had a drive with just a little "float," which was what we wanted. And we made it in a hurry too.

Fitting Up Auto Engine Bearings

By Herbert F. Crawford

The average garage man who fits up engine bearings seems to feel that his first duty is to set the bearings up as tight as will allow them to be turned over. They sometimes make them so tight that the car has to be dragged around by a truck for several hours before the motor can be started either by starter, or crank, or both.

I had such a case with a car not long ago. When new the car ran beautifully. Then it developed a slight, but pronounced knock. This was diagnosed as piston slap, loose piston pin, connecting rods and main bearings, by as many different experts. So I had the motor taken down by a good man who only found a little looseness in the connecting rod bearings on the crankpins. This he proceeded to correct by setting the bearings up so tight that it took the aforementioned truck, to turn the motor over.

In 300 miles the knock returned—and he repeated the dose with the same result. In from 300 to 400 miles, the knock came back.

After several different experts tried the job and all with the same result, I was peeved. Finally a young fellow offered to bet me $25 he could remove the knock so it would not return for at least 1,000 miles. I took him up and he did the trick. And, much to my surprise, the starter rolled the engine over easily, as it wasn't fitted up tight at all. His theory is this:

When you fit an engine up with tight bearings, you damage the bearings before the oil can really get to work on them. You leave no room for an oil film, and the bearing scores, or wears unduly, before the lubrication gets thoroughly between the bearings, this being especially true of engines with force feed to the bearings.

By leaving space for an oil film, say from 0.0015 to 0.002 in., the oil pressure keeps the bearing surfaces apart and wear is very slow. This seems to be pretty sound advice and it also checks up with the practice of the builders of the best known engines.

Use of Double-Acting Machines—Discussion

By George Avery

There have recently been several articles in the *American Machinist* relative to the fitting of a planer to cut both ways. As a matter of fact, while the subject *sounds* attractive, it simply isn't practical, and that is the reason planers that cut both ways are not used generally.

In the first place, suppose a workable toolholder or special clapper box could be fitted to a planer, how many standard machines would carry the tools so as to make cuts of the same depth when working both ways? Not one. Why? Because the machines are designed to meet the conditions and stresses set up by cuts made in one direction only. To try to make the machine work both ways, means that the various traveling parts must be set so tight as to be almost immovable in order to overcome the stresses of the two tools as they alternately cut in opposing directions. The average planer tool not only has to meet resistance from directly in front, but also from the side, or diagonally.

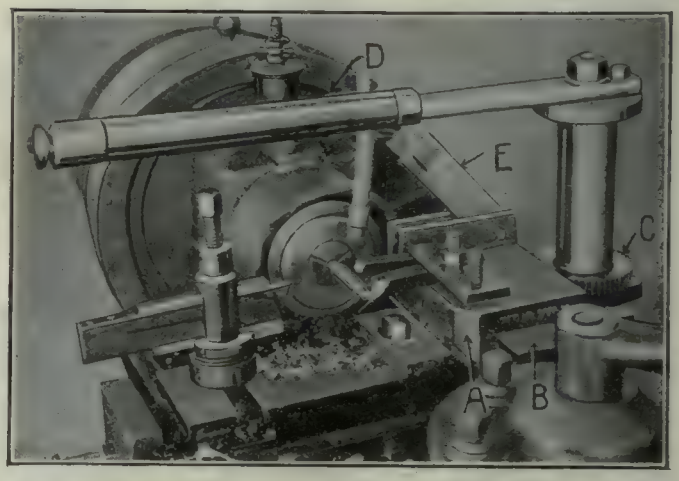
To add to the trouble encountered when trying to use double acting tools, is the difficulty of clamping the work to the planer table so that there may be no movement during either of the cuts. If there is any movement in the work; if the two tools are not set exactly and ground exactly to cut the same depth; if there is play in the planer crossrail, toolholder or slides; or if provision is not made for a dozen or more other difficulties, the machined surface will look like a badly ploughed field. At best, double acting tools could only be used for the roughest kind of work in actual practice, for on really accurate work a good workman would soon throw one of the tools away in disgust. On any work where a double acting device could be used with any degree of practicability, a milling machine of the Ingersoll type could be used with far more satisfaction and the workman would have none of the discouraging conditions met with otherwise.

A real mechanical engineer is always endeavoring to simplify productive methods and not to complicate them, and complications are certainly in evidence when one tries to use double-acting tools on a planer!

Taper-Turning Attachment for a Screw Machine

By A. Becker

The illustration herewith shows an improvised taper turning attachment in use on a hand screw machine. The block *A* slides on the dove-tailed base *B* which is attached to the carriage of the machine by a bolt



AN IMPROVISED TAPER TURNING ATTACHMENT

through the center. A 16-p. rack on the back of the block *A* meshes with the 48-tooth gear *C*, which can be turned by means of the lever *D*. By moving the lever *D*, and thus turning the gear *C*, motion is imparted to the block *A*. By loosening the nut on the bolt in the base *B*, the attachment can be swung to any desired angle, so that the tools shown will turn a corresponding taper. One of the tools is for turning the taper on the body of the work and the other is for pointing the end.

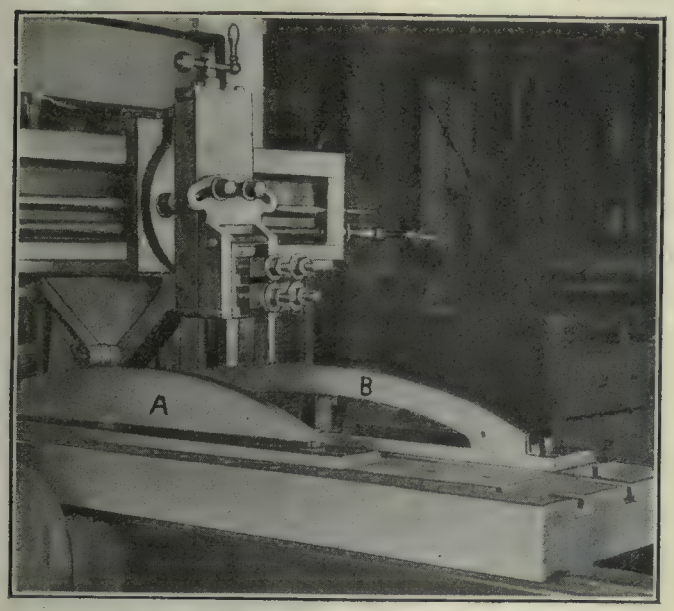
Another feature of the attachment is the parting tool *E*. The tool is pivoted at the rear end and when not in use it can be pushed up and out of the way. When needed it is dropped into position and held by an L-shaped clamp (not shown) pivoted at the front of the tool block, and which can easily be swung into position over the tool.

Planing Curved Work

By Harold Brown

The fixtures shown in the illustration were used for planing a slot in the lower-cowl rail for holding the lower windshield glass in an automobile.

The nuts on the screws for raising and lowering the cross-rail on the planer were removed and a leg carrying a roller was placed on the under side of the rail. The roller was used to give a vertical movement to the



FIXTURE FOR PLANING CURVED WORK

rail by following the contour of the cam *A*, fastened to the planer table. The rail was counterbalanced by means of springs which are not shown in the illustration.

The relation between the cam and the cutting tool was secured by moving the fixture along the planer table in either direction.

The work was clamped on the side of the fixture *B*, with the outer end against a stop pin, which gave it the proper location on fixture and also took the thrust of the tool.

A cut was taken across the top of the cowl rail to remove the scale, after which the slot was planed to the proper depth.

The machining time was 10 min. complete.

The time and material cost of the entire outfit was as follows: Design, 20 hr. Patterns, 31 hr. Machining and assembling, 84.8 hr. Material, $21.45.

Floating Holders for Reamers—Discussion

By William Archer

Under the above title on page 149, Vol. 59, of the *American Machinist*, J. T. Towlson, of London, England, writes regarding the use of floating reamer holders for *accurate* work. As a matter of fact, floating reamer holders are intended for *commercially accurate* work only and never for really accurate work. They are usually used in turret lathes or radial drilling machines to follow drilled or roughly bored holes, where very accurate setting of the work or the tools is not an economical proposition. Where very accurate holes are desired, it is the universal practice in the United States to finish ream by hand with an adjustable reamer where the size of the hole will allow. If the hole is too small for an adjustable reamer it is too small for a floating reamer holder.

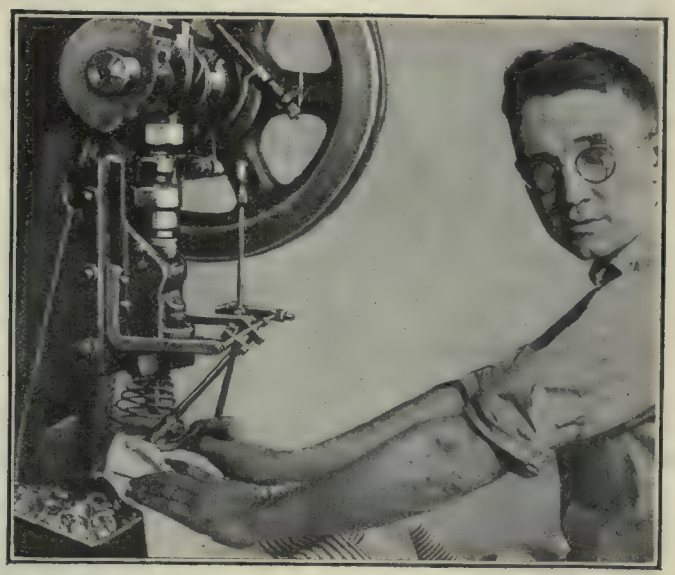
Spring Safety Device for a Punch Press—a Correction

There was published an article under the above title on page 919, Vol. 58, of the *American Machinist*, to which the inventor of the device takes exception—and rightly so.

The device was improperly described, the fault not being ours but that of the contributor who sent the article to us.

At the request of the inventor we give the following description of the device properly corrected.

The accompanying illustration shows a safety device



SAFETY GUARD FOR PUNCH PRESS

invented by A. E. Wilde, an employee of the Mail Equipment Shops of the Post Office Department. The special function of the invention is to save human fingers. The device takes the form of a guard for the punch presses which are used in grommeting mail bags in the process of manufacture.

The Mail Equipment Shops turn out millions of these bags during the course of the year and the harvest of fingers has been a serious problem. During a period of two years ending June 30, 1922, thirty-one operators lost fingers in the operation of the presses. After Wilde's guard was adopted and installed, in July, 1922, but two accidents of the nature occurred in a period of ten months.

In order to put the hands in a dangerous position it is necessary for the operator to raise the guard by depressing a pedal. This action locks the clutch dog so that it is impossible to operate the press. The space below the guard is sufficient only to admit the work and the insertion of anything thicker will also cause the clutch to be locked.

The cone-shaped spring surrounding the punch prevents the operator from putting his hands in danger while the press is in operation.

The Post Office Department has paid Wilde a special award of $100 for the device.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors
August 23, 1923

We Can Stand This Kind of Depression

WORD HAS JUST reached us that a certain New England machine-tool builder has recently received an order from a prominent automobile manufacturer that runs something over one million dollars. Only one type of tool is covered by the order, which makes it all the pleasanter.

In a time when gloomy forebodings continue to issue from various sources news like this is decidedly cheerful. Of course it is encouraging to be told, with figures to prove it, that the credit situation is sound, that the railroads are handling vast quantities of manufactured goods in an unexpectedly satisfactory fashion and that no serious clouds appear on the business horizon. Just the same it is much more to the point to learn that some hustler has won a man's-size order, for it shows that there is business, and good business, to be had.

Keeping Tabs on Machines

AS CONTRASTING the efficiency in management of two different firms in the same line the following incidents may be of interest:

The first sent in a hurry call for six new machines and the order was duly entered. Next day a long distance telephone cancelled the order because some one had just discovered that they had not only six, but ten, of these very machines which had never been uncrated. These machines had been in the shop for over two years and no one seemed to know it until they were found, quite by accident. The efficiency of the system used for keeping tabs on tools and machines can be well imagined.

The other shop has a system by which it not only knows what machines are on hand, but also what they are doing. Large bulletin boards in the superintendent's office tell the whole story, almost at a glance.

Taking automatic screw machines as an example, the bulletin board shows the kind of machine, the cost, the estimated output, the actual output, the time it is "down" and the cause, and other data which is necessary to actually know the net results from each machine. Single and multiple spindle machines of different types are automatically compared as to actual net performance. Guarantees and alibis stand aside while the bulletin board tells the real story.

There are too many shops with systems approaching the first mentioned and too few like the last. Even shops which do not come in the high production class can keep a record of machine tool performance to advantage. Idle time alone is a great eye-opener in many cases. It does much to show up either the machine or the management, or both. If the idle time is due to machine breakdown, you may know what machine not to buy next time. If the idle time is due to lack of material, the planning and routing wants looking after.

There is one point in this connection which is sometimes overlooked. A machine may be idle half of the time and still be a paying investment. If the total cost of the work done is less than when using a less efficient machine all the time the half-time machine pays. For, in addition to doing its work economically it is a reserve of capacity against the time when the business should increase.

Keeping tabs on machines is just as much a part of good management as keeping tabs on the bank balance.

Interchangeable Parts in the Toolroom

WE LIKE to think that the days are past when every piece had to be fitted to its mating piece. We believe that we have fully adopted the system of carefully measuring things with refined instruments. True it is that quantity production no longer depends on a pair of calipers and the sense of touch. But it is equally true that we are not yet using these refined measuring instruments to the fullest possible extent and that we miss the benefits of their application in many and very important operations. It is a peculiar fact that the system of production by careful measurements is distrusted by many of the very men who use it constantly and who are most skillful in its application—toolmakers and diemakers.

Perhaps we should not say that they distrust the system but rather that they do not trust the system in anybody's else hands. They are willing to confess that they can make a stud today and a bushing tomorrow and that these pieces will match though they were never fitted to each other. Mr. A can do this and so can Mr. B, but Mr. A is not willing to take for granted that Mr. B can make a bushing to fit his stud, nor does Mr. B believe that Mr. A can make a stud to fit his bushing. However they do not aim to slight each other's talents. Both believe that each can make interchangeable pieces, but only for his own job. Of course, this is not the thought of all of them but it cannot be denied that many think so or that others act upon this principle though they may never have formulated it in their minds.

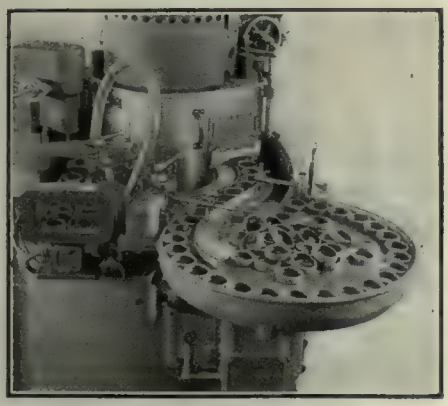
There are many shops where a toolmaker or diemaker makes the entire tool, die, jig or fixture. This must necessarily load the man with certain operations which do not require skill such as his, which cannot interest him and which could be done by a less skilled man equally well. At the same time it prevents another man from learning the use of fine measuring instruments and tools and so acquiring the knowledge which will make him a more skilled and valuable man in the course of time.

Using fine machinery for rough work is not considered good practice but using the highest skill in the shop for work which could be done by an apprentice is still being defended by otherwise practical men who wonder why their competitors are able to underbid them on many jobs.

Shop Equipment News

Dial Loading Device for Blanchard Surface Grinder

A dial loading device for the No. 16-A automatic surface grinding machine, manufactured by the Blanchard Machine Co., 64 State St., Cambridge, Mass., has been developed, and the modified machine is now being marketed. The hand-loaded



DIAL LOADING DEVICE FOR BLANCHARD GRINDER

machine was described on page 349, Vol. 58, of the *American Machinist*. The modified machine is known as the dial loading type, and is adapted to the grinding of rings, washers and similar circular work.

The operation of the loading device is shown in the accompanying illustration. The work is placed upon the circular table which rotates at a slightly higher peripheral speed than the magnetic chuck. A large number of pieces may be laid on this loading table and they are then fed automatically and continuously to the revolving magnetic chuck. The operator's work is therefore intermittent and he is released for such work as moving containers of rough and finished pieces. The grinding is continuous and lots of several thousand pieces may be ground without interruption.

As described before, the chuck is non-magnetic at the position where the work is loaded and becomes magnetic as the piece approaches the grinding wheel. The grinding is completed in one pass under the wheel, the exact size of the work being maintained by an automatic device which adjusts the wheel head for wear of the wheel. As the work leaves the wheel the chuck becomes non-magnetic and the finished pieces are discharged.

It is stated that the grinder will maintain size to within limits of 0.0005 in. and will hold work parallel to within 0.0003 in. On work within the range of the machine, production of from 550 to 650 pieces per hr., ground on both sides, is claimed.

"Syntron" Electric Hammer

A general purpose electric hammer with interesting features is now being marketed by the National Electric Manufacturing Co., Pittsburgh, Pa. The instrument is known as the "Syntron" electric hammer and its



"SYNTRON" ELECTRIC HAMMER

distinctive feature is the use of only one moving part in the mechanism.

The hammer is of the solenoid type and consists of a bronze sleeve in which the hardened steel piston or hammer head oscillates, striking the drilling head at one end of the stroke and a buffer spring at the other. The action of the piston is produced by coils at each end of the bronze cylinder. In operation the hammer is connected through a portable control box to any convenient alternating current light socket. When the trigger is pulled, the alternating voltage causes the coils to become temporary magnets in turn, and the hammer head is drawn back and forth in the bronze cylinder in synchronism with the voltage. The hammer strikes 3,600 blows per min. on 60-cycle current.

The control box is a static device which contains no moving parts and it is stated that the hammer uses less current than the ordinary domestic electric iron.

The accompanying illustration shows the hammer as used for drilling holes in concrete. On such work as this it is claimed that a 1-in. hole, 3 in. deep, can be drilled in hard concrete in one minute.

Porter-Cable Bench Spindle Sander

A small vertical spindle sander has just been added by the Porter-Cable Machine Co., 1708 N. Salina St., Syracuse, N. Y., to its line of machine shop equipment. This machine is adapted to be fastened to the bench but a suitable pedestal will be furnished if desired.

The sander is equipped with a G. E. motor which runs at a speed of 1,725 r.p.m. and is direct-connected through the spindle which has an oscillating movement of 1 in. The motor is totally inclosed. The spindle



PORTER-CABLE BENCH SPINDLE SANDER

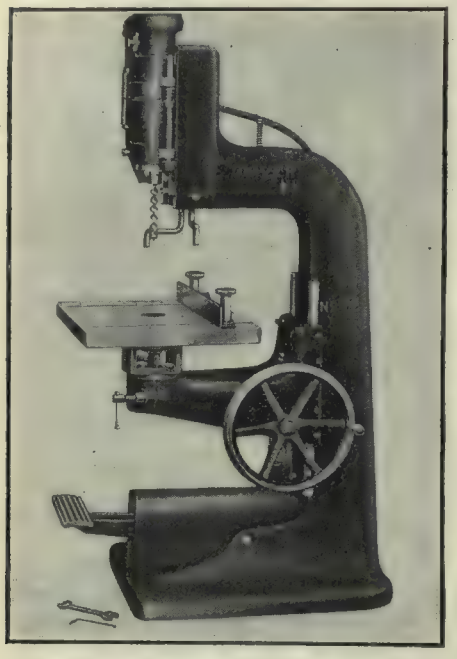
runs in ball bearings and is furnished with a 2¼ x 6 in. sander roll.

The table is 16 in. in diam., will tilt 45 deg. below the horizontal and 15 deg. above. The weight of the machine is 75 pounds.

Oliver Vertical Electric Boring Machine

The Oliver Machinery Co., Grand Rapids, Mich., has recently placed on the market a motor-in-head, vertical, single spindle boring machine, designated as No. 72. This machine is for use in woodworking shops.

The column is a one-piece cored casting, the base of which measures



OLIVER VERTICAL ELECTRIC BORING MACHINE

24x31 in. A counterbalance for the head is located inside the column and forms the connecting link between the foot pedal and the head.

The motor housing consists of two halves, bolted together and forming a unit with planed dovetailed ways at the rear. The lower half of the housing carries a lug at the back which is attached to the counterbalance lever system, through which the head receives its downward motion from the foot pedal. A compression spring provides quick return when the pedal is released. At the right side of the housing a lug is placed which operates between two adjustable stops for setting the length and position of stroke. The 1½-hp. motor is fully enclosed and runs at 3,600 r.p.m. on 60-cycle, 220 or 440 volt alternating current.

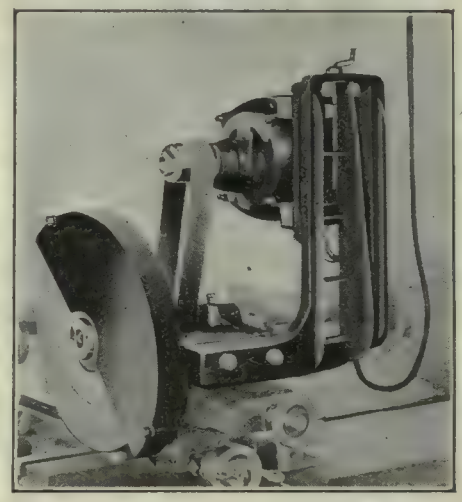
The spindle runs in ball bearings at either end of the housing, and is made from high-carbon crucible steel ground to size. At the lower end it is bored to receive ½-in. straight shanks of bits or chucks, but may be arranged for Nos. 1, 2 or 3 Morse taper shanks. A blast fan is mounted on the upper end of the spindle, and the air is directed toward the boring point to blow the chips away and cool the bits.

The cast iron table measures 20x24 in. and the distance from center of spindle to column is 18 in. The table is mounted on rockers and seats having a trunnion base which allows the table to swivel completely around and tilt in any desired direction up to 45 deg. The angle of tilt is indicated by a scale and pointer. At the center of the table an opening 2¼x3¼ in. provides bit clearance at all positions of the table and allows chips to drop through. The table arm is moved vertically by means of a large hand-wheel which operates a square-thread screw through spiral gears. A right angle fence, 24 in. long and 2¼ in. high is furnished.

The maximum stroke of the motor spindle is 6½ in., and the table has a vertical movement of 14 in. The floor space required is 31x39 in. and the total height is 72 inches.

Wilkie Lathe Grinder

A lathe grinder has recently been added to the line of equipment manufactured by the Wilkie Machine Works, Winona, Minn. This self-contained unit, which will be of interest especially to jobbing shops and garages, is adapted to be fastened to the carriage of any lathe by



WILKIE LATHE GRINDER

means of a plate which is machined to fit the tool post slot.

The grinding wheel spindle is hardened and ground and is mounted in two bronze bearings which are adjustable for wear. The standard grinding wheels are 6 and 10 in. in diam. and two wheels are furnished. The wheels are mounted on special locking collets and can be easily changed or placed on either end of the spindle.

The motor is mounted on a strong frame above the spindle and is arranged to be easily raised and lowered. The parts are so arranged that the weight of the unit comes directly over the carriage and this tends to decrease vibration. Wooden belt pulleys are furnished for the motor shaft in sizes to give the proper speed at the grinding wheel.

Suitable guards are provided for the grinding wheels. In operation the carriage is not brought back farther than for ordinary tool work as the spindle comes directly over the tool post slot of the carriage. The proper motor will be furnished for any current requirements.

Waynesboro "Bull-Dog" Nut Lock

The Waynesboro Nut Lock Co., Waynesboro, Pa., is now marketing a nut lock or locking washer which has interesting features. It is adapted especially for use in cases where difficulty is experienced in keeping nuts



WAYNESBORO "BULL-DOG" NUT LOCK

tight on account of vibration or shock to which they are exposed.

The device is shown in the accompanying illustration and requires no special bolts or nuts. It can be applied to any bolt with an ordinary wrench and operates on the principle of the alligator wrench. Upon tightening the nut the tooth engages the thread, and it is said that the nut cannot be backed off, even with a wrench, since the greater the tendency to back off, the tighter the engagement of the tooth is in the thread.

This nut lock has undergone severe and extensive tests on rail joints and is claimed to be exceptionally effective and efficient.

News Section

Plan Motor Accessories Convention

The Fall convention of the Motor and Accessory Manufacturers' Association will be held at Boston from Sept. 19 to 22. The general program committee which has been organized under the direction of the president, W. O. Rutherford, and the general manager, M. L. Heminway, includes J. M. McComb, vice-president, of the Crucible Steel Co. of America; Maurice Switzer, vice-president, the Kelly-Springfield Tire Co.; S. W. Dorman, vice-president and general manager, the Overseas Motor Service Corp.; E. P. Chalfant, chairman, the Gill Manufacturing Co.; H. W. Angevine, treasurer, and P. C. Gunion, advertising manager, of the Hyatt Roller Bearing Co.; A. Pauli, credit manager, S K F Industries; B. M. Asch, president, Asch & Co., Inc., and C. A. Burrell, manager of the credit department, H. Deuster, manager of the traffic department, and M. Lincoln Schuster, manager of the educational department, of the Motor and Accessory Manufacturers' Association.

The dominating theme of the convention will be "Widening the Market for Automotive Products." This subject will include discussions on the need for more and better roads; the acute need for more space to drive and park automobiles; the need of removing unfair automobile taxation; and a world view of motor transportation.

The problems relating to jobber distribution will be another important subject which the convention will consider in its plan to widen the automotive market. In this connection the association states that close to 50 per cent of its affiliated companies market their products through automotive jobbers and vehicle makers.

New Record in Repairing Locomotives

The railroads of the United States from July 15 to Aug. 1 repaired and turned out of their shops the largest number of locomotives for any semi-monthly period in their history.

The total number repaired during that period was 22,200. This exceeded by 794 the previous record which was established during the last half of May this year when 21,406 locomotives were repaired.

Locomotives in need of repair on Aug. 1 this year totaled 11,555 or 18.1 per cent of the total number on line. This was a decrease of 300 compared with the number on July 15, at which time there were 11,855 or 18.6 per cent.

Of the total number on Aug. 1, 10,370 or 16.2 per cent of the number on line were in need of heavy repair, a decrease of 414 since July 15.. There were also on Aug. 1 this year, 1,185 or 1.9 per cent in need of light repair, an increase, however, of 114 over the number in need of such repair on July 15.

The railroads on Aug. 1 had 52,385 serviceable locomotives, an increase of 313 over the number on July 15, while they also had 2,550 locomotives in good repair and in storage, which was an increase of 113 within the same period.

Canadian Railroads Show Substantial Gains

Official statistics of railway revenues and expenses for the month of May show that the railways of Canada increased their revenues by 4.7 per cent over April, and 10.2 per cent over May, 1922, the increase in the passenger traffic being 8.6 per cent.

The Canadian National Railway in comparison with May of last year, had a gain of 9.4 per cent in gross receipts, and of 7.4 per cent in operating expenses. A betterment of 18.7 per cent in passenger revenues took place, and of 8.5 per cent in earnings from freight service. The operating ratio was reduced from 96.26 per cent in May, 1922, to 94.50 per cent. The wages bill was larger by $873,736 and the number of employees was increased by 8,103.

The Canadian Pacific Railway had a betterment of 2.5 per cent in operating revenues and of 9 per cent in operating expenses. The chief addition in outgo was in the department of way and structures, amounting to 20.3 per cent. Wages increased by $651,173, and the number of employees by 6,371. The operating ratio rose from 82.72 to 87.99, it is reported.

British Iron Production Declines in July

England produced 655,100 tons of pig iron in July, against 692,900 tons in June and 714,200 in May, which was the biggest this year. The output for July last year was 399,100 tons and the monthly average for 1922 was 408,300 tons, with 855,000 tons the average for 1913.

Steel ingots and castings produced last month aggregated 624,300 tons, against 821,000 tons in May, the high record for the year, and 433,100 tons in July, 1922. The average for 1922 was 486,000 tons, with an average of 638,600 tons established in 1913.

Furnaces working last month aggregated 206, establishing a decrease during the month of 16.

General Electric Will Give Bonus

Payment of supplementary compensation to all employees who had completed five years or more continuous service on June 30, last, was announced by the General Electric Co. The payment is for the first six months of the year, and employees receiving $4,000 or less a year will be paid 5 per cent of their earnings for the period.

The distribution will total $1,119,300 and 26,324 persons will benefit.

Unemployment Shows But Slight Increase

An analysis, based on information gathered in sixty-five industrial centers from 1,428 firms employing 500 or more workers, showed that in July there was a slight increase in unemployment over June. A total of thirty-seven cities, however, reported increased employment, while twenty-seven registered a slight decrease.

"In the fourteen basic industries," F. I. Jones, director general of the United States Labor Department's employment service, said, "nine showed increases in employment, as follows: Beverages, 72 per cent; paper and printing, 4.4 per cent; railroad repair shops, 2.4; food and kindred products, 2.16; chemicals and allied products, 0.79; lumber and its manufacture, 0.47; iron and steel and their products, 0.44; miscellaneous industries, 0.36, and stone, clay and glass products, 0.13 per cent.

"A few pessimists pop up their heads here and there; however, they are always with us. There is an atmosphere in industry that is decidedly optimistic. Some call it 'back to normal.' We are of the opinion it is back to a sound and firm foundation that is wholesome and basically healthy."

Heavy Freight Loading Continues

Loading of revenue freight for the week which ended on Aug. 4 totaled 1,033,130 cars, the second largest number for anyone week in history.

This was a reduction of 7,914 cars under the previous week when the total was 1,041,044 cars which stands as the high mark.

The total for the week of Aug. 4 was considerably in excess of any corresponding week in previous years, however, exceeding by 190,467 cars the same week last year when freight loadings were reduced by the strikes of miners and railway shopmen. It also was an increase of 246,952 cars over the same week in 1921, and an increase of 95,400 cars above the corresponding week in 1920.

While the number of cars loaded with revenue freight for the week was an increase for the country as a whole of 22.6 per cent over the corresponding week last year, freight loadings in the Western district increased only 15.3 per cent and in the Southern district, 17.1 per cent. The increase in the Eastern district, which includes the Pocahontas district, was 30.3 per cent, partly due to curtailment of coal loading last year because of the miners' strike.

The decrease in loadings compared with the week before, was due to a slight falling off in the loading of all commodities, which except for grain and grain products, however, were considerably above those for the corresponding weeks in the two previous years.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THE gasoline war in the United States and the "near war" in Europe were the subjects that chiefly occupied the attention of the markets last week. The former caused a decline in gasoline, and the oil stocks, but the latter seems to have lost its terrors for American business. Seriously speaking neither are entitled to the attention given them, but on a cloudless day even a light shadow looks dark and our domestic conditions are now so satisfactory that the pessimists would be forgotten unless they emphasized the few unfavorable features of the outlook.

In Europe the expected has happened. There have been food riots with some bloodshed in Germany, and France and England seem to be parting company as they exchange notes. But the reassuring fact is that the American markets have become insensible to conditions abroad, while the continued decline in the franc is gradually bringing France face to face with the economic impotence that will be hers if her foreign credit is withdrawn and her currency become valueless.

The decline in French bonds and francs is therefore to be counted as encouraging for things in Europe seem to have reached a pass at which economic compulsion is the only argument that is effective.

Meantime, America must wait, but she is apparently coming to realize that each decimal that the franc declines hastens the inevitable settlement in Europe.

As to the gasoline war, it, too, is a blessing in disguise for it means that the cost of motoring will be reduced and that the people will be benefited even though the oil companies suffer. The governor of South Dakota who forced the reduction in the price of "gas" by establishing state filling stations is therefore to be thanked and congratulated upon having discovered a new way to achieve political popularity.

The decline in the oil stocks which ensued is not surprising though it is probably unwarranted for the oil companies will in all liklihood be able to take care of themselves. Meantime, it is worth noting that the schedule of the late William Rockefeller's estate published last week showed that less than 4 per cent of his fortune was invested in Standard Oil securities from which it is inferred that the stocks of these concerns are now widely distributed.

Except for the oil stocks and the French and Belgium bonds, the stock market has been quietly firm with a tendency toward improvement on news that was at all encouraging. This tendency seems likely to persist and when the European clouds roll by, as they will in time, a sharp advance is to be expected. Premonitions of a mild speculative revival are already discernible in the commodity markets. Wheat is well bought whenever it falls below a dollar. The market has been strengthened by the issuance of a Department of Agriculture report which declares that farmers "intend to plant" 15½ per cent less acreage in Winter wheat this year than they did last. The chances are that the figure is meaningless, for neither the government's crop estimators nor anyone else can foresee what farmers will do next Fall, and the Department's assumption of psychic power is little short of ridiculous. But good comes out of evil and if the report dissipates some of the bearish fog which has been hanging over the wheat market its consequences, at least, are to be welcomed.

> "In the steel industry the activity is surprising in view of the dullness predicted two months ago and copper is moving freely, though the price is no higher. . . . Our foreign trade in July, with exports of $310,000,000 and imports of $284,000,000 was heavier than in the same month last year, and the excess of exports was the first since February. Nor has there been any falling off in our gold imports."

Hogs and cattle are higher despite the unusually large receipts at the stock yards.

Cotton is acutely susceptible to the high temperatures reported from Texas and advances easily although many think that the damage done is exaggerated and has been discounted.

The dry goods market is in much better shape. There is a good demand at slightly higher prices.

Coffee has not moved much though there is a feeling that it would be higher were it not for the unsatisfactory financial position of the Brazilian government. Sugar continues weak, but the situation is simply the old one of distributors refusing to buy in a declining market. Meanwhile their stocks are being exhausted and when they think the bottom is reached the necessary buying that must ensue will put prices up quickly again.

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The tire manufacturers are reported to have accumulated an unwieldy surplus, but there is no proof of it in the action of the crude rubber market which has been advancing lately.

It is generally believed that President Coolidge will succeed in averting an anthracite coal strike, but even if he does not the supplies above ground and in the hands of consumers are sufficient to prevent a famine.

Our foreign trade in July with exports of $310,000,000 and imports of $284,000,000 was heavier than in the same month last year, and the excess of exports was the first since February. Nor has there been any falling off in our gold imports. For the first seven months of this year they totaled $160,000,000 compared with $166,000,000 for the same period in 1922.

The "articles of accord" that have been signed in Mexico City by the commissioners from the United States and Mexico are understood to presage an early recognition of Obregon's government at Washington and those who do business with Mexico or have investments there are optimistic as to the result.

The weekly statement of the Federal Reserve System shows a reserve ratio of 77.3 per cent which insures a continued abundance of commercial credit and the Farm Loan Board has sold $10,000,000 of its six months debentures at 4½ per cent. The funds thus provided will be loaned chiefly to farmers' co-operative marketing organizations on warehouse receipts for wheat, wool, and cotton to aid in the orderly marketing of these commodities.

In addition to all this President Coolidge has given the country to understand that he will spare it an extra session of Congress thereby putting a final touch to an unusually cheerful domestic outlook.

Illinois Central to Build Big Cut-Off

The Interstate Commerce Commission recently authorized the Illinois Central Railroad to proceed, through subsidiary corporations, with the construction of a 165-mile cut-off line running from Fulton, Ky., to Edgewood, Ill., at a cost of approximately $16,500,000.

To carry its plan into effect, the Illinois Central proposes to organize the Southern Illinois & Kentucky Railroad, which would build 123 miles of single track railroad from Edgewood, Ill., to Metropolis, Ill., on the Ohio River. At Metropolis the Chicago, St. Louis & New Orleans Railroad, another subsidiary, would take up the construction, bridging the Ohio and building forty-two miles to Fulton, where it would connect with the Paducah & Illinois Railroad, a third subsidiary, which the Illinois Central is now operating.

News of Washington Activities

By Paul Wooton

WHILE officially there has been no move made by the Federal Government in the anthracite situation, it is known that the threatened cessation of work in the hard coal fields when the present agreement expires Aug. 31 has been given considerable thought by President Coolidge as well as by other officials. Despite many rumors and newspaper reports asserting as a fact that first one course then another will be pursued by the Government, there has been no formal announcement of policy and most of these reports may be set down as belonging in the realm of pure speculation.

The activities of the Coal Commission have been restricted in the last week owing to the halting of Governmental activities in Washington for three and a half days on account of the death of President Harding. Members of the commission have been watching for developments in the anthracite situation, but formal meetings of the body practically were suspended for a week.

The Coal Commission made public recently a report submitted to it by a special staff composed of Henry S. Dennison, Willard E. Hotchkiss and Joseph H. Willits on "Labor Relations in the Anthracite Industry." This report was one of those upon which the Commission based its recent report and recommendations regarding the anthracite industry.

The Commission also made public a statement showing that it will be impossible for the Commission to make the detailed investigation of the retail coal industry throughout the country as such a survey would cost $2,000,000 and in all probability would not be conclusive.

What Will Coolidge Do?

As the crisis in the anthracite industry through the apparent deadlock in negotiations between operators and miners is of immediate importance and is pressing for attention as the days of August pass, the situation has been called to the attention of President Coolidge by a number of visitors who were accorded audience with him in his first week in office. It may be stated upon reliable authority that President Coolidge has not indicated a course of action definitely. It may be stated with equal authority that the new President does not view coal in terms of anthracite alone, but that he is rather familiar with the fuel situation not only in the New England states, but throughout the country in a general sense at least. Coming from New England, it is natural that President Coolidge should thoroughly understand and sympathize with the attitude of the New England states regarding fuel supply.

President Coolidge is understood to have no intention of calling a special session of Congress, even should there be a cessation of operations in the anthracite field Sept. 1. The President does not possess any authority to take over the mines and so far as powers of compulsion are concerned, President Coolidge in the event of a coal strike would find himself in exactly the same position that President Harding occupied in the Spring of 1922. There is, however, a decided difference between the two periods in that public sentiment has crystallized to a large extent within the last year against strikes which cut off supplies of necessities of life. This sentiment is reflected among members of Congress and it does not require particular wisdom to prophesy that the incoming Congress will be very much more ready to enact drastic legislation affecting coal than any of its predecessors has been.

This sentiment is understood by both miners and operators, it is believed in Washington, and it is this sentiment added to the natural power of the position of Chief Executive of the United States that places in the hands of President Coolidge, and of the President's agency, the Coal Commission, a powerful weapon in behalf of the public interests.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb....	$0.0337	$0 0337	$0.0278
Cold finished shafting.....	per lb....	0.0428	0.0428	0 0365
Brass rods.....	per lb....	0.1741	0.1825	0.1650
Solder (½ and ½)	per lb....	0.276	0.276	0.221
Cotton waste...	per lb....	0.1231	0.1231	0.11
Washers, cast iron (½ in.)...	per 100 lb.	4.66	4.66	4.00
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100...	3.08	3.08	3.11
Lard cutting oil	per gal...	0.575	0.575	0.575
Machine oil....	per gal...	0.349	0.349	0.36
Belting, leather, medium.....	off list....	37%	37%	46⅔%
Machine bolts up to 1x30 in.	off list....	44¼%	44¼%	59%

Many New Freight Cars Delivered

During the last half of July, 9,493 new freight cars were delivered to the railroads and placed in service, which brought the total number of new freight cars placed in service from Jan. 1 to Aug. 1 up to 96,950.

The railroads also during the last half of July installed 121 new locomotives, making a total of 2,221 placed in service during the first seven months this year.

Of the new freight cars placed in service during the last half of July, box cars numbered 3,595; coal cars, 3,133; refrigerator cars, including those delivered to railroad-owned private refrigerator companies, 1,846, and stock cars, 226.

The railroads had on Aug. 1, this year, 86,716 new freight cars on order with deliveries being made constantly. Of the total number on order, box cars numbered 38,689; coal cars, 34,457; refrigerator cars, 9,299, and stock cars, 2,214.

Canada Looks for Busy Autumn

The industrial situation in Canada at present is to a marked degree influenced by the crop situation in the Western provinces. Wheat harvesting is becoming general, and as indications promise an excellent yield, with a consequent inflow of millions of dollars, manufacturing interests are counting upon a continuation of the present active demand for mill and shop products. Sales of farm machinery have been of unusual volume and, with cash in hand, the farmers may be expected to invest liberally in machinery for Autumn cultivation.

Employment in building construction and on engineering works continues to be satisfactory, although with the unprecedented demand for harvesters in the West unskilled labor is apt to be below requirements for new waterpower undertakings.

Since the recent drop in pig iron prices the market for both iron and steel has shown considerable firmness. Reports of several of the larger gold mining companies in Ontario accompany the announcement of enhanced value of their monthly output by estimates of further extension of operations and the employment of more mechanical energy as the latter becomes available through the completion of several hydro-electric plants in their vicinity. Co-incident with this condition in northern Ontario is the impetus given to prospecting in the neighboring metaliferous region of Quebec by new provincial mining regulations.

An active demand for British coal, particularly Welsh anthracite, has developed as a result of experience in Canada of the unreliability of the United States sources of supply with the prospect of ever ascending prices. Importation of British coal in the three months ended June 30, totaled 150,000 tons as compared with 16,845 tons imported during the corresponding period of last year.

Construction continues active throughout the provinces of Quebec and Ontario. During the first seven months of this year the contracts awarded throughout the Dominion amounted to $196,165,700, as compared with $159,146,200 for the same period last year.

Screw Thread Commission Holds Meeting

The National Screw Thread Commission met in Greenfield, Mass., Aug. 7 for the discussion of standardizing of screw threads and related matters. During its stay in Greenfield the party enjoyed a tour over the Mohawk Trail scenic highway. The commission comprises Dr. G. R. Burgess, director of the U. S. Bureau of Standards, Washington, D. C.; H. W. Bearce of the Bureau of Standards; Commanders J. N. Ferguson and M. A. Libbey of the United States Navy; R. E. Flanders, Springfield, Vt.; George S. Chase, Cleveland, O.; E. Buckingham, Hartford, Conn.; and F. O. Wells, Greenfield, Mass.

Chicago Is Confident of Fall Improvement

Railroads are leading in the buying of machine tools in the Chicago district. There is practically no buying by indsutrials. The Chicago, Burlington & Quincy R.R. is expected to commence buying on the rather large list which has been outstanding for several months and the Elgin, Joliet & Eastern R.R. has made a few purchases during the past week. The Canadian National Ry. has made inquiry for some twenty machine shop tools. The Pennsylvania R.R. has issued a list involving about 30 tools for its Pitcairn, Sharpsburg, Youngwood and Jerry shop. The Union Pacific R.R. is making inquiry for a driving wheel lathe and a drill press. The Baltimore & Ohio R.R. has issued an inquiry for one 32-in. shaper; one 36-in. upright drilling machine; one 44-in. vertical boring mill; three 24-in. x 12-ft. engine lathes; one 12-in. centering machine; two 5-in. twist drill grinding machines; one electric one-ton hoist; one motor-driven hack saw; one 20-in drill press; two 36-in. x 18-ft. motor-driven engine lathes; one 24-in. shaper; one 28-in. shaper; two 20-in. x 10-ft. engine lathes; and two No. 1 grinding and polishing machines for its Glenwood Shop.

Some purchases have been made by the pressed metal manufacturers. The automobile industry is doing very little at this time, but it is anticipated that purchases for replacement will be made during the next couple of months.

Chicago dealers are inclined to the belief that machine tool buying has reached the low point for the year and that the market will show a gradual increase in activity from now until the end of the year.

The second hand machinery demand has eased off. The price of new tools remains the same.

Presses are in demand more than any other tool among the industrial concerns. A toy manufacurer has placed an order for several presses. Sales have been confined almost entirely to small tools with the exception of those made to the railroads.

Better Trade Reported in Cincinnati

There are definite signs of improvement evident in the Cincinnati machine tool market. Plants are reported to be running anywhere from 50 to 70 per cent of their capacity and business is considered slightly better than normal for this time of the year. The number of inquiries being received is indicative of increased activity for Cincinnati plants in the near future and it is apparent that many of these inquiries are likely to develop into good business within a short period.

One source of gratification is the noticeable improvement in sales to the automotive industries. This field has been rather slack for a number of weeks and few orders of consequence have been filled for automotive manufacturers, but business in this line is steadily improving and it is expected that September will bring many orders. Railroads and the electrical tool manufacturers are doing about their normal amount of buying for Summer and here again inquiries are on the increase. Business has been very good lately for manufacturers of conveying machinery. This has been due in a large measure to the shortage of both skilled and unskilled labor. Much conveying machinery is being installed in rubber and powder plants and also in brass and steel mills. One of the large buyers of conveying machinery in the Cincinnati market recently was the General Electric Co.

Machine tool dealers say that the local purchase of machinery is on the increase and that the volume of business done by Cincinnati machine tool houses with Cincinnati firms is steadily showing a larger total. Manufacturers of planers expect that the railroads will be in the market soon and will make extensive purchases. In fact there have been many inquiries and there are quite a number of orders which are about to be placed according to reliable authority. A normal production and sale of planers has been reported by Cincinnati houses, the steel mills doing their share of the purchasing. A marked preference for small planers is evident. This should not be interpreted as a tendency towards small orders as some of the recent orders have been for both small planers and the highest-priced planers.

Among the electrical tool manufacturers business is fair, in certain instances running as high as 25 per cent above the volume of business last year with a good outlook for the remainder of this month. Several large garages have been in the electrical tool market and the Pennsylvania R.R. has bought drills recently in the Cincinnati market.

The production of lathes is going along nicely with orders in some of the plants providing for a normal amount of work during the rest of August. The automotive people are displaying more interest in lathes and buying at Detroit and Cleveland has picked up.

Southern Market Shows Slight Betterment

While industrial conditions throughout the Southern territory are reported as generally satisfactory, machinery and machine tool sales by Atlanta jobbers and manufacturers have been slightly off during the past two or three weeks. They have found the principal demand of late throughout the South has been for lathes, drilling machines and milling machines, and regarded as a whole this business has proven materially better this Summer than it did last year at this time. The outlook for the rest of the year, too, is considerably better than at this time a year ago, and a majority of distributors and manufacturers predict a good volume of business the rest of the year in the Southern territory.

The textile industries have been the principal machinery buyers in the past few months and are expected to continue so the rest of the year due to the enormous amount of new construction that industry is carrying out in the South this year. The lumber industry has also been a fairly good buyer, but recently that trade has fallen off to some extent.

Inquiries being received at present are out of all proportion to the gross amount of business that is being done. That is, numerous inquiries are being received, but they are developing only a comparatively small amount of business.

New York Market Holds Its Own

Business in the machine tool market continues good and by comparison much better than at this time last year. Prospects for Fall business are excellent and leaders in the trade express the opinion that they are confidently looking forward to one of the best seasons in several years.

Both the General Electric Co. and the Central Railroad of New Jersey were good customers last week and inquiries are out from several roads in the East. The New York Central R.R. has several lists out and buying is expected from this source within a short time.

General industrials are not in the market just now to any extent but, again by comparison, neither were they in the market last August. Automotive industries are buying for replacement at this time and dealers report that exceptionally large sales are expected in September from this source. One sale recently made to an automobile concern totaled over a million dollars and machine tool men say that this is the beginning of rather spirited buying on the part of the automobile group.

Used machine tools are not moving as fast as they were a few weeks ago and there has been no call for special machines in the past two weeks.

Business Improves in Indiana

A somewhat better tone is noticeable in the machinery and machine tool business in Indianapolis. The first part of August and the latter part of July saw many purchasing agents and executives out of the city on vacations, with the result that new equipment purchases were held up generally unless there was some pressing need.

While there has been some decrease in the requirements for wood-working plants particularly interested in the construction industry, such as sash and door and interior finish plants, there has been an increase in inquiries from box factories, furniture factories and cabinet factories. The trade here learns these plants are gradually increasing production and many of them are planning some additional installations that will mean considerable more business for local firms. At the Ross Power & Equipment Co. dealing in machinery here, Mr. Ross said the volume of business this year, during the first seven months, was far ahead of the same period last year.

An encouraging note has been struck by the automotive industry here. Its tooling requirements have increased rather more than was expected since the first of August. One plant that was in the hands of a receiver has secured an order for several hundred taxicabs for use in New York, that has given the entire business here additional optimism. The popular demand for closed cars has done much to increase the sale of special machinery in local automotive plants.

Practically all sorts of printing machinery and machinery specially fitted for allied trades, are reported in demand. There has been a big increase in this business since the middle of July.

Philadelphia Trade Is at Even Trend

Skilled workers in the machine trades from British possessions, mostly Scotch, have provided an industrial asset to manufacturers in the Philadelphia district in recent months. While the influx has not been great, the stream has been quite steady, and the trade has been able to absorb them.

Reports from large industries are that all the manufacturers are glad to obtain the services of the thrifty Scotch workers, who prove a valuable addition to this country. Under the trade union rules abroad most of these men have served apprenticeships of from five to seven years, it was said by Earl S. Sparks, secretary of the Metal Manufacturers Association, and they are well fitted for work here. Even the workers with less experience can find employment in the machine trades.

Trade in the machine industry continues somewhat sluggish, due to the seasonal decline. Many manufacturers reported production to be in excess of orders. Others said that orders were keeping pace with production.

In the steel industry reports show that so far this month the August sales are slightly ahead of the daily average for July. A considerable number of orders for structural steel has been booked this month. Tank plates for large oil interests for storage reservoirs have been ordered for the West in large quantities from mills in the Philadelphia district.

Boiler manufacturers report a considerable demand from laundries and industrial concerns. Sheet brass and copper dealers are enjoying a fairly active business with the call for sheet brass largely from builders using that material in roofing.

In anticipation of the new plant of the General Electric Co., in contemplation for southwest Philadelphia, a $3,000,000 housing project is under consideration. It is planned to develop about twenty acres of ground with 500 dwellings. The operation is under contemplation by Norman R. Leedom. The Electric Co.'s plans have not yet fully developed.

Iron Production Is Big in the South

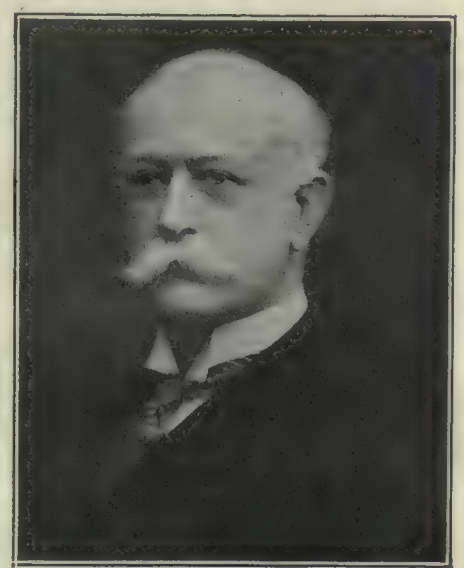
With pig iron production in the Alabama district now on a basis of 240,000 tons per month on the average there is a promise that 1923 will prove the biggest record in the state's history, according to a recent survey by William E. Dunn, Jr., of Atlanta, secretary of the Southern Metal Trades Association. Production in July was less than in June, being 234,985 tons, but present indications promise this will be improved in August due to a steady improvement of late in market conditions. The total for the first seven months of the year was 1,680,667 tons, nearly 50 per cent better than the first seven months of 1922, or more than half a million tons. The biggest year in the industry's history was in 1917 with a total of 2,950,000 tons, and with a slight increase the rest of this year that record will be either equalled or excelled in 1923.

Throughout the South, Mr. Dunn states, the iron and steel industries are in as prosperous a condition as they have ever been, with most plants on capacity production. Export trade out of Southeastern ports has been exceptionally good all this year, and 1923, according to present indications, will prove one of the best export years in the history of the industry in the South.

Financially the South is in excellent shape, with a promise of remaining so for the coming year due to good cotton prospects. A yield of close to 12,000,000 bales is looked for selling at an average price of 25 cents per pound, and this would mean the best cotton year in the South's history so far as its monetary returns are concerned.

Edward M. Woodward Dies in Worcester

Edward M. Woodward, aged 76 years, died recently at his home in Worcester, Mass. Mr. Woodward was president and treasurer of the Woodward & Powell Planer Co., Worcester,



EDWARD M. WOODWARD

and was an ex-president of the National Machine Tool Builders' Association, of which he was also a founder. Besides his prominence among machine tool makers he was also well known in civic activities of Worcester. For several years he was president of the board of aldermen and also chairman of the overseers of the poor. He served a term as president of the Chamber of Commerce of Worcester and was president of the Metal Trades Association in the same city. He was prominent in Masonic circles.

Mr. Woodward had been identified with the machine tool trade during his entire business life. He learned the machinist trade in his uncle's shop and was employed as a journeyman by Lathe & Morse, makers of lathes in Worcester. Later he was the mechanical expert in the Southern territory for the Weed Sewing Machine Co., with headquarters in Baltimore. Following this he was in the New York office of the Bullard Machine Tool Co., of Bridgeport, Conn.

With A. M. Powell he organized the Powell Planer Co. at Worcester in 1887 and when the firm was incorporated the name was changed to the Woodward & Powell Planer Co.

Business Items

The Pawling & Harnischfegar Co., Milwaukee, Wis., has appointed the Laughlin Barney Machinery Co., Pittsburgh, Pa., to represent the company in western Pennsylvania and eastern Ohio.

The Waynesboro Nut Lock Co., Waynesboro, Pa., has recently been incorporated for the purpose of manufacturing lock washers.

The Oilgear Co., Milwaukee, Wis., has moved its offices and factory to 398-406 Thirty-eighth St., Milwaukee.

Standard Steel & Bearings, Inc., has completed moving its Philadelphia plant to Plainville, Conn.

The Foster Machine Co. of Elkhart, Ind., has increased its capital stock from $500,000 to $1,000,000.

After Sept. 1 the address of Pollard Brothers, Chicago, Ill., will be 4034-4036 N. Tripp Avenue.

The Pioneer Instrument Co. has purchased the business of Brandis & Sons, Inc., including their factory and equipment. The latter company has made engineering and nautical instruments since 1872, while the Pioneer company manufacturers aircraft instruments exclusively. Each organization will continue the sale of its own product. The manufacturing facilities will be combined, however, and operated as one plant. William F. and Henry A. Brandis will continue as president and vice-president of Brandis & Sons. Both companies will occupy the Brandis building at 754-758 Lexington Ave., Brooklyn.

The United States Electrical Tool Co., Cincinnati, Ohio, has moved its Detroit office from the Marquette Building to 50 Canfield Ave., E., and its Columbus office from 430 N. High St., to 509 N. Park Ave. At both locations larger stocks of tools will be carried than formerly.

The Schultz-Osmanki Sheet Metal Works, 532 National Ave., Milwaukee, have been dissolved as a partnership. Frank P. Schultz retires and the business will be continued by John G. Osmanski as the Osmanski Sheet Metal Works.

Destruction of practically the entire benzol plant of the Milwaukee Coke & Gas Co. on Aug. 1 caused a loss estimated at nearly $250,000, covered by blanket insurance amounting to $3,600,000 on the complete property. Plans are being completed for reconstruction of the unit. The damage was caused by an explostion of a storage tank which caused a conflagration and further explosions, wrecking the buildings and equipment.

The increased volume of steel business is reflected in the construction program of the Carnegie Steel Co. at its Munhall, Pa., plant. Eight new 834 hp. Stirling boilers and eight new model Westinghouse underfeed stokers will supply steam for steel production. The new stoking department includes steam power refuse dumping mechanisms, non-clinkering extension sidewall tuyeres and automatic secondary ram fuel bed control adjusting mechanisms. Engberg vertical steam engines will drive forced draft fans.

The name of the village of Corliss, Racine County, Wis., has been officially changed to Sturtevant, in honor of the B. F. Sturtevant Co., Boston, Mass., that recently purchased the plant and property comprising the works of the former Wisconsin Engine Co., and is completing extensive repairs and overhauling with the purpose of resuming the operation as a mid-west production center.

The Smith-Grubber Co. of LaCrescent, Minn., near LaCrosse, Wis., manufacturing machinery and special equipment for clearing cutover lands, pulling and grubbing stumps, etc., has been re-incorporated as the W. Smith Grubber Co., with a capital of $100,000. The officers are: president, Frank R. Smith; vice-president, Donnelly Smith; secretary-treasurer, Mark W. Smith.

The Brightman Bros. Co., Columbus, Ohio, which recently was incorporated with $250,000 capital stock has purchased a site in South Columbus. and has let contracts for the erection of factory buildings and the purchase of equipment. It expects to be in operation in 90 days. The company will manufacture hexagon steel bar nuts, shafting machinery and straightening machinery and later on additional buildings will be erected to be devoted to the manufacture of turned and drawn shafting, screw stock and cold drawn products.

L. W. Seeligsberg has established an office at 50 Church St., New York City, for his industrial advertising service.

A trade and technical division has been established in Detroit by the advertising concern, Brooke, Smith & French, Inc.

Personals

WILLIAM J. MERTEN, metallurgical engineer of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has been elected chairman of the Pittsburgh chapter of the American Society for Steel Treating.

EDWARD T. OLIVER has been appointed representative for the Whitman & Barnes Manufacturing Co., Akron, Ohio, in the Ohio district with his headquarters in Cleveland.

B. B. QUILLEN of the Cincinnati Planer Co., Cincinnati, returned recently from a six weeks trip to Yellowstone Park, Alaska, California and the Grand Canyon.

NORMAN B. CHACE of the Fosdick Machine Tool Co., Cincinnati, has returned from a combination business and pleasure trip to Utah, California, Wyoming and other Western states.

PAUL M. MAHLER has severed his connection with G. Topham & Co., Vienna, Austria, and is now the export manager of the D. J. Murray Manufacturing Co., Wausau, Wis.

JOHN P. O'CONNOR has been appointed manager of the Seattle, Wash., branch of E. C. Atkins & Co., Indianapolis.

WILLIAM F. IRRGANG, for some years a member of the Warren & Irrgang Co., manufacturing factory trucks and trailers in Springfield and Chicopee, Mass., has joined the Cowan Truck Co., Holyoke, Mass., as designer of equipment to meet the special needs of industries and railroads in the handling of material.

WILLIAM BEST, JR., has been appointed district sales manager on the Pacific Coast for the Falcon Tinplate Co. and the Falcon Steel Co., Niles, Ohio, which recently opened offices in the Sharon Building, San Francisco.

WILLIAM S. DICKSON has been appointed manager of the Rochester office of Henry Prentiss & Co., New York. He succeeds F. W. Schiefer who has resigned. Mr. Dickson was formerly with the Acme Machine Tool Co. and the Cincinnati Planer Co., both of Cincinnati.

F. H. ROOD has been appointed engineer of tests for the Pittsburgh Testing Laboratory. He is a graduate of Syracuse University, and for many years was engineer of tests for the New York State Highway Commission.

ARMAND J. P. VANDERMYN has been elected president of the Industrial Paint Co. Pittsburgh, of which he has been vice-president and general manager.

HOWARD B. CHARLES, former general purchasing agent for the McClintic-Marshall Construction Co., has been appointed secretary and treasurer of the Industrial Paint Co.

W. J. SMITH has been appointed district manager of the car service division of the American Railway Association with headquarters in Omaha, Neb. Mr. Smith was formerly general agent for the Chicago & Northwestern R.R. in Omaha.

Obituary

THOMAS ELLIS BROWN, chief consulting engineer of the Otis Elevator Co., New York, died recently at his home in Morristown, N. J., of heart disease. Mr. Brown was 67 years of age and one of the best known engineers in the country. He had been with the Otis Elevator Co. for the past 27 years. He was the designer of the elevator in the Eiffel Tower, Paris, and was assistant engineer on the elevated railway construction in New York City.

ELMER G. HURLBUT, general manager of the Vulcan Iron Works, New Britain, Conn., died recently in a hospital in New Haven, Conn. Mr. Hurlbut was 56 years of age and had long been identified with the foundry business.

JOHN HOYES MCGOWAN, aged 93 years, president of the John H. McGowan Co., pump manufacturer of Cincinnati, Ohio, died recently at his residence in that city. Mr. McGowan had been connected with the machinery business for a number of year and obtained patents on many pump inventions. He retired from active business about 20 years ago. The John H. McGowan Co. was formed by his brother and himself in 1862 and incorporated in 1881.

CHARLES P. LAIRD, one of the superintendents of the Carnegie Steel Co., located at Homestead, Pa., was found murdered near Erie, Pa., recently. The perpetrators of the crime have not been apprehended.

Carnegie Steel First to Adopt New Hours

The twelve-hour day in the plants of the Carnegie Steel Co. was eliminated Aug. 16, it was officially stated. The workers will receive a flat increase in wages of 25 per cent. Thousands of additional workmen will be required under the new schedule.

Laborers who have been working ten hours or more and who will go on the eight-hour turn will receive 50 cents an hour instead of 40 cents. If the mills are unable to obtain sufficient labor for the extra turn which will be necessary operations may have to be curtailed until such time as the shortage can be made up. Workmen who have been employed twelve hours a day will receive $4 a day, compared to $4.80 under the old wage schedule.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquires for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Automobile parts and accessories. Warsaw, Poland. Agency. Reference No. 7419.

Motor Accessories. Christchurch, Australia. Agency. Reference No. 7478.

Oil well drilling equipment. San Sebastian, Spain. Purchase. Reference No. 7479.

Tin can making plant. Cairo, Egypt. Purchase. Reference No. 7437.

Engineering materials. Birmingham, England. Agency. Reference No. 7429.

Forthcoming Meetings

The Supply Association of the American Railway Tool Foreman's Association. Hotel Sherman, Chicago, Ill., Aug. 29, 30 and 31. Eleventh annual convention. Herbert S. White, Cleveland Twist Drill Co., 9 North Jefferson St., Chicago, Ill., secretary and treasurer.

International Railway General Foremen's Association. Annual convention. Hotel Sherman, Chicago, Ill., Sept. 4, 5, 6 and 7. William Hall, secretary, 1061 W. Wabash Ave., Winona, Minn.

New Haven Branch of the American Society of Mechanical Engineers. Third annual machine tool exhibit Sept. 18, 19, 20 and 21. Mason Laboratory, New Haven, Conn. A. C. Jewett, chairman.

Association of Iron and Steel Electrical Engineers. Iron and steel exposition, Buffalo, Sept. 24 to 28. John F. Kelly, secretary, Association of Iron & Steel Electrical Engineers, 708 Empire Building, Pittsburgh, Pa.

National Safety Council. Twelfth annual congress at Buffalo, N. Y., Oct. 1 to 5. All meetings will be held at the Statler Hotel. Headquarters, 168 No. Michigan Ave., Chicago, Ill.

American Society for Steel Treating. Annual convention at Pittsburgh in connection with the International Steel Exposition, Oct. 8, 9, 10, 11 and 12. W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio, national secretary.

Society of Automotive Engineers. Production meeting at Cleveland, Ohio, Oct. 25 and 26. Headquarters, 29 West 39th St., New York City.

American Management Association. October 29, 30, and 31. Hotel Astor, New York City.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8 Headquarters, Grand Central Palace, New York City.

New and Enlarged Shops

Machine Tools Wanted

Ill., Chicago—G. & G. Brass Mfg. Co., 6024 South State St.—one 20 to 24 in. drill press.

Kan., Cimarron—Crawford Bros. (garage)—drill press, lathe, emery stand, belting, pulleys and shafting.

Kan., Deerfield—Ford Garage—lathe.

Kan., Dodge City—E. A. Zweig, 1310 Central St. (garage)—cylinder grinder, drill press, lathe, emery wheel, stand, belting, hangers and bearings (used preferred).

Kan., Garden City—Egger Electric Co., C. Egger, Purch. Agt.—lathe and drill press.

Kan., Garden City—Elsey Electric Co.—lathe.

Kan., Garden City—H. & H. Motor Co., Severs Ave., G. A. Hard, Purch. Agt.—cylinder grinder.

Kan., Garden City—C. E. Kretzinger, 514 North 10th St. (blacksmith)—lathe.

Kan., Garden City—Long Bros.—drill press for garage.

Kan., Garden City—Nash Sales & Service, Webb Bros., Purch. Agts.—drill press and cylinder grinder.

Kan., Syracuse—Hastings & Lane Motor Co.—burning in machine and lathe.

Kan., Syracuse—P. Kennedy—lathe for repair shop.

Ky., Louisville—Office of United States Engineer, P. O. Box 72—one pipe cutter for ⅛ to 2 in. pipe; one pipe vise to hold ⅛ to 3 in. pipe; one ratchet drill, combination, 22 in. handle, with sockets; one screw rail bender for 85 lb. rails.

La., Independence—T. E. Sanders (manufacturer of hoes)—sheet steel tools, machinery and dies.

Mich., Detroit—A. N. Haskell, 1045 Hibbard Ave.—21 in. Le Blond lathe and drill grinder.

N. Y., Buffalo—J. Jacobstein, 309 Liberty Bldg.—equipment for garage and repair shop at 1202 Bway.

N. Y., Buffalo—F. J. Lewis, 1630 Bailey Ave.—equipment for garage and repair shop.

N. Y., Buffalo—L. Spaeth, 1389 Jefferson Ave.—equipment for automobile service station at 1142 Jefferson Ave.

N. Y., Buffalo—H. Weinstein, 90 Monroe St.—equipment for automobile service station at 421 Niagara St.

N. Y., Jamestown—Anderson Motor Sales Co., East 3rd St. and Prendergast Ave., J. Mudjett, Jr., Purch. Agt.—presses, lathe, tools and general equipment for garage and service station.

N. Y., New York—Elk Mchy. Corp., 243 West 17th St.—internal grinding attachment for Universal grinder, multiple index for Cincinnati miller and 8 in. face mill.

N. Y., New York—Noble Mchy. Co., Inc., 3 Howard St., W. Noble, Purch. Agt.—several No. 0 and No. 00 Brown & Sharpe automatic screw machines.

N. C., Winston-Salem—Lindsay-Fiskel-Buick Co. (garage and service station)—lathe and drill press.

Pa., Sugargrove—W. F. Dalymple—one 10 or 12 in. lathe, presses and small garage tools.

W. Va., Williamson—S. M. Goodloe—lathe, drill press and air compressor for garage.

Wis., Madison—F. A. Hallman, 213 East Main St.—equipment, anvils, presses and small tools for proposed machine shop.

Wis., Milwaukee—Mchy. Supply & Equipment Co., 522 Poplar St. (manufacturer of saws, knives, etc.), B. L. McBride, Purch. Agt.—5,000 lb. punch press to punch hole up to 2⅝ in., diameter by ⅝ in.

Wis., Milwaukee—Standard Fitting Co., c/o L. J. Tiefenthaler, 221 Grand Ave. (manufacturer of cooking apparatus, etc.)—machine shop equipment, including medium size lathes, two drill presses and grinders; also foundry equipment.

Wis., Mondovi—W. Hardy—automobile repair machinery, press, gasoline tanks and pumps for proposed garage.

Wis., Prairie du Chien—Prairie du Chien Mfg. Co. (manufacturer of table lamps and phonographs), W. Erni, Purch. Agt.—22 in. drill press and nickle plating equipment.

Que., Baieville—Garage Central, M. Joyal, Purch. Agt.—equipment.

Que., Breakeyville—Garage Gosselin, J. Gosselin, Purch. Agt.—automobile repair equipment.

Que., Buckingham—Garage Cadieux, H. Cadieux, Purch. Agt.—automobile repair equipment.

Que., Cedars—Garage Legault, O. Legault, Purch. Agt.—equipment.

Que., Chandler—Chandler Garage Co., D. Lefebvre, Purch. Agt.—garage and automobile repair equipment.

Que., Charny—Garage Girard, A. Girard, Purch. Agt.—garage and automobile repair equipment.

Que., Chateauguay—I. H. Jeffrey—garage and automobile repair shop equipment.

Que., Cheneville — Garage Levert, H. Levert, Purch. Agt. — automobile repair shop equipment.

Que., Delson—Garage Delson, A. Lacoste, Purch. Agt.—automobile repair shop equipment.

Que., Deschambault—Garage Mayrand, A. Mayrand, Purch. Agt.—garage and automobile repair equipment.

Que., Drummondville—J. Cardin—automobile repair shop equipment.

Que., Drummondville—E. L. Watkins—garage and automobile repair equipment.

Que., Farnham—G. A. Rivard & Son, Main St.—automobile repair shop equipment.

Que., Franklin Centre—C. Stone—automobile repair shop equipment.

Que., Granby—Seale & Lockwood, Young St. (garage, etc.), E. A. Lockwood, Purch. Agt.—machine shop equipment.

Que., Howick—J. S. Rorison—automobile repair shop equipment.

Que., Mont Joli—J. A. Landry—automobile repair equipment.

Que., Montmagmy — Garage Normand, J. L. O. Normand, Purch. Agt.—garage and automobile repair equipment.

Que., Montreal—A. Belanger, 689 Ave. Des Erables—automobile repair equipment.

Que., Montreal—G. Fortier, 3099 Notre Dame St., E., N. Fortier, Purch. Agt.—small punching machine and other equipment for automobile repair shop.

Que., Montreal—E. Leclerc, 1481 St., Dominique St.—automobile repair equipment.

Que., Montreal—R. R. Lortie, 1870 Henri Julien St.—equipment for garage and repair shop.

Que., Montreal—G. Plamondon, 548 Mentana St., E. R. Plamondon, Purch. Agt.—garage and automobile repair equipment.

Que., Montreal—L. Prefontaine, 21 De La Roche St.—small lathe and other garage equipment.

Que., Montreal—W. H. Rodgers, 448 Lagauchetiere St., W.—equipment for garage and automobile repair shop.

Que., Napierville—E. Lavoie, Boulevard—small lathe and other equipment for garage.

Que., Ormstown — D. T. Macintyre—equipment for blacksmith and machine shop.

Que., Papineauville—Garage Central, I. H. Lefebvre, Purch. Agt.—automobile repair equipment, small lathe, etc.

Que., Repentigny — J. Rivit — complete equipment for garage and automobile repair shop at 3839 Lasalle St., Montreal.

Que., St. Barnabe Sud—A. J. Benoit—automobile repair shop equipment.

Que., Ste. Marguerite Sta.—C. D. Robert—complete garage and repair equipment.

Que., St. Scholastique—G. Senecal—complete equipment for garage on Boyer St.

Machinery Wanted

Calif., Martinez—R. R. Arnold, County Surveyor—one crane for loading and unloading gravel cars. Estimated cost $5,000.

Calif., Sacramento — Sacramento Pipe Wks., R St. near 7th St.—traveling crane.

Calif., San Francisco — San Francisco Assn. for the Blind, 1120 Folsom St.—$50,000 worth of machinery and equipment for broom factory and for the manufacture of baskets and rattan furniture.

Ill., Chicago—Gumbinsky Bros. Co., 2261 South Union Ave.—$1,500,000 worth of equipment for proposed paper mill.

Ill., Chicago—R. Hoffman, Room 205, 235 South State St.—woodturning bench lathe, 11 in. swing, 3 ft. between centers, slide rest, countershaft, speed and shift pulleys with hangers.

Ill., Chicago—Neptune Linen Supply Co., 805 East 39th St.—complete laundry equipment.

Ill., Rockford—Rockford Casket Co., 1418 South Marion St.—woodworking machinery, including sticker, bandsaw and sander.

Ill., Waukegan—Callahan Dairy Co., 428 Franklin St.—pasteurizing machinery, belting, shafting, hangers and refrigeration machinery, several ton capacity.

Ind., Hillisburg—H. A. Spurgeon—14½ x 22 in. Chandler & Price job press with shafting.

Ind., Newcastle—Indiana Rolling Mill—gate type shear, capacity 144 in. or longer by 1 in.

Ia., Decorah—A. Prastmaik—9 x 12 in. job printing press.

Kan., Garden City—L. Kempe Battery & Radiator Shop—electric drill.

Kan., Garden City — A. R. Oldfather (battery repair)—electric drill.

Kan., Syracuse—Syracuse Times, M. B. Royer, Purch. Agt.—14½ x 22 in. job press.

Ky., Louisville—Standard Sanitary Mfg. Co., 6th and Shipp Sts.—sand drier and sand blasting machinery.

Ky., Louisville—Stoll Oil Refining Co., Bway—tanks and other equipment for three proposed filling stations.

Minn., Evansville—Enterprise—Diamond press.

Minn., Minneapolis—Smith's Inventions, Inc., 2619 4th St.—squaring shear, circle shear and bending roll for 12 gauge material.

Mo., Kansas City—F. P. Hitchcock, 404 Gumbel Bldg. (lumber)—steam sawmill.

Mo., St. Louis—Roxana Petroleum Co., Arcade Bldg.—equipment, including pumping machinery, for proposed forty gasoline service stations.

Mo., St. Louis—Weber Bros., 806 Warren St. (wood carving)—wood turning lathe, medium size.

N. Y., Buffalo—Joy Bubble Candy Co., 887 Niagara St.—equipment for proposed candy factory.

N. Y., Lockport — Harrison Radiator Wks., Washburn St., H. C. Harrison, Pres.—furnaces, power hammers, cranes, hoists, shafting, hangers, reamers, etc. for $500,000 addition to plant.

N. Y., New York—Elsee Products Co., 280 Bway.—bagging machine, capacity, 50 ton cement per day.

N. C., Statesville—J. C. Steele & Sons (manufacturer of brick making and clay working machinery), C. M. Steele, Purch. Agt.—large plain milling machine, about No. 4 (new or used).

O., Columbus—Linde Air Products Co., 320 Dublin Ave.—special equipment for proposed $45,000 factory.

O., Dayton—Eng. Division, Air Service, McCook Field—one arc welding machine.

O., Leetonia—Leetonia Tool Co.—vertical shears, belt driven, to cut 3 or 3½ in. square.

Pa., Honesdale—Woodlawn Dairy Products Co., address manager—milk testing machines, coolers, shafting, hangers, pulleys, etc.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Principal price changes were in the inactive nonferrous metals market, which declined fairly generally in both New York and Cleveland. Steel prices remain the same as a week ago, the "short day" not yet having affected the market. The low record of the year to date in steel ingot production was hung up in July, when the daily rate of 140,000 tons was under 3,500 under the June rate. The peak was in April, when production was 17,100 tons per day higher than in July.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$28.55
Northern Basic	28.77
Southern Ohio No. 2	28.77
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.25
BIRMINGHAM	
No. 2 Foundry	25.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	27.76
Virginia No. 2	32.17
Basic	26.76
Grey Forge	26 76
CHICAGO	
No. 2 Foundry local	28.61
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.51
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	27.77
Basic	26 77
Bessemer	28.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5.00@5.50

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.95	4.45	5.05
Nos. 22 and 24.	3.75	5.00	4.50	5.05
Nos. 25 and 26.	3.80	5.05	4.55	5.10
No. 28	3.85	5.15	4.65	5.20

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00	5.15	4.70	5.35
Nos. 12 and 14.	4.10	5.25	4.80	5.45
Nos. 17 and 21.	4.40	5.55	5.10	5.75
Nos. 22 and 24.	4.55	5.70	5.25	5.90
No. 26	4.70	5.85	5.50	6.05
No. 28	5.00	6.15	5.80	6.35

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	62	50½	⅜ to 1½	30	13
LAP WELD					
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	26	11
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	60	49½	⅜ to 1½	30	14
2 and 3	61	50½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ⅛-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
⅛	$0.09	50%	⅞	$0.16	35%
⅜	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	8.00	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.40	3.90	4.55
Cold finished flats, squares	4.90	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Carbon tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.00
Tin, 5-ton lots, New York			39.75
Lead (up to carlots), St. Louis	6.50	New York	6.97½
Zinc (up to carlots), St. Louis	6.20	New York	6.60

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.10	27.00	28.00
Antimony (Chinese), ton spot	8.00	10.50	8.75
Copper sheets, base	23.75	22.50@23.00	23.00
Copper wire (l.c.l.)	17.00	19.75	16.25
Copper bars (l.c.l.)	21.25	23.00	19.50
Copper tubing (l.c.l.)	26.00	28.00	23.00
Brass sheets (l.c.l.)	19.00	23.00	18.75
Brass tubing (l.c.l.)	24.50	28.50	20.50
Brass rods (l. c. l.)	17.25	19.25	15.75
Brass wire (l. c. l.)	19.50	23.00	.....
Zinc sheets (casks)	10.25	10.10	.....
Solder (½ and ½), (case lots)	29.50	27.75	20.00
Babbitt metal (83% tin)	52.00	49.00	38.00
Babbitt metal (35% tin)	25.00	17.00	16.00
Nickel (ingot and shot)	29.00	.....	35 00
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	11.50	12.00
Copper, heavy, and wire	11.50	11.00	11.25
Copper, light, and bottoms	10.00	9.00	10.00
Lead, heavy	5.00	5.00	5.50
Lead, tea	4.00	4.00	4.50
Brass, heavy, yellow	7.50	....	7.00
Brass, heavy, red	9.50	9.50	9.00
Brass, light	6.00	5.00	6.25
No. 1 yellow brass turnings	7.00	6.00	6.75
Zinc	3.75	3.00	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$23.50	$19.50	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.00	17.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	12.60	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13¼x13¼, per lb.	10.25	36.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	1.05	1.18	1.14
White lead, dry or in oil	100 lb. kegs.	New York, 14.00	
Red lead, dry	100 lb. kegs.	New York, 14.00	
Red lead, in oil	100 lb. kegs.	New York, 15.50	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.00@4.50	
Coke, prompt foundry, Connellsville	per net ton	5.25@5.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	30%	50-10%	45-5%
1⅛ and 1¼x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	15%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	20%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	30%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	25%	45%	40-5%
Bolt ends, with hot pressed nuts	30%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, $\frac{9}{16}$ and smaller	60%	.....	....
Semi-finished nuts, ⅝ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	3 50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	List net	2.75	2.50
Rivets:			
Rivets, $\frac{7}{16}$ in. dia. and smaller	40%	50–10%	60%
Rivets, tinned	40%	50–10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30–10%	30–10%	30–10%
Heavy grade	20–5–2½	30%	20–5–2½%
Rubber and duck:			
First grade	50–10–5%	50–10%	40-10%
Second grade	60–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20

Pa., Pittsburgh—B. H. Prack, Keystone Bldg.—13 ton crane, 31 ft. 2 in. span, for Emeryville, Calif.

S. C., Ehrhardt—G. B. Kinard—machinery for the manufacture of barrel staves.

S. C., Saluda—R. H. Etheridge—complete excelsior machinery, including belting and shafting.

S. C., Simpsonville—T. T. Todd (wheelwright)—lathe for wood turning.

S. D., Mitchell—Beadle Printing Co.—cylinder press and linotype machine.

Va., Columbia—L. H. Stoneman (planing mill)—4 side planer and bandsaw.

Va., Prince George—J. E. Cousins, Jr. (well drilling, pump erecting, etc.)—2 cylinder, splash oiled, water cooled air compressor, belt or steam driven, capacity not less than 60 cu.ft. per minute at normal speed.

Wis., Antigo—Northern Wisconsin Cheese Mfg. Co., c/o A. A. Kriewaldt—large cheese vats, mixing machines, belting, shafting and hangers.

Wis., Bruce—Bruce News Letters Co., c/o V. A. Valiquette—linotype machine, press and belting for proposed printing plant.

Wis., Burlington—E. Nagel—pumps, also oil and gasoline storage tanks for proposed filling station.

Wis., Chippewa Falls—Farmers Produce Co., 15 West Central St., F. W. Anderson, Mgr.—hoisting machinery and conveyors for proposed $40,000 grain elevator.

Wis., Chippewa Falls—Tschopp-Durch-Camastral Co., High and East Columbia Sts. (woodworking)—dry kiln machinery and equipment.

Wis., De Pere—W. L. Stecker, Route 1—power churns, separators, weighing machine, cheese vats, belting, shafting and hangers.

Wis., Hartford—Spaeth Packing Co.—canning, pork grinding machinery, etc. for proposed $50,000 plant.

Wis., Kenosha—Kenosha Evening News, 261 Wisconsin St.—presses for proposed $40,000 addition to print shop.

Wis., Madison—Bd. of Regents, University of Wisconsin, Administration Bldg., J. D. Phillips, Purch. Agt.—refrigeration machinery and equipment for new state hospital.

Wis., Madison—Chicago & Northwestern Ry. Co., c/o B. R. Kulp, 201 South Blair St.—belting, shafting, etc. for proposed $100,000 power house.

Wis., Madison—Madison Nash Co., 155 East Wilson St.—air compressor, oil and gasoline pumps, storage tanks, also small tools for proposed $60,000 garage.

Wis., Milwaukee—Badger Monument Co., c/o A. H. Potratz, 1187½ 28th St.—several air hammers, stone cutting saw and air compressor.

Wis., Milwaukee—Hilty Lumber Co., foot of 12th St. (manufacturer of boxes and lumber)—C. H. Mueller, Purch. Agt.—large re-saw, also small cross cut and rip saws.

Wis., Milwaukee — Peerless Press, Inc., c/o A. Brill, 4113 Elm St.—paper cutter, rotary presses and proof press.

Wis., Milwaukee—T. C. Schmidt, 935 Mound St. (woodworker)—one saw rig for fine cord work, with or without engine.

Wis., Park Falls—T. O. Myhers (sawmill, etc.)—one large bandsaw.

Wis., Port Washington — Farmers Co-operative Dairy, c/o J. E. Schmit—power churns, separators and testing machine.

Wis., Richland Center—E. B. Prouty—gasoline storage tanks, oil and gas pumps for proposed filling station.

Wis., Watertown—Jaeger Milling Co., 514 1st St., A. C. Jaeger, Pres.—grinding machinery, shellers, sifters, grading and weighing machines for proposed $50,000 flour mill, to replace that which was destroyed by fire.

Wis., Wausaukee — Polomis Bros., F. Polomis, Mgr.—churns, belting, shafting, refrigeration and ice cream machinery for proposed $40,000 plant.

N. B., Nelson—W. Sullivan, Ltd.—complete equipment for planning mill to replace fire loss.

N. B., Quarryville—Miramiche Quarry Co., Ltd., R. G. Hood, Mgr.—quarrying machinery.

N. S., Hantsport—Avon Crafts, Ltd.—electrical machinery for the manufacture of children's sleds, wagons, chairs, etc.

N. S., Malagash—Chambers & MacKay, A. R. Chambers, P. O. Box 264, New Glasgow, Purch. Agt.—rock crushing machinery.

N. S., West Pubnico — West Pubnico Trading, Ltd., R. N. d'Entremont, Dir.—machinery and equipment for freezing, packing, smoking, drying and preserving fish.

Ont., Blyth—Cockerline & Floody—complete equipment for planing mill, to replace that which was destroyed by fire.

Ont., Brampton—Brampton Tire & Rubber Co.—rubber tire equipment for proposed $150,000 factory.

Ont., Hamilton—Porritts & Spencer of Canada, Ltd., Lottridge St. (manufacturer of paper machines and pulp felts)—machinery.

Ont., Hamilton—F. L. Snively, 212 Imperial Bldg.—equipment for oil and gas drilling at Bothwell.

Ont., Niagara Falls — Niagara Falls Arena, Ltd.—artificial ice plant for proposed $150,000 arena.

Ont., Niagara Falls—Niagara Wire Weaving Co.—equipment.

Ont., North Bay — Nugget Publishers, Ltd., S. J. Mason, Mgr.—rotary perfecting press.

Ont., Preston—Clare Bros. & Co., Ltd. (stoves, ranges, registers, etc.), J. S. Clare, Purch. Agt.—one cupola charging machine, moulding machines and other equipment for new foundry.

Ont., Sarnia—Sarnia Oil & Gas Co.—equipment for proposed $100,000 factory for the manufacture of carbon black from natural gas.

Ont., Stratford—McLeod Milling Co.—equipment for flour mill, to replace that which was destroyed by fire.

Ont., Windsor—Fournier Tool Mfg. Co.—complete equipment, to replace that which was destroyed by fire.

Que., Anderson's Corners (Huntingdon P. O.)—A. E. Mason—equipment for blacksmith shop, including forge.

Que., Aubrey — Morris Bros. (granite works)—quarrying equipment, also polishing machinery.

Que., Beauharnois — E. Poirier (boat building and garage)—woodworking equipment.

Que., Bedford—M. Smith, Upper Main St. (sawmill)—sawing machinery.

Que., Cowansville—Sayers Bros.—equipment for sash and door factory.

Que., Dunham—G. Vail—saws, etc., for sawmill.

Que., Farnham—A. Girout, St. Joseph St.—forge and other blacksmith and machine shop equipment.

Que., Farnham—Ice Mfg. Co., Ltd.—ice manufacturing machinery and equipment.

Que., Granby—Granby Clay Products, Ltd., N. A. Meyer, Purch. Agt.—machinery.

Que., Granby—Leader-Mail Printing Co., Ltd., G. Legge, Purch. Agt.—job printing machinery, etc.

Que., Granby—A. Messier, Main St.—machinery and equipment for sash and door factory.

Que., Huntingdon—A Desgardins—forge and small tools for blacksmith shop.

Que., Kelso—D. W. Smaill—forge and other blacksmith shop equipment.

Que., Knowlton — E. W. Morgan — machinist's small tools and blacksmith shop equipment.

Que., Laprairie—O. Roy—foundry equipment.

Que., Montreal—Tidicoute Refining Co. of Canada, Ltd., c/o L. G. Bell, 107 St. James St.—drilling, pumping, mining, milling, reducing, refining and smelting equipment.

Que., North Georgetown—A. Desgrosseillien—blacksmith shop equipment.

Que., Sabrevois—H. Tougas—forge equipment for blacksmith shop.

Que., St. Antoine Abbe—F. Larochelier—borer and other blacksmith shop equipment.

Que., St. Nazaire d'Acton—S. Gloutnez—forge and other tools for blacksmith shop.

Que., St. Thomas—Rutland & Noyan Ry. Co., E. F. Stephenson, Secy.—repair equipment, etc.

Que., West Shefford—S. Rosseau—equipment for sawmill.

Metal Working Shops

Ala., Pell City—E. R. Bukacek is receiving bids for the construction of a 1 story, 100 x 175 ft. garage. Private plans.

Calif., Davis—The Pacific Gas & Electric Co., 445 Sutter St., San Francisco, is having plans prepared for the construction of additions to its truck repair plant, etc. Estimated cost $95,000. Private plans.

Ill., Chicago—M. Bonlokke, 7508 South Halstead St., is receiving bids for the construction of a 72 x 119 ft. garage at 7504-06 South Halstead St. Estimated cost $40,000. Kocher & Larson, 6250 South Halstead St., Archts.

Ill., Chicago — Ronneberg, Pierce & Hauber, Archts., 10 South La Salle St., are receiving bids for the construction of a 3 story addition to factory for the D. O. James Mfg. Co., 1120 West Monroe St., manufacturer of cut gears. Estimated cost $50,000.

Ill., Chicago—P. C. Winn, 1107 Albion Ave., awarded the contract for the construction of a 2 story, 161 x 171 ft. garage at 1217-31 Morse Ave. Estimated cost $60,000. Noted July 19.

Ill., East St. Louis—The Baltimore & Ohio R.R., Baltimore and Charles Sts., Baltimore, Md., is having plans prepared and will soon receive bids for the construction of a round house, machine shop, car repair shop, etc., on a 200 acre site near here. Estimated cost $2,000,000. H. A. Lane, Ch. Engr.

O., Cleveland—The Alliance Lumber Co., Sloan Bldg., H. Gaffney, Treas., is receiving bids for the construction of a 1 story, 92 x 186 ft. garage on East 101st St. Estimated cost $50,000. L. Skolnik, St. Clair Bldg., Cleveland, Archt.

O., Cleveland—J. Rutkowski of the Cleveland Structural Steel Co., 6600 Park Ave., is having plans prepared for the construction of a 1 story, 100 x 120 ft. factory on East 49th St. and Harvard Ave. Estimated cost $60,000. Private plans.

Pa., Pittsburgh—The Pittsburgh Malleable Iron Co., 34th and Smallman Sts., is having plans prepared for the construction of a 1 story mill building. Estimated cost $150,000. P. Dietz, Lyceum Bldg., Pittsburgh, Engr.

Pa., Pittsburgh — W. W. Martin, 5847 Center Ave., awarded the contract for the construction of a 1 story, 60 x 190 ft. garage on Penn Ave. Estimated cost $40,000.

Pa., Warren—The W. H. Frest Co. is having plans prepared for the construction of a 2 story, 40 x 70 ft. garage on Liberty St. Estimated cost $40,000. Private plans.

R. I., Providence—Hamilton & Hamilton, Jr., 66 Eddy St., awarded the contract for the construction of a 1 story, 53 x 200 ft. jewelry factory on Allens Ave. Estimated cost $40,000.

Va., Radford—The Radford Motor Co. is receiving bids for the construction of a 1 story, 50 x 150 ft. garage. Private plans.

W. Va., Martinsburg — F. Hodgson is having plans prepared for the construction of a 3 story, 74 x 79 ft. garage on King St. Estimated cost $65,000. H. Westenhaser, 712 South Virginia St., Martinsburg, Archt.

Wis., Cambridge—A. Kravich is having plans prepared for the construction of a 1 story, 50 x 83 ft. garage. Estimated cost $40,000. E. A. Tough, Conklin Bldg., Madison, Archt.

Wis., Madison—Claude & Starck, Archts., Badger Annex, are receiving bids for the construction of a 2 story, 66 x 122 ft. garage and repair shop for the Madison Nash Co., 155 East Wilson St. Estimated cost $60,000. Noted July 5.

Wis., Madison—The University Motor Co., 2201 University Ave., will build a 2 story, 50 x 100 ft. garage and repair shop, J. Fishnick, Mgr. Noted Aug. 2.

Wis., Milwaukee—The Milwaukee Tank Wks., 1615 Fratney St., awarded the contract for the construction of a 1 story, 82 x 115 ft. assembling shop. Estimated cost $40,000.

Wis., Milwaukee—The C. Schott Machine Co., 1281 28th St., plans to build a 1 story, 43 x 75 ft. addition to its shop.

Wis., New London — The New London Motor Co. awarded the contract for the construction of a 1 story, 60 x 120 ft. garage. Estimated cost $40,000.

Wis., New London—M. Smith awarded the contract for the construction of a 2 story, 38 x 120 ft. garage. Estimated cost $40,000.

Wis., Portage—R. A. Phillips, Archt., Beaver Bldg., Madison, is receiving bids for the construction of a 2 story, 50 x 70 ft. garage and repair shop for E. Weinke, here. Estimated cost $40,000. Noted Aug. 2.

Wis., Shawano—The Schweers Hardware Co. is having plans prepared for the construction of a 2 story garage. Estimated cost $40,000. H. Wildhogen, College Ave., Appleton, Archt.

Ont., Toronto—J. G. Pendrith, 970 Queen St., W., awarded the contract for the construction of a 2 story, 56 x 142 ft. machine shop on King St., W. Estimated cost $50,000.

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Development of Machine Tools in New England

BY GUY HUBBARD

The fourth article—The ornamental period in machine design—Machine for ruling paper—History of the dividing engine for graduating scales and rules

OLD-FASHIONED machinery, at least that which was built for sale, usually had cast iron frames of most fanciful and illogical design, being embellished with such details as scroll work, claw feet, delicately carved legs, and fluted columns—sometimes Ionic and sometimes Corinthian. It is frequently assumed, probably because of the prevalence of architectural details in the early machine tools, that the designers themselves must have been architects who had shifted over into the less artistic profession of machine design, carrying into their new field their structural ideas.

It appears that both pattern making and machine drafting, as we know these related subjects today, really developed during the early part of the 19th century, and that they were offshoots of cabinet making, evolving in the following way: Early machinery was built almost entirely of wood, not only because of the scarcity of metal but also because of the lack of facilities for working it. This naturally brought machine building into the realm of the cabinet maker, who was equipped with the necessary knowledge and tools for this grade of work. Whatever iron parts were used were generally forgings, so that the blacksmith also had a hand in the matter.

DRAWINGS SELDOM USED

Drawings, other than rough sketches upon boards, were seldom used, the machine being built "out of the head" of the inventor, necessary changes being easily made in the wood as the work progressed. This "cut and try" method persisted even after the use of castings became more prevalent, novel machines being built from wooden models upon which the experimental work was done before the permanent iron structure was erected. As the Patent Office at that time, and in fact for many years thereafter, required a small sized working model of an invention with the written specifications, instead of the "formal drawings" furnished today, these interesting experimental wooden models frequently were made to serve at least a double purpose.

A cabinet maker usually built the model if the inventor did not do so himself and it is natural that he would also build the patterns, as they closely resembled the details of the model. Thus, pattern making gradually developed as a branch of the cabinet makers' trade. Accustomed to building furniture of highly decorative carved designs and being acquainted with the design of architectural details, through the making of columns and other fancy "trim" for the builders of the fine mansions of that period, it is not surprising that when these skillful and artistic craftsmen undertook the rather prosaic task of building a set of machine patterns, they often tried to emulate Leonardo da Vinci the artist-engineer, and as a result produced machinery which might have been a compliment to Chippendale and Sir Christopher Wren, but extremely painful to Prof. Francis Reuleaux.

LEMUEL HEDGE, BLACKSMITH

It was during this transition or formative period in the machine industry that Lemuel Hedge began his mechanical training. Lemuel Hedge, whose portrait is shown in Fig. 18, son of Solomon Hedge the village blacksmith, was born at Windsor, Vt., Nov. 2, 1786. During his boyhood he attended for a short time the rather primitive village school, at the same time receiving his early mechanical training as a helper or "striker" at his father's blacksmith shop. Lemuel Hedge was a natural mechanic and was soon attracted to the finer classes of work. As soon as his brief schooling was over, he served a regular apprenticeship under one of the early Windsor cabinet makers and became a skilled worker in wood as well as an all around mechanic, both on account of his natural ability and because of his previous training in the blacksmith shop. After his release from apprenticeship, he set up as a cabinet maker at Windsor and in 1813 went into partnership with one William Ayres, under the firm name of Hedge & Ayres.

There held forth in Windsor at that time, a character by the name of Thomas Pomroy who was the publisher

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of the locality—carrying on the combined businesses of printer, book binder, book seller and stationer in a shop in the Tontine Block, a wooden building which was the largest in the business district of the village. In those days paper for blank books was ruled by hand in the manner shown in Fig. 19 and it was a tedious and expensive process. Lemuel Hedge noticed this at the shop of Thomas Pomroy and his mind became set upon improving it.

His first step was to invent an improved spring-pen ruler, patented June 21, 1815, and this was followed by his revolving ruling machine in which was incorporated his spring pen, patented March 3, 1817. These patents were issued to Lemuel Hedge and Thomas Pomroy, the two men meanwhile going into partnership under the name of Pomroy & Hedge, for the purpose of manufacturing the Hedge revolving ruling machine. This machine, shown in Fig. 20, was the first novel and complicated mechanical device to be

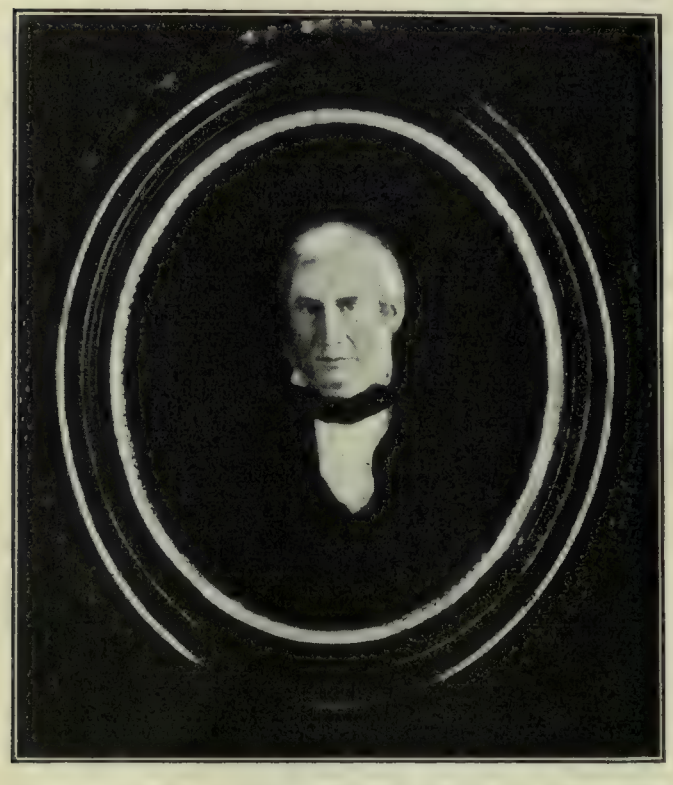


FIG. 18—LEMUEL HEDGE, PIONEER WINDSOR INVENTOR
(From a miniature in oil)

produced in the Windsor village, and was the basis of the best modern ruling machines. Of it the *Albany Register* had the following to say at the time of its introduction in 1818:

". . . We witnessed with much pleasure (at the shop of Van Vechten & Seymour, blank book manufacturers and fancy binders at Albany, N. Y.) an improvement which cannot but be interesting to the merchant and mechanic. It was a machine which ruled *both sides of the sheet at once*, and with a rapidity and beauty truly astonishing. By means of this labour saving machine, paper can be ruled about 75 per cent cheaper than heretofore. Those acquainted with the process of ruling blank books, can appreciate its value, when we inform them that two lads in the shop have repeatedly faint-lined a ream of paper on both sides in twelve minutes."

Pomroy & Hedge occupied the lower floor of the Tontine Building, which was 91 x 40 ft. and three stories high and carried on the publishing and stationery business along with the cabinet making and machine business—a very curious combination.

As soon as the success of the Hedge ruling machine seemed assured, the firm sold out its book and stationery business and in the Fall of 1818, made preparations to manufacture the ruling machine upon a large scale. In the midst of these preparations, early in the morning of Nov. 25, 1818, the Tontine Building was burned to the ground and it required several hours of combined efforts of the citizens of Windsor and Cornish to save the entire village from the same fate. Deeds of heroism are recorded, such as the descent of one Zeba Toot through the flames from the third story calmly bearing a barrel of rifle powder on his shoulder.

On account of this fire, which Pomroy & Hedge claimed to be of incendiary origin, the budding industry was completely wiped out; even to its books and plans, at a loss of $3,500 and Lemuel Hedge set out on along journey in an attempt to recoup his fortunes. He traveled through the West and South selling state rights to manufacture and sell his ruling machine and through this procedure (which was customary at that time) its use became widespread without any great benefit to the young inventor.

Making Musical Instruments

After this journey, Hedge returned to Windsor and again set up as a cabinet maker, now becoming interested in the manufacture of musical instruments. He patented and manufactured an improved bass viol. Later he brought from England a skilled organ builder and added high-grade pipe organs to his list of products. Many large Hedge organs, very fine instruments with mahogany cases, were built into New England meeting houses at the time when organ music first ceased to be looked upon as a sacrilege and some of them are very likely still in use.

His keen and restless mind was constantly at work on inventions and improvements and on June 20, 1827, he patented his "Engine for Dividing Scales," mentioned in Bishop's "History of American Manufactures" as one of the notable inventions of the year. This machine for the rapid and accurate marking and numbering of rules and mechanics' scales was evidently suggested by his revolving ruling machine of 1817 and was of national importance in the development of the machine industry.

It has been generally believed that Joseph R. Brown of Providence, R. I. and Samuel Darling of Bangor, Me., were, in 1850 and 1852 respectively, the American pioneers in the field of automatic graduating engines and the importance of their work in the rise of interchangeable manufacturing by cheaply and rapidly multiplying accurate scales has frequently been pointed out. In view of the following facts it would appear that Lemuel Hedge, whose engine for dividing scales antedated those of Brown and Darling by more than twenty years, is also entitled to no small measure of credit for the important work of unifying the linear-measurement system of this country.

The original Hedge engine, shown in Fig. 21, is clearly described in the patent, which, because of its importance, was one of those restored to the records after the unfortunate Patent Office fires of 1836 and 1877. It consisted of eight important details, namely, a frame, a sliding carriage, index plates, detents, detent levers, marking chisels, hammers, and a cam wheel. The frame and carriage were something like the bed

and platen of a metal planing machine, the bed being more than twice as long as the carriage and the carriage somewhat longer than the scale to be divided. The carriage had at the front, a clamping device for holding scale blanks and at the rear provision for holding changeable index plates. The carriage, which moved on the bed from right to left, was provided with a weight feed.

Fastened to the frame of the machine, and projecting over the index plate, was an L-shaped block in which

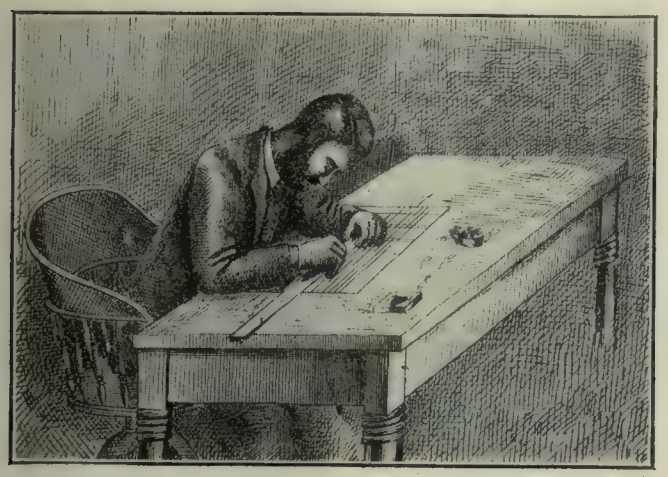


FIG. 19—RULING PAPER BY HAND
(From an old wood cut)

were pivoted, so as to lie parallel to the carriage and side by side above the index plate, four hooked bars about six inches long and numberd 1, 2, 3, and 4. The hook or detent ends of these bars were normally pressed down by flat springs so as to engage with the index plate. The four detent levers were pivoted side by side on the frame by a link, so as to lie at right angles to the free end of a separate detent-bar. The rear ends of the detent levers, beyond their fulcrums, were in a position to be acted upon by a cam drum. The cam drum, some ten inches in diameter, was supported on the rear of the frame with its axis above and parallel to the carriage, and was provided with two sets of movable-pin cams upon its surface, the assembly being much like the drum of a music box. One set of these cams was designed to lift the detents one by one from the index plate, while the other set was designed to trip the marking hammers.

How the Divisions Were Marked

The markers themselves were short vertically-sliding chisels with edges of different widths, supported perpendicularly above the scale in movable bearing-blocks, their cutting edges being normally kept slightly above the surface of the scale by coil springs under their heads. Resting upon these chisels were the heads of miniature trip hammers, having helves pivoted above the detent levers and actuated by the trip pins in the cam drum. The index plate was made of four strips of ivory or metal, one for each detent, and each strip was pierced with an accurately-spaced row of holes.

The operation of graduating a two foot-rule to eighths of an inch was as follows: A blank at least an inch longer than the finished rule was clamped in place in the front of the carriage and four marking chisels were set in place. No. 1 for inch marks, No. 2 for halves, No. 3 for quarters and No. 4 for eighths. As set up from left to right, No. 1 came first, No. 3 second, No. 2 third, and No. 4 fourth, their edges being spaced exactly half an inch apart. An index plate of four sections or ranks, having holes in each rank exactly half an inch apart, was now clamped in place with the four ranks arranged so that the holes in the second rank came exactly one eighth of an inch ahead of those in the first, those of the third one eighth ahead of those in the second, and those of the fourth one eighth ahead of those in the third. Eight detent cams were placed upon the drum, so that in one revolution each of the detents was acted upon twice. The hammer which struck chisel No. 1 was acted upon once, that which struck chisel No. 2 once, that which struck No. 3 twice, and that which struck No. 4 four times, in the following order: the cam which tripped the hammer of chisel No. 1 was placed half way between those which raised detents Nos. 4 and 1. Commencing the operation, detent No. 4 was first raised leaving detent No. 1 to hold the carriage (which was drawn forward by a weight attached to it by a cord passing over a pulley at the end of the frame), chisel No. 1 meanwhile striking an impression; then detent No. 1 was raised, allowing the carriage to jump one eighth of an inch before being stopped by detent No. 2, which held it while chisel No. 4 struck an impression; next detent No. 2 was raised and the carriage jumped an eighth of an inch before being stopped by detent No. 3, which held it while chisel No. 3 struck an impression; next detent No. 3 was raised and the carriage jumped an eighth of an inch to detent No. 4, which held it while chisel No. 4 struck a second impression; next detent No. 4 was raised and the carriage jumped an eighth of an inch

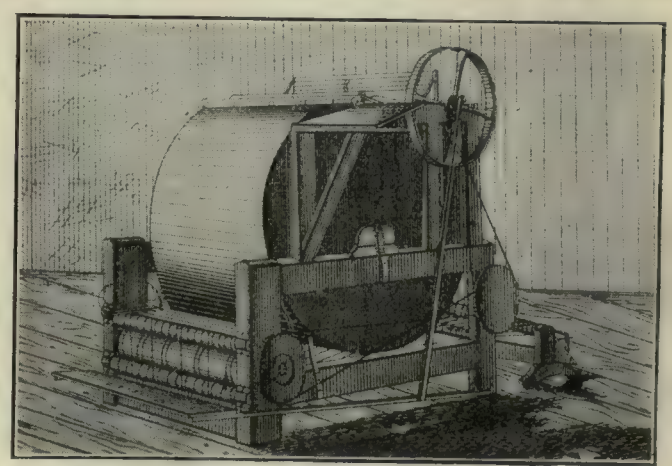


FIG. 20—THE HEDGE REVOLVING RULING-MACHINE
(From an old wood cut)

to detent No. 1 which held it while chisel No. 2 struck an impression; next detent No. 1 was raised and the carriage jumped an eighth of an inch to detent No. 2, which held it while chisel No. 4 struck a third impression; next detent No. 2 was raised and the carriage jumped an eighth of an inch to detent No. 3, which held it while chisel No. 3 struck its second impression; next detent No. 3 was raised and the carriage jumped an eighth of an inch to detent No. 4, which held it while chisel No. 4 struck its fourth impression.

The cam drum had now made one revolution and one inch of the rule had been passed over, the several chisels having given their appropriate impressions. As the four chisels occupied a space of two inches and the rule had moved but one inch, blanks were necessarily left in this first inch but the second, and all succeed-

ing inches, would be fully graduated. This will account for the extra inch left on the blank, which was cut off when the rule was finished. In case expensive wood, ivory or metal scales were being divided, this waste was avoided by inserting a block of wood at the left to receive the impressions of the first inch.

When it was desired to divide a scale into sixteenths of inches a chisel with two edges, one sixteenth of an inch apart, one for eighths and one for sixteenths, was substituted for chisel No. 4, so that no change in indexing was required. Smaller divisions to almost

with the face of the cam. An index plate similar to the one used before, but eight feet in length, was fastened vertically to the back of the sliding frame, opposite the cam drum and a special set of spring detents (as many as the ranks of the index plate) were located so as to bear upon the plate, being operated by the cam drum through a special set of detent levers. As the machine was operated with these attachments, the detents were raised one by one and the hammers operated as before. Each time a detent was raised, the frame dropped by gravity a unit distance till stopped by an-

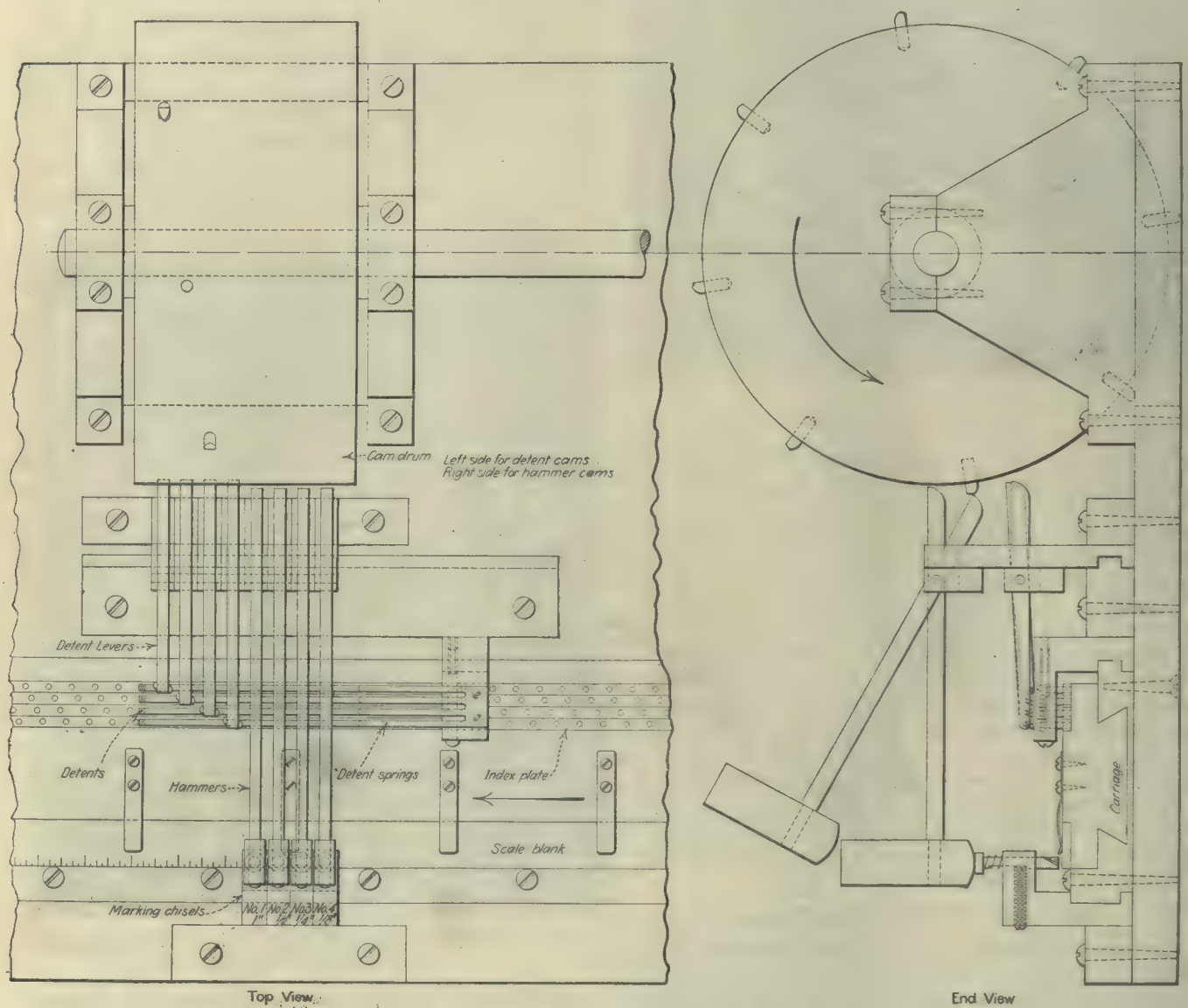


FIG. 21—ORIGINAL HEDGE DIVIDING ENGINE

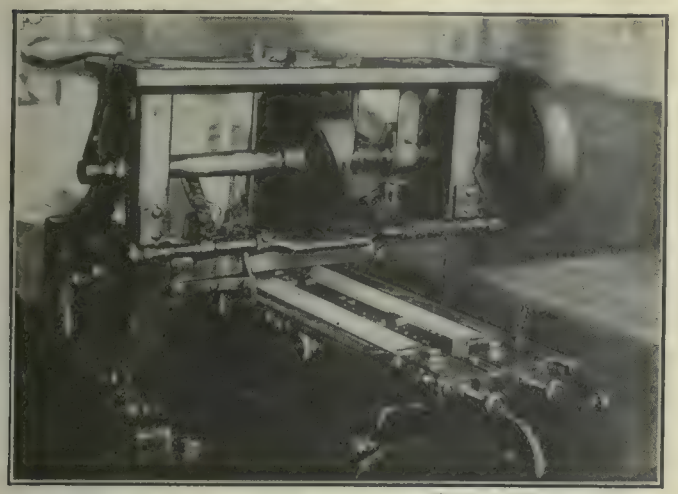
any degree of fineness were cut with great accuracy by the use of an ingenious reducing or pantograph attachment. This attachment consisted of an oblong frame about eight feet long and two feet wide, which was arranged to slide lengthwise vertically in another frame, attached to the rear of the engine bed at the left-hand end. On the front surface of the sliding frame was a straight bar, extending diagonally from the lower left-hand corner to the upper right-hand corner. The left face of this wedge or cam, was placed in contact with a roll at the left end of the rear of the carriage and the pull of the carriage drive-weight was reversed, so that it served to keep the roll in contact

other detent. It is evident that when a frame proportioned as above descended eight feet, the carriage moved only two feet—hence the scale was graduated four times as fine as the index plate. In other words an eight-foot index plate carefully divided to eighths of inches would produce a two-foot scale very accurately divided to sixty-fourths of inches.

Another ingenious attachment, was that used for accurately copying standard or special scales and by which they could be rapidly reproduced. This attachment consisted of a disk somewhat greater in diameter than twice the length of the scale, which was substituted for the frame mentioned above. The disk had a

blank index fastened about its periphery and upon its front face it had a spiral cam, arranged to allow the roller mentioned above to move from the center to the periphery of the disk during revolution, being in reality the wedge of the previous instance, coiled up. The distance of the face of the spiral cam from the center of the disk, increased in exact proportion to the degree of revolutions of the disk. The disk was revolved by a weight attached to a cord wound upon its axle, the weight being sufficient to propel the carriage against the counter pull of the regular drive-weight.

The master scale to be copied was placed in the front of the carriage and chisel No. 1, now used as a marker, was set above the first graduation. A special set of detents, also used as markers, were set in place at the top of the disk with their edges resting upon the blank index. The carriage was then indexed by pressing the



Courtesy of the Stanley Works

FIG. 22—IMPROVED HEDGE DIVIDING ENGINE (1836) STILL IN USE AT STANLEY RULE & LEVEL CO., NEW BRITAIN, CONN.

edge of chisel No. 1, carefully into the first division of the master scale, after which a second operator pressed an impression into the blank index by striking the first marker detent a light blow. The carriage was then moved to index the next graduation of the master with the edge of chisel No. 1, the movement of the carriage allowing the disk to revolve slightly. The second operator now struck an impression from the next detent—this operation being repeated through the length of the master scale. When the marking process was completed, the light marks in the index plate were deepened to hold detents and it was checked back by running the engine with the master scale still in place. Any inaccuracies were corrected by filing the slots in the index until the markers registered perfectly with the master.

Scales Automatically Duplicated

After this was carefully done, the master was removed, and a blank took its place, the engine now being ready to automatically duplicate the master scale as many times as required. Scales were rapidly numbered in the Hedge engine by substituting for the regular cam drum one as long as the scale, having as many hammer trip-cams as there were numbers, the cams being arranged in a helical path about the drum. A row of dies carrying the numbers was substituted for the marking chisels, each having its own hammer. The divided scale was clamped in place and the dies were set so as to register with the proper graduations. As the drum was revolved, the hammers were tripped one after the other and in one revolution the entire scale was numbered. This could be carried on almost as fast as the scales could be put in place.

Hedge also proved himself to be something of a mathematician by making special index plates, cams and chisels by which the complicated trigonometric and logarithmic lines of Gunter's scale could be rapidly reproduced.

Sale of the Dividing Engine

Hedge built and for sometime operated his first dividing engine at Windsor, but not being able to finance an extensive rule and scale manufactory in that town, he interested E. A. Stearns of Brattleboro, Vt., in the proposition. About 1830, the firm of E. A. Stearns & Co. was organized and Hedge and his dividing engine removed to Brattleboro, where he spent the next ten years in perfecting his machinery and in manufacturing scales, which were sold in great numbers. In the course of this work, he not only invented a revolving planing machine and the familiar carpenters' folding two-foot rule but also brought out an improved dividing engine as shown in Fig. 22. In this improved engine, built about 1836, cam-operated engraving tools were substituted for the hammer-operated marking chisels of the original machine. The improved machine was capable of graduating two scales at once and was not only more rapid but, on account of its nicer construction, was more accurate than the first machine.

In 1840, Hedge sold out his interest in E. A. Stearns & Co. and went to New York City. E. A. Stearns & Co. continued to do an excellent business under that name at Brattleboro until 1862, when it sold out to Charles L. Mead. In 1868, Mr. Mead became treasurer of the Stanley Rule & Level Co. of New Britain, Conn., and consolidated his business with that company—the Hedge machinery being removed to New Britain. The original dividing engine from Windsor continued to operate there for many years and to this day one of the Hedge engines of 1836 is used at the Stanley works to divide its high-grade ivory rules, in preference to the modern types of machines.

Nick-Bend Test for Wrought Iron

All of the laboratory work in connection with this investigation by the Bureau of Standards has been completed, and the report is being assembled for publication. The general conclusions which the results appear to warrant are given below. Crystalline areas appear most readily in the fractures obtained in the nick-bend test of those wrought irons in which the individual slag threads are small and uniformly distributed. The presence of "steel" in wrought iron, since it is conducive to this condition, favors the formation of such crystalline areas. The converse, however, is not true.

A crystalline area in the fracture is not a sure indication of the presence of "steel" in such wrought iron. The test cannot be used as a means for detecting high-phosphorus iron. A rapid application of the load in the nick-bend test, usually by impact, is necessary for the formation of the crystalline areas. Distinction should be made between the crystalline areas on the tension and on the compression sides of the tested bar. The latter, in general, are not to be regarded as indicative of the structural condition of the metal.

Unilateral or Bilateral Tolerances?

By Earle Buckingham

WE LIKE to think that we, in this present age, have advanced, technically at least, far beyond our forefathers. It would be to our discredit if we had not because we have available, either by written word or tradition, all of the accumulated experience of former ages as well as the little direct experience we ourselves have gathered.

If we go on the theory that everything new represents progress it is safe to say that we have advanced in many respects. Sometimes, however, when we try to go to the root of things and ponder on fundamentals we get a distinct shock.

The general impression exists that the subject of standards and tolerances is distinctly modern. This is not the case. The subject is almost as old as the race of man. For thousands of years it has been considered in its many aspects. Yet, despite all these centuries of accumulated thought and experience, we seem no nearer a solution than when the subject was first introduced.

Today we are wrangling over the matter of whether to use unilateral tolerances or bilateral ones. Lifelong friendships are almost shattered because of opposing views on this subject. The names of the two types of tolerances may be new, but the problem itself is old—older than the Pyramids.

Let us forget for a little while our personal prejudices on this subject and spend a little time and thought on the treatment of the problem in earlier days.

It may seem strange to use the Bible as an engineer's hand-book. Although it was written several thousand years ago, the Bible contains the fundamentals of modern law, sanitation, military science, ethics, etc. A few passages deal pertinently with this subject.

Ye shall do no unrighteousness in judgment, in meteyard, in weight, or in measure.

Just balances, just weights, a just ephah, and just hin, shall ye have: I am the Lord your God, which brought you out of the land of Egypt. (Leviticus, XIX-35, 36.)

Thou shalt not have in thy bag divers weights, a great and a small.

Thou shalt not have in thine house divers measures a great and a small.

But thou shalt have a perfect and just weight, a perfect and just measure shalt thou have; that thy days may be lengthened in the land which the Lord thy God giveth thee. (Deuteronomy, XXV-13-15.)

Give, and it shall be given unto you; good measure, pressed down, and shaken together, and running over, shall men give into your bosom. For with the same measure that ye mete withal, it shall be measured to you again. (Luke, VI-38.)

Although no definite tolerances were specified, it is evident from the foregoing that a variation in one direction was commendable, while any variation in the opposite direction was far otherwise.

The ultimate purpose of mechanical standardization is economy. This economy can only be obtained by a process of simplification and reduction in number of stock sizes of any given detail. This in turn must permit the simplification and reduction in number of stock sizes of mating details, and of tools and materials used to produce them. A careful analysis will show that in the vast majority of cases a unilateral tolerance will achieve this result while bilateral ones will not.

Usually a demand for a bilateral tolerance conceals some ulterior motive. For example, some years ago our Congress passed a law establishing definite tolerances of weight for various package goods. A bilateral tolerance of plus or minus a definite quantity was specified. The ostensible reason for establishing this practice was two-fold. First, by permitting the variation in either direction, the average weights would be very close to the absolute standard. Second, by specifying this bilateral tolerance, the matter would be handled impartially as regards the buyer and seller.

From time to time, tests are made of the weights of such package goods. Although very few, if any, are found outside of the specified limits, yet the average weight of any considerable number of packages has always been found to be below the basic weight.

This same practice has been applied in most other cases of legislation, where definite tolerances of size, weight, or capacity are established. The actual results in practice in many cases has been such that a different method is gaining in favor.

In France, on the other hand, the tolerance is unilateral and the variation must always be on the larger side. The object here is also twofold. First, to protect the purchasers, as they are in the largest numbers and usually need protection most; and second, to hold variations to a minimum, because as the seller usually provides the weights and measures used in trade, it is to his interest to have the variation as small as possible.

The use of a unilateral tolerance means the maintenance of a basic standard—a sharp dividing line between right and wrong. The use of a bilateral tolerance, on the other hand, means a departure from such basic standards, to as great an extent as will be condoned, and in the direction which is of the greatest selfish advantage to the producer.

Invar and Related Steels

Circular No. 58 of the Bureau of Standards on Invar and Related Steels, has recently been revised, and the second edition can be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 30c. a copy.

This circular is mainly a compilation of data obtained during the last 30 years by various investigators on the different properties of nickel steels. Particular attention is given to "invar," a nickel-iron alloy containing about 36 per cent nickel and possessing an extremely small thermal expansivity at ordinary temperatures, the mean coefficient of linear expansion between 0 and 40 deg. C. being of the order of 1 to 2 millionths. The results of investigations made on the various properties of the nickel-iron alloy series have been presented largely in diagrammatic and tabular form.

Following an historial account of development of nickel steel and studies of their properties, the nature of the anomalies in behavior met with in these steels and characterized by their irreversible and reversible phenomena are discussed in the light of results obtained on their various physical properties. The constitution and microstructure of these alloys are first dealt with, and next the rather extensive studies made on the magnetic properties. A magnetic transformation (Curie points) diagram has been plotted from the observation obtained magnetically, for the most part, by various investigators.

Repairing Locomotives in a Machine-Tool Shop

SPECIAL CORRESPONDENCE

Conclusion—Portable floor and cylinder boring machines—Repairing driving boxes—Regrinding valves, joints, links and link blocks—Minor boiler repairs

THE FLOOR BORING machine is of inestimable value in locomotive repairs. There are many holes in the supporting parts that become worn out of shape while the engine is in service that can be restored to their original condition of roundness without loss of time and without dismantling the engine for the purpose.

The machine shown in Fig. 20 is set up for reboring

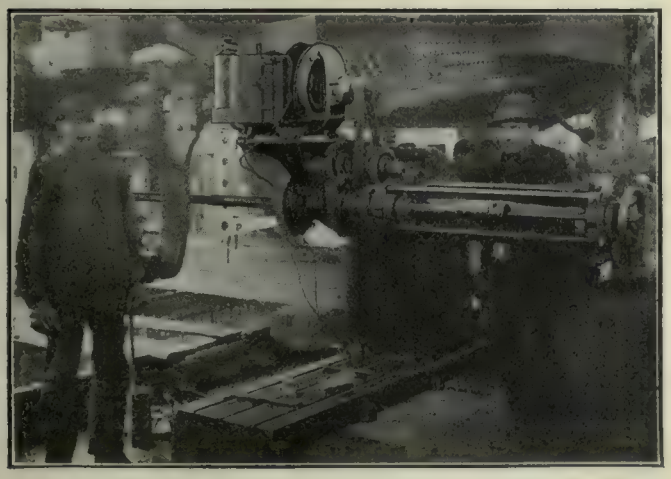


FIG. 20—THE FLOOR BORING-MACHINE

the holes in the spring hangers. The entire machine from floor plate to driving motor, may be picked up by one of the cranes and deposited wherever its services may be needed.

The cylinder boring machine, Fig. 21, is available for reboring cylinders and valve chambers and may be applied to any engine anywhere, as it is suported by a spider bolted to the open end of the cylinder and held by the studs that ordinarily hold the cylinder head in place. It is driven by a separate electric motor.

The driving boxes of a locomotive have not only to support the greater part of the weight but all of the forward thrust and a large part of the side thrust due to the swaying of the engine as well as its tendency to maintain a straight course when rounding a curve. The boxes are steel castings fitted with crown bearings of brass or bronze for the journals of the driving axles and also are faced with the same material on one side to bear against the hubs of the driving wheels. Both the crown bearings and the hub liners require frequent renewal.

Sometimes the hub liner is made as a separate piece, like a slip washer, and bolted to the box with flush head screws of brass; oftener it is cast in place and finished on the boring mill at the same time the crown bearing is finish bored. Fig. 22 shows such a box prepared with a dovetailed annular groove in the side to anchor the hub liner. Fig. 23 shows the same box after the hub liner has been cast and ready for the facing operation.

There are many valves and joints that need to be re-ground on every locomotive that comes into the shop for repairs, and so far as is possible this work is taken care of in the valve department, though there are necessarily many places where the work has to be done upon the engine. Often the superheater units are taken out, either for repairs upon the units themselves or to allow repairs to be made upon the flues, which would otherwise be inaccessible because covered by the units.

The joints of the superheater units are hemispherical

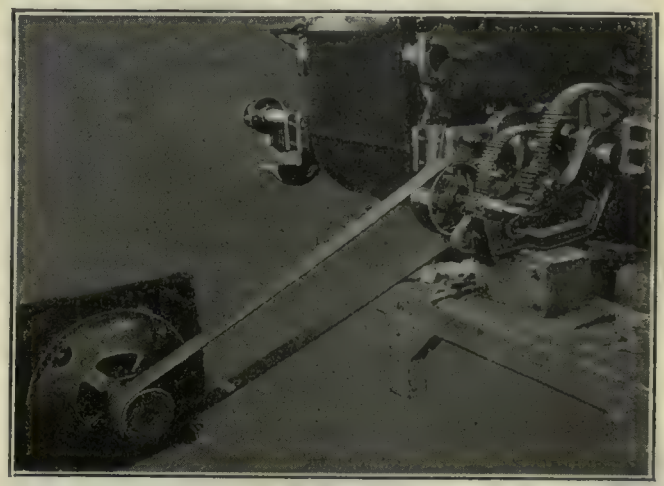


FIG. 21—PORTABLE CYLINDER-BORING MACHINE

in shape and are re-ground with lead laps of corresponding shape, revolved by means of an air motor.

The motor and attached lap are held in the hands of the operator who rocks the outfit about with an irregular gyratory movement as the lap revolves, serving to distribute the lapping compound evenly between the lap and the joint-face, thus producing a smooth hemispherical surface that, when bolted to a correspondingly lapped surface in the header, will insure a steam-tight joint.





FIG. 22—A DRIVING BOX PREPARED FOR CASTING THE HUB LINER. FIG. 23—AFTER CASTING THE HUB LINER

Some of the larger joints are of the same shape and are re-ground in the same manner with suitable laps, but valves or other joints having conical mating surfaces are ground by hand with the usual reversing movement and constant lifting out of contact for the purpose of distributing the compound.

On slide-valve engines the valves and seats are first scraped to true surface plates, after which they are scraped together—a job that must be done in place. By far the greater part of the engines that come in for repairs are of the piston- or "spool"-valve type, and any work to be done upon the valves is taken care of in the valve department.

About the only thing that can be done to piston valves is to fit them with new rings, though it may sometimes be necessary to build up the valve body by welding as is done in the case of the main pistons. The seat of a piston valve is a round bushing, and if it becomes worn to any extent it is drawn out and replaced by a new one.

A valve that causes more or less trouble from steam leakage is the throttle, and it has to be looked after very carefully. In most modern locomotives this valve is of the double poppet, or balanced type, an example of which may be seen in Fig. 24. When in place in the boiler the valve housing *A* is entirely surrounded by live steam and is therefore subjected externally to boiler pressure. There is pressure upward under the lower ring as well as pressure downward upon the upper part of the valve. Because the area of the latter is slightly larger than the former, the preponderance of pressure is downward and the valve remains closed.

As shown in this figure, the valve is in its proper

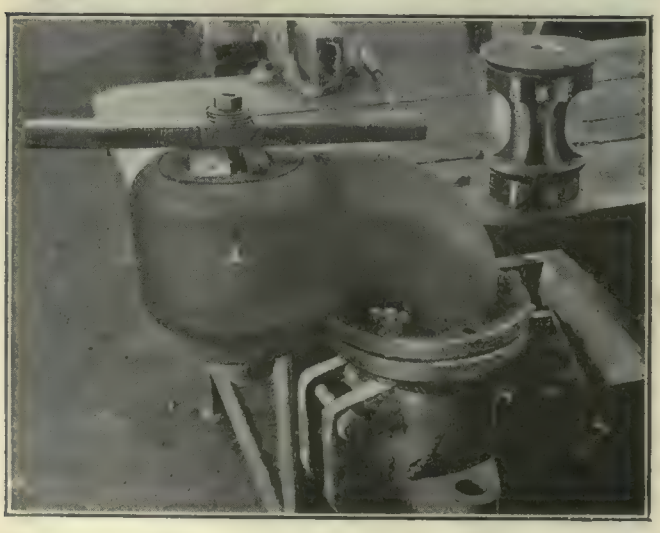


FIG. 24—GRINDING IN A LOCOMOTIVE THROTTLE VALVE

place in the housing and has attached to it a wooden handle by means of which it may be turned and lifted during the re-grinding operation. Another and exactly similar valve is shown on the bench at *B*.

To grind such a valve, both conical faces are covered with the lapping compound, usually flour emery sus-

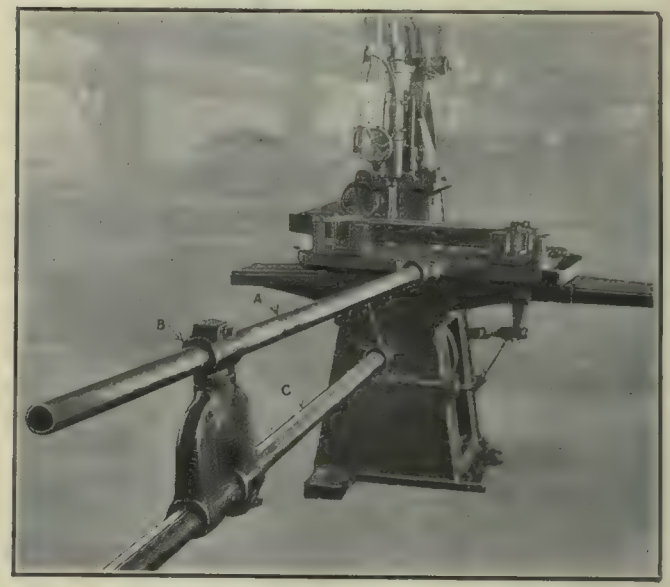


FIG. 25—THE LINK GRINDING MACHINE

pended in oil, and the valve is rotated back and forth by means of the wooden handle, lifting it every turn or two to allow the compound to re-distribute itself evenly between the surfaces.

The links of a locomotive reversing gear are peculiarly subject to wear, both by reason of the rapid reciprocating motion under heavy bearing pressures and because they are exposed to flying particles of sand

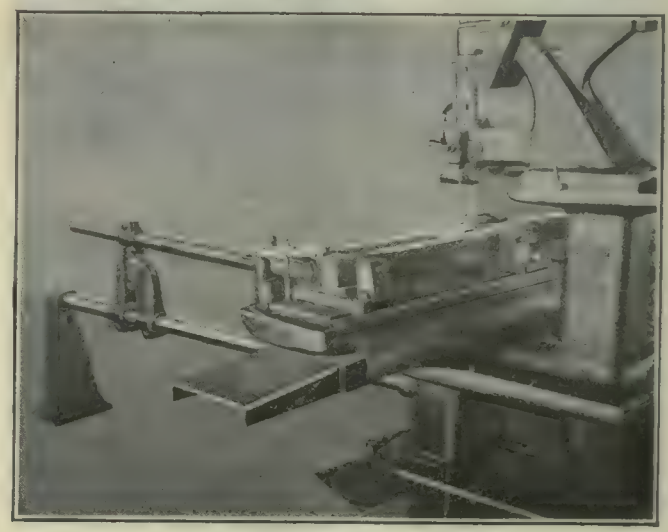


FIG. 26—GRINDING A LINK

and dust from the roadbed when the engine is in service and so they must be repaired.

The repairs involve, first the building up of the link block by the electric welding process and then re-grinding the new surface to a true arc, after which the inner surfaces of the links are reground to fit the blocks. A machine for grinding both blocks and links is shown in Figs. 25 and 26, in each case with a Walschaert link in place.

This machine is not unlike a toolroom surface grind-

ing machine. There is a bracket to carry a vertical wheel spindle that is located over the center of the table. Upon the reciprocating table there is mounted a secondary table so arranged as to swivel freely about a central stud. Rigidly attached to the upper table and extending at a right angle from it is the tubular radius rod *A*, passing through the swiveling fulcrum *B*, which is in turn fastened to the stationary rod *C*. The fulcrum is adjustable upon the stationary rod and the distance from it to the center of the stud upon which the table swivels, is the radius to which the machine will grind.

Repairs upon boilers at this shop are confined to flues, staybolts, mud-rings and minor parts around the fire-box. When new sheets are needed the boiler is lifted from the frames and sent to the boiler shop. Flues are welded in at the fire-box end with the electric arc, while the forward ends are rolled in on soft metal ferrules.

Tool Temperatures and the Cutting Resistance of Metals

At the 26th Annual Meeting of the American Society for Testing Materials, held at Atlantic City June 26 to 29, 1923, H. A. Schwartz and W. W. Slagle described an instrument for recording the changes in temperature of drills or other cutting tools in action. It is believed that the life of a good tool is a function of its working temperature, and hence that the temperatures under given cutting conditions in varying materials are an indication of their machineability or cutting hardness.

Data covering typical ferrous-alloys were given. Some relations between energy per cubic inch of metal removed, the temperature and the rate of the removal of metal were shown. These suggest the possibility of using a pyrometer in place of a tool dynamometer for determining the work done.

The tests were made with high-speed drills, $\frac{3}{4}$ in. in diameter and 3 in. long in the flutes, having two oil holes in the body between the flutes. These drills were supplied by the Cleveland Twist Drill Co. who also reground them to standard form whenever necessary.

The shanks of the drills were provided with flat lands to permit secure chucking in the fixed spindle of the testing machine. An iron-constantan couple was introduced into each hole, the junction being just inside the end of the hole and near the cutting edge. This arrangement made it necessary to hold the drill stationary and revolve the work. The fact that the two couples inserted in the oil holes read within a few degrees of each other whenever comparisons were made, showed that either indicated closely the temperature of the drill. It is quite probable, however, that the actual cutting or rubbing surface of each drill was a little hotter than the couple. This error was evidently small, however, as the couples were within a $\frac{1}{32}$ in. of surface.

A Long Specimen Necessary

In order that the amount of penetration will be sufficient to allow the temperature to come to equilibrium, a very long specimen, many times longer than the drill, is required. This was accomplished by using a piece 24 in. long finished, to 1 in. in diameter, and set against the drill point through a ball bearing held in a steady-rest and meeting just in front of the drill point.

The procedure consisted in reading, or recording, the torque and thrust of the standard drill and following by the potentiometer its temperature, until the temperature became stationary.

Tests on each material were conducted at as many combinations of speed of 0.0025, 0.005, 0.01, 0.02 and 0.04 in various revolutions and with speeds of approximately 40, 80, 160, 320, 460, 640 and 760 r.p.m. as were within the hour capacity of the machine or the temperature range of the pyrometer.

The conclusion shows that there is a lack of relationship between cutting hardness and Brinell number. Malleable cast iron, Armco iron and mild or machinery steel, all have substantially similar Brinell hardness, yet the resistance in cutting varies widely. Experiments described lead to the conclusion that cutting resistance of various metals, even through a wide range of materials and feeds, could be shown quite accurately by the temperature developed by the cutting tool.

A cheap clamp for holding the drill and steadyrest could be mounted on the carriage of any lathe and render it available for comparisons of cutting hardness by this method. It is hoped to adopt this method of investigation to the turning operation where the need of rigidity under heavy cuts renders an application of a dynamometer very difficult.

In the past, tool loads have been regarded as relatively of slight significance in machine-shop operation. It was thought sufficient to meet increased loads by increased power of the machine and strength of the tool. These tests show that the increased loads find direct expression in increased tool temperature, and hence are of primary importance in determining tool life.

It may be assumed that cutting compounds act primarily by removing heat from the system. Such a removal of heat can be beneficial only if the maximum temperature of the cutting tool is reduced. If only the chips are cooled as they leave contact with the tool, little good can be accomplished.

A Disadvantage of the Monopoly Patent

In pointing out the development of the automatic spark control for automobile motors, one of the speakers at the S. A. E. convention, referred to several patents which had been issued for some particular features of the devices which were necessary for future developments. Unless, however, the various inventors get together in some sort of a mutual agreement, it is apparently impossible for the best results to be obtained.

If, as has been suggested on various occasions for many years, patents were granted with the understanding that they could be used by anyone on payment of royalty to the inventor, fragmental patents of this kind would help rather than hinder the final development of many useful devices. In the great majority of cases the inventor would probably receive far more than he does now and it would be possible for the most enterprising concerns to manufacture devices which embody all that was known to be best, without regard to the origin of the patents. This would be of special benefit to the users, who are not interested in the quarrels of patentees, but who wish the best devices possible for their use.

Book Reviews

The Story of Flying. Aircraft Year Book, 1923. Published by Aeronautical Chamber of Commerce of America, New York City. 396 pages, 6x9 inches.

This is by far the most ambitious effort which has yet been made to show in an interesting manner the advance which has been made in commercial aviation and in aeronautics generally. In addition to a large number of extremely interesting illustrations, the book contains much valuable information. There is, for example, a critical study of the services performed and the problems which had to be overcome by commercial aircraft in the United States. A detailed account is given of the achievements of the Air Mail Service, which has the enviable record of being over 95 per cent efficient for the year.

Several sections are devoted to the national airplane meet at Detroit, the Second Aero Congress, Safety in Flying, which points out the serious effect of the delay in securing a Federal Air Law; airship progress, including the Navy Dirigible ZR-1, the Zeppelin Reparation Ship ZR-3 and the Goodyear Army Semi-Rigid R-1.

Other sections show the technical progress in aircraft construction during the past year; a review of aeronautics throughout the world, the experiments in motorless flights; and aircraft and engine design. Separate sections are devoted to the commercial operation of aircraft and the Government. The latter includes both Army and Navy, as well as the Air Mail Service, the National Advisory Committee for Aeronautics, Bureau of Foreign and Domestic Commerce, and other Governmental activities along this line. The book is particularly valuable to all interested in the development of aviation. It shows very clearly the crying need for Federal control of all aviation, in order to prevent the many accidents due to the flying of unsafe aircraft, and in some cases, of unskilled pilots.

Germany's Capacity to Pay. By H. G. Moulton and C. E. McGuire. Three hundred and seventy-nine 6x9 pages. With charts, graphs and tables as illustrations. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York. Price, $2.50.

That Germany is unable to pay her war debt to the Allies unless her exports exceed her imports in both goods and service, is clearly and logically outlined and discussed in this book that has been prepared by Mr. Moulton and Mr. McGuire with the aid of the council and staff of the Institute of Economics.

That Germany owes nearly twice as much gold as there has been produced in the entire world since the discovery of America, and that her finances have been placed in a precarious condition by following the fallacy of trying to pay during the past four years when her trade balance was unfavorable, are pointed out by the authors.

Many of the popular fallacies of the situation are discussed. That Germany can pay by borrowing from the United States or by the sale of bonds in neutral markets are shown to be little short of ridiculous in that her debts would not be liquidated but merely shifted from one creditor to another. The disastrous results of going into the country to collect the debt are also reviewed.

Trade accounts, investment accounts, shipping accounts, banking and insurance accounts, and tourist accounts must all be considered in Germany's capacity to pay, assert the authors and proceed to show in detail the country's condition in all of these branches of revenues or expenditures. The amount spent by tourists is stressed as well as the fact that Germany cannot possibly pay a sum greater than that by which total exports exceed total imports.

There are eight chapters devoted to the following subjects: What paying foreign debts involves; Germany's international balance of accounts; what Germany has paid and how; German foreign trade requirements; the budgetary problem; the German monetary situation; how France met the indemnity of 1871; and international implications of the problem. There are also eight appendices.

The book shows much work on the part of the compilers and is a clearly analyzed study of a serious situation.

The Spanish Machinery Market

It seems that during the last few years American machinery manufacturers have paid but little attention to the possibilities offered again by the Spanish market, according to a European correspondent of the *American Machinist*. Up to the outbreak of the war, Spain imported all kinds of machinery and tools from the United States, the Spanish manufacturers being well aware of the superiority of the American makes.

Immediately after the close of the war German manufacturers made the greatest efforts to regain their foothold on the Spanish market, and likewise did Swiss, Swedish and English machinery makers. It should be borne in mind that during the war quite a number of new industries have sprung up in Spain and the demand for all kinds of modern tools is quite important at the present time. Of late, French machinery manufacturers are also paying closer attention to the Spanish requirements.

American manufacturers anxious to do business with Spain should send catalogs printed in Spanish. English catalogs are of little use. They should furthermore bear in mind that their prices should not be too high. Men in the trade stated that as a rule Swedish prices were about ten per cent lower than the American and Swiss prices. German products pay indeed higher import duty rates than other countries, but as the Spanish government authorities do not demand a certificate of origin, German machines and tools are being shipped quite frequently via a country with high rates of exchange, mostly via Holland.

In motors, for which there exists a considerable demand, especially for those of about 200 hp., Swiss manufacturers are leading more and more; German manufacturers, and lately also English machinery makers, are making almost incredibly easy terms of payment, extending credits up to even five years. Also in Diesel motors Swiss manufacturers are said to be leading. In some cases the Spanish importers have even paid prices for Swiss Diesel motors 25 per cent higher than those asked by German manufacturers.

The Spanish market requires especially machines and tools which are not too high in price, simply and strongly constructed and this particularly for the reason that the Spanish machinist in most cases is not capable of handling a complicated machine.

It Pays to Replace—

How a Shop Saved by Replacing Old Shop Equipment with New Equipment

By FRED H. KORFF
Factory Manager, Metal Stamping Co., Long Island City, N. Y.

This article won a $10 prize

WHILE working toward our production peak in 1922 it was found that the production curve while rising in all departments, showed a hesitancy in our miscellaneous parts japanning department.

The "drag" on our production was the japan baking equipment. It consisted of a battery of 12 gas-burning ovens 8 ft. high, 45 in. wide and 6 ft. deep, each being equipped with an indicating thermometer for the regulation of heat. Our operations were as follows: Parts were japanned by dipping and spraying and then placed on specially designed trucks, which, when filled, were placed in ovens for baking. The trucks were left in the ovens for one hour. Because of the heat, when they were taken out they had to cool a half-hour before the parts could be taken from them. The trucks, while being filled and while parts were cooling occupied needed floor space.

Our problem was solved by the installation of the semi-automatic, electrically driven and heated japan-baking convevor-oven illustrated, designed by the writer and constructed after his own specifications at our plant. Six of the gas ovens were replaced by the conveyor-oven.

The framework is made of channel iron and the covered section of sheet steel. The insulation wall is of asbestos bricks 6 in. thick. The oven section is built in units of 4 ft. each, to permit of its being lengthened at any time if so desired. The heating units are Westinghouse Electric & Manufacturing Co. coils. This conveyor-oven overall is 46½ ft. long and 56 in. wide. It consists of a baking chamber 20 ft. long; a level horizontal loading section 10½ ft. long; a rise 4½ ft. long as the parts enter baking chamber; a drop 4½ ft. long at the unloading end; and a level horizontal unloading and cooling section 7 ft. long. The degree of heat in the baking chamber is controlled automatically by magnetically operated switches. All of this electrical equipment was specified by us and supplied by the Westinghouse Electric & Manufacturing Co. The parts travel on a double chain conveyor, the speed of which is controlled by a Reeves variable speed transmission.

Our miscellaneous parts japan baking equipment at present consists of this conveyor-oven and six gas-



CONVEYOR-OVEN, SHOWING UNLOADING END AND EXTERIOR

In the contest, which closed July 5, nine prizes were given for articles telling how a shop saved by replacing old shop equipments with new equipment. Additional articles will be printed in forthcoming issues.

burning ovens of the type described above. The figures given in the table show the saving actually effected in one month of operation this year over the corresponding month last year.

Our gross saving for the first year of operation will

ONE MONTH'S SAVINGS DUE TO NEW EQUIPMENT

	1922	1923
Number of parts japanned and baked	317,204	345,206
Number of men employed	20	13
Number of working hours per employe	204.5	209.1
Cost of fuel consumed		
Gas, 166,800 cu.ft. at $1.20 per M	$ 200.16	
Gas, 16,680 cu.ft. at $1.20 per M		$ 20.02
Electricity, 6,390 kw.-hr. at $0.02		127.80
Labor cost	1,840.50	1,223.24
Total cost of fuel and labor	2,040.66	1,371.06
Unit cost per part	0.00643	0.00397
Comparison: At the unit rate shown for 1922, parts japanned in 1923 would have cost		2,219.67
Cost with new equipment was (as above)		1,371.06
Actual saving for one month		$ 848.61

be no less than $8,000. The complete cost of the new electric conveyor-oven equipment, including cost of installation, was $2,600. This cost, by the saving effected, has been paid for by the first three full months of operation. As the life of the new equipment is at least fifteen years, the value of the investment can be readily appreciated.

Today increased efficiency is apparent throughout the miscellaneous parts japanning department. Our production curve there indicates no hesitancy. The operations of this department at present not only do not "drag" but can be accelerated at will without vibration. We show increased departmental output with costs reduced—it has paid us to "replace."

These articles won honorable mention

By F. E. Ervin
Foreman Machine Shop
Diamond Alkali Co., Painesville, Ohio

OUR plant is of such size and character that the maintenance department, especially the machine shop, assumes the proportions of a small manufacturing shop. There are used in the plant a very large number of gear reduction drives, transmitting from five to fifty horsepower; a turbine-driven pumping plant with capacity enough for a good-sized city; an engine room with over fifty engines, generators, blowers, high-pressure pumps, etc.; sixteen locomotives, locomotive crane, bridges, monorails; and literally hundreds of motors of every size.

All of this the company keeps in repair in its own shops, duplicate parts being made up as far as possible so as to cause the least delay for replacements. It is evident from the foregoing that there would be a large number of shafts, rods, valves, and valve stems to be gotten out. Formerly these parts were turned and finished to dimensions in the lathe, and no attempt was made to grind anything except the Corliss engine valves, which were ground dry in the lathe with a special motor-driven fixture, it often taking three days and nights to grind one set of eight valves. However, after long and patient effort the management was prevailed upon to install a Landis 12x96-in. plain grinding machine.

The result has been a complete overturn in our shop methods. Where formerly it took from fourteen to twenty days to overhaul a Corliss compressor-engine, we now do it in from nine to ten days. Where it used to take a day and a night to turn and finish a low-carbon or vanadium-steel drive shaft, we now have it turned, ground, drilled and keywayed ready for the press in 20 hr. Jobs that we formerly could trust to none but the most expert of our men, we now can give to the less reliable ones and their deficiencies are easily made up by the grinding machine. It is a surprising thing, too, that our most versatile grinding-machine operator never shone so brightly as a lathe man, either in accuracy or speed. But give him a definite size and he will produce it accurately and in a surprisingly short time on the grinding machine.

Where we used to be compelled to keep our lathes busy night and day, we now nearly always have a spare lathe which is most valuable in a maintenance shop, and at that, the grinding machine is by no means always busy although the volume of our work is increasing.

From a cost accountant's viewpoint, the grinding machine may not be earning its cost. But from the point of dollar-producing equipment kept going in the plant, it has earned its cost in the short year we have had it.

By William J. Fisher, Jr.
Foreman Machine Shop
Joseph Bancroft & Sons Co., Wilmington, Delaware

WE MAKE machines that require a heavy spider forced on to a steel shaft. This spider must be well fitted and has to be very tight, for, if it comes loose, it not only means the loss of the spider or shaft, but also the part that works in connection with it.

Formerly in forcing these spiders on we used a wooden frame, with a coarse pitch screw, having holes drilled in the head in which we put an iron bar to pull the spider into place. When the spider began to get tight, we used a longer bar with a rope tied to the end, as it stood up too far for a man to reach.

There was absolutely no way to tell how tight a fit we had, except by the number of men we had on the bar. It might be in place here to say that it was a rather dangerous proceeding, as the casting moved by jumps and a man had to be very careful when the pulling bar was overhead, as a small movement of the spider on the shaft meant a large one of the bar, which might strike a man on the head.

We now use a forcing machine with pump and gage complete, made by the Fairbanks Company, of New York, and the operator knowing what pressure he needs can watch the gage and get the desired results.

By Wm. Dossing
Reichel & Drews, Inc., Chicago, Ill.

AMONG the articles we make are ring gears ⅜ in. thick, 12⅛ in. outside diam. and 9 in. bore. These gears were formerly cut on a milling machine, the time being from 7 to 8 hr. each.

In December, 1921, our shop bought a Flather automatic gear cutting machine equipped with an arbor to hold six of the ring gears at a time. On this machine we now cut the gears in 2½ hours.



Where Machine Tools are Made

Gisholt Machine Company



Turret Lathes on Production





Training Customers' Operators



The Foundry



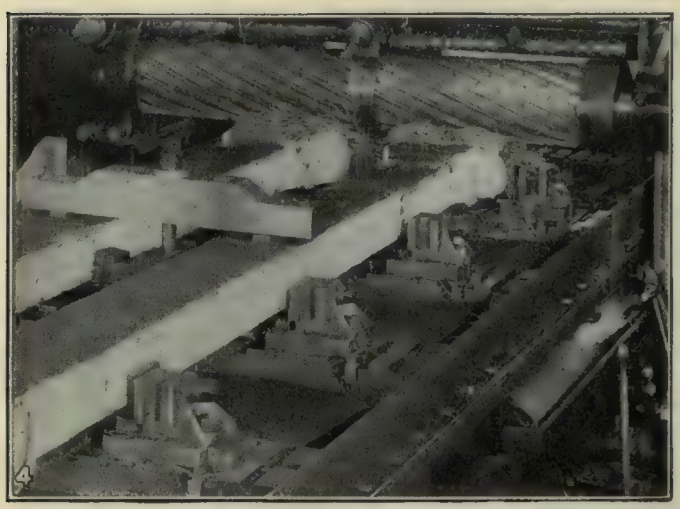
Machine Floor

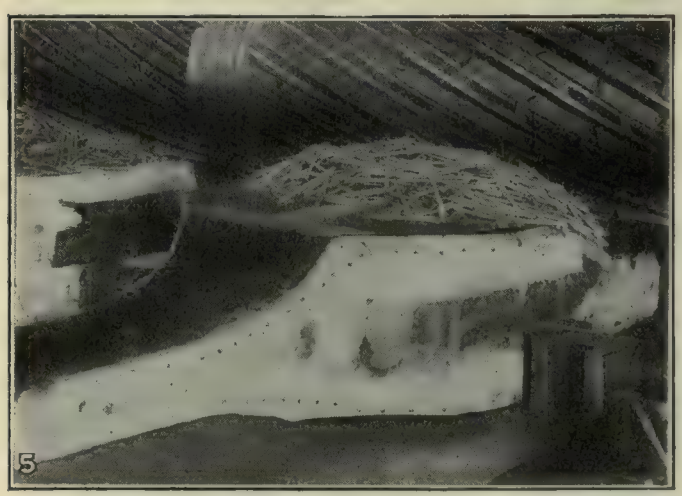












Modern Methods of Machining Connecting and Side Rods

THESE illustrations show what are believed to be the latest methods of machining connecting and side rods for locomotives. They show the use of both types of Ingersoll milling machines including the special fixtures and tools which have been designed for this purpose. The captions which follow give a brief description of the methods and the results obtained.

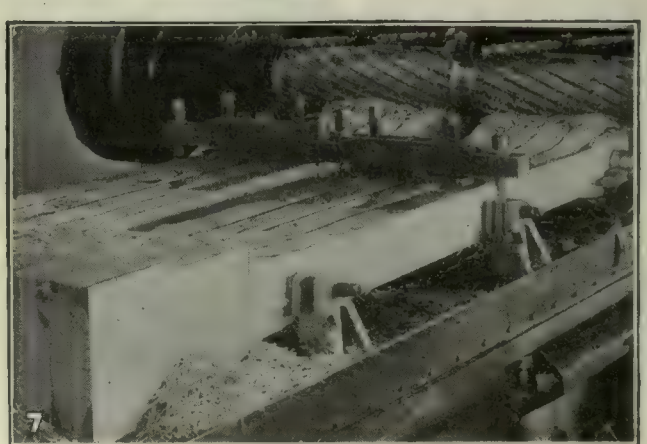
Fig. 1—Loading two heat treated chrome vanadium steel main side rods and making ready for slabbing the sides. These rods are laid out on the forging before coming to this machine.

Fig. 2—Setting the two 9 x 24-in. Ingersoll helical inserted tooth cutters. These cutters are mounted on a single arbor and are driven by the single horizontal head through radial keys.

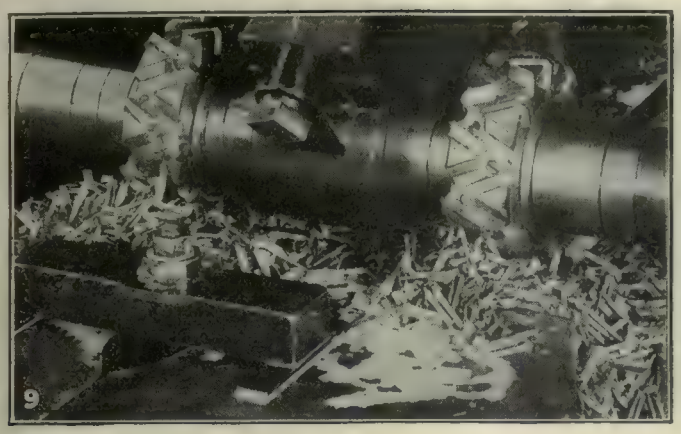
Fig. 3—Start of the cut which is $\frac{23}{64}$ in. deep × $30\frac{5}{8}$ in. wide. Table feed 3 in. per min. (limited by cutter speed). Cutter speed 33 ft. per min. (limited by scale). This feed produces an exceptionally fine finish.

Fig. 4—Slabbing the sides of two carbon steel main rods with two 9 x 24-in. Ingersoll cutters. Rods are held in fixtures which are universal for all locomotive rods. Cut is $\frac{19}{32}$ in. deep by $11\frac{1}{4}$ in. wide. Table feed 3 in. per min. Cutter speed 33 ft. per min. Removes 41 cu.in. of metal per min., requiring 59.5 hp. Floor to floor time 3 hr., 28 min., for slabbing both sides of two rods.









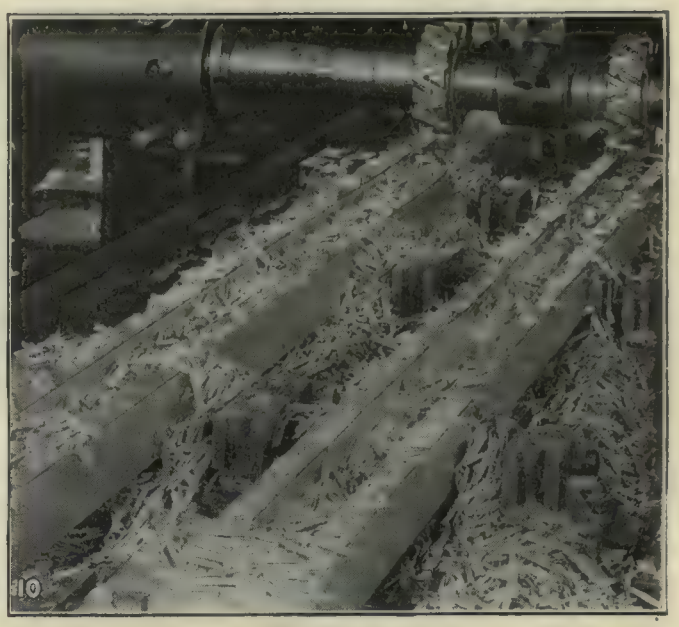


Fig. 5—Close-up of slabbing two rods on a 54 x 30-in. x 16-ft. horizontal spindle, inclined rail, milling machine, Note the method used in laying off work.

Fig. 6—Drilling 2½-in. hole in main rods. The rods are then mounted on arbors in sets of 8, before going to the edging operation. It is necessary to layout only the two outside rods.

Fig. 7—Edging 8 main rods, taking a cut ¾-in. deep, table feed 8½ in. per min., requiring 68 hp. Rods are held in Ingersoll universal rod fixtures. Cutters are 9 x 24 inches.

Fig. 8—Sinking channeling cutters to depth, 1⅝ inches.

Fig. 9—Channeling two 40 to 60 carbon steel rods on a 54 x 48-in. x 16-ft. machine, using a 10-in. cutter at 65½ ft. per min. cutting speed. Depth of cut 1⅝ in., width 3¼ in., table feed 4¾ in. per min., and consuming 86 horsepower.

Fig. 10—Channeling locomotive rod on 54 x 30-in. x 16-ft. milling machine, using patented staggered, inserted-tooth, channeling cutters.

Fig. 11—Milling all the radii of two locomotive side rods on a special Ingersoll adjustable, rotary milling machine, using a 5 x 12-in. solid-shank, helical, inserted-tooth cutter, supported at lower end. The rods are held in special rod fixtures.

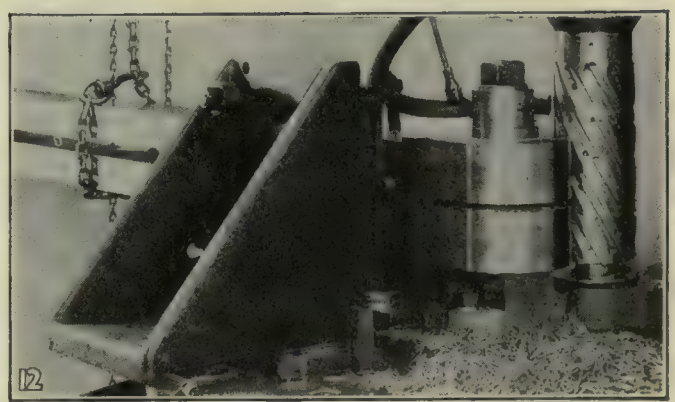
Fig. 12—Contour-milling the piston end of two heat treated, chrome vanadium steel main rods, using a 5 x 12-in. solid shank cutter, supported at the lower end. Table feed is 1½ in. per min., with a cutter speed of 35 ft. The cut is ⅝ in. deep and 10⅜ in. wide over all. Floor to floor time for two rods is 45 minutes.

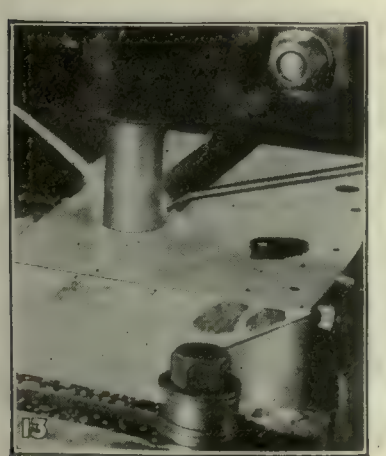
Fig. 13—Cutting the first side of a main rod-end.

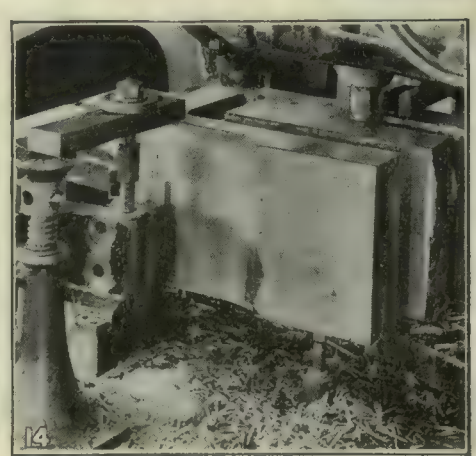
Fig. 14—Milling out the open or strap end of two carbon steel main rods on rotary milling machine. This is done with a 2½-in. solid, spiral cutter, supported at lower end. Floor to floor time for milling two rods 2 hr., 50 minutes.

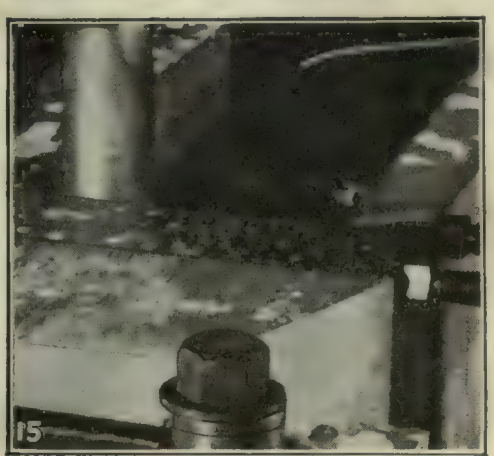
Fig. 15—Finishing the inside of the rod end.



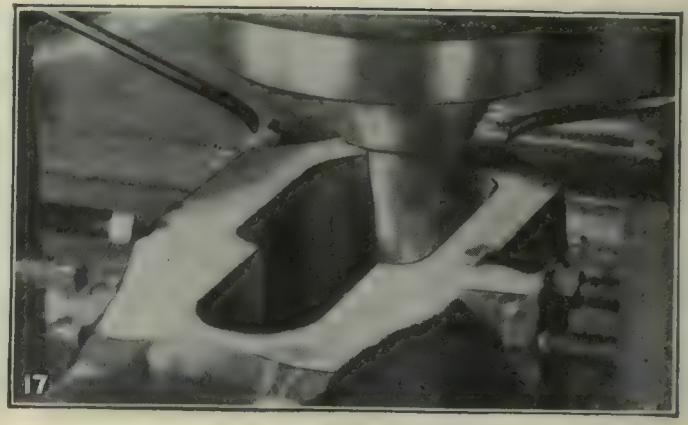












Modern Methods of Machining Connecting and Side Rods

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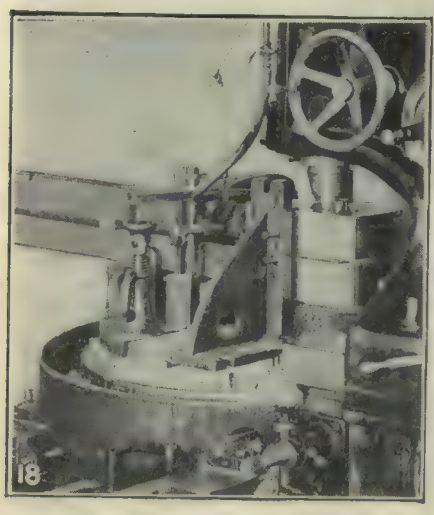


Fig. 16—Milling out piston end. This operation starts from the 2½ in. hole drilled for the edging operation.

Fig. 17—Piston end completed.

Fig. 18—Milling piston end of two chrome-vanadium main rods with 2-in. solid spiral cutter, supported at lower end. Cut is 2 in. wide and 10⅜ in. deep. Feed for roughing cut, ¼ in. per min.; finishing cut, 1½ in. per min. Cutter speed, 50 ft. per min. Floor to floor time for two rods, finished ready for brasses, 4 hr., 30 min.

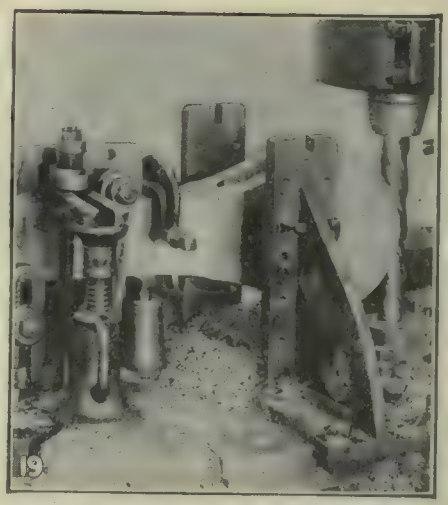


Fig. 19—Milling slot for tongue in chrome vanadium intermediate side rod using 2¾ in. cutter. The cut is 11⅝ in. deep and 2¾ in. wide. Table feed, ⅜ in. per min. for roughing, 1½ in. per min. for finishing. Cutter speed, 50 ft. per min., requiring 18 hp., including friction load. Floor to floor time, 1 hr. 20 min. After cutter mills full length of slot in the solid it is fed out at 1½ in. per min. taking finishing cut on one side of slot. Then fed in at same feed, finishing the other side of slot.

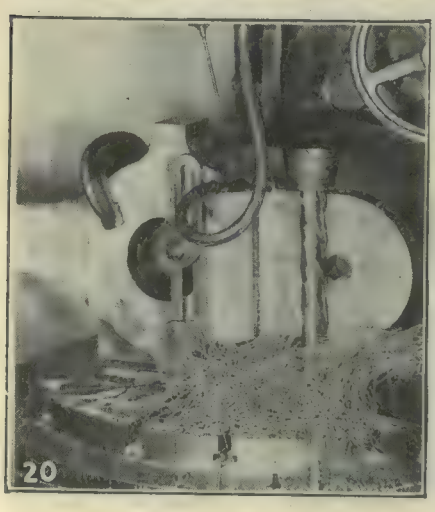


Fig. 20—Milling both sides of tongue of chrome vanadium side rod, using a 2⅜-in. cutter. Cut varies from ⅜ in. to 1⅜ in. and is 7⅛ in. wide. Table feed is 2½ in. per min., cutter speed of 65 ft. Floor to floor time for four surfaces, 1 hr., 10 min.

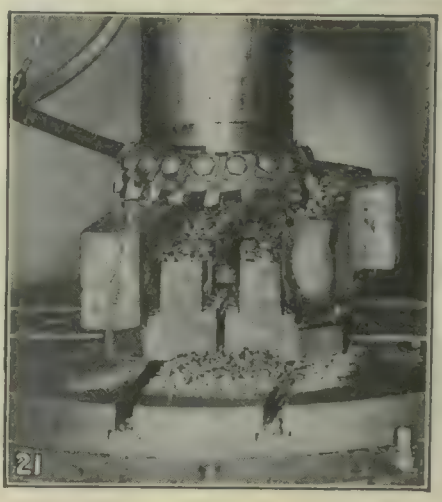
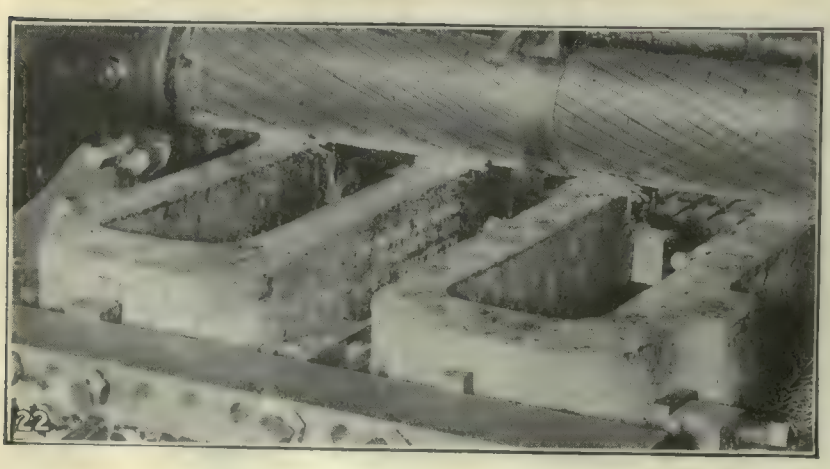


Fig. 21—Face-milling locomotive rod straps on rotary milling machine, using Ingersoll type "B" face-milling cutter.

Fig. 22—Slabbing two chrome vanadium straps using two 9x24-in. cutters. Cut is ⅜ in. deep. Width varies from 12 to 30 in. Table feed 4½ in. per min. Scale was very light, allowing increase in cutter speed. Table feed 4½ in. per min. Cutter speed 52 ft. per min. Floor to floor time 2 hr., 6 min., both sides of two straps.

Fig. 23—Milling outside of carbon main rod strap, except where the radius is under 6 in., using one 6x6-in. cutter. Cut varies from ⅜ to ⅝ in. in depth and is 5½ in. wide. Table feed, 1½ in. per min. Floor to floor time is 1 hr., 25 min.





The New Screw Thread Standard—II

By RALPH E. FLANDERS
General Manager, Jones & Lamson Machine Co.

Sellers' or U. S. S. Profile adopted for tooth form in A.E.S.C. report—Reasons for selecting the name American (National) for standard threads—Considerations affecting clearances and methods of gaging

CONTINUING the publication of the Screw Thread Report of the American Engineering Standards Committee, we next come to the section entitled:

II—FORM OF THREAD

The form of thread profile as specified herein, and known previously as the United States Standard or Sellers' profile, is adopted and shall hereafter be known as the American (National) Form of Thread.

1—Where Used.—The American (National) Form of Thread Profile shall be used wherever possible for screw-thread work.

2—Specifications.—The basic angle of thread (A) between the sides of the thread measured in an axial plane shall be 60 degrees. The line bisecting this 60-degree angle shall be perpendicular to the axis of the screw thread.

The basic width of flat at the root and crest of the thread form is found as follows:

$$F = \tfrac{1}{8} \times p, \text{ or } 0.125 \times p$$

The basic depth of the thread form is found as follows:

$$h = 0.649519 \times p = \frac{0.649519}{n}$$

where p = pitch in inches
n = number of threads per inch.

3—Illustration.—There are indicated in Fig. 5 the relations as specified herein for the American (National) Form of Thread for the minimum nut and maximum screw, Free Fit. These relations are further shown in Figs. 9, 10 and 11.

4—Clearance in Nut at Minor Diameter.—A clearance shall be provided at the minor diameter of the nut by removing the thread form at the crest by an amount between one-sixth and one-fourth of the basic thread depth.

5—Clearance in Nut at Major Diameter.—A clearance at the major diameter of the nut shall be provided by decreasing the depth of the truncation triangle any desired amount down to one-third of its theoretical value.

The parenthesized title for the standard—"American (National)"—will at once be noted. It is almost as objectionable as a hyphenated citizenship. It is unfortunate that it could not have been called "American" or "National" instead of both together.

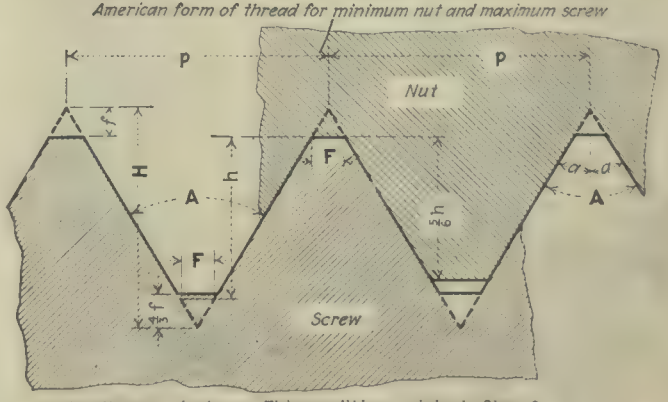
The situation developed from the considerations which originally led the Commission to adopt the term "National." It was feared that the term "American" would be prejudicial to its adoption by other nations; and it was believed that wide spread adoption would be facilitated by the ease of changing the title either to "International" (though that has been preempted by a metric standard) or to "Mexican National," Chinese National," etc. by the simple addition of the name of the country adopting it. On the other hand the rules of the American Engineering Standards call for the use of the term "American." As a compromise both words are used as given above. The precedent for this was established by the Commission itself when it approved the pipe thread standard already adopted by the A.E.S.C. as "American" and incorporated it bodily as the "National (American)" Standard.

In practice it will be allowable to call it by either name or by the combination of the two. Time will tell which name survives the test of usage.

The basic form of the new system is the old "U.S.S." In the actual form used there are certain radical departures, which make their first appearance in the provisions for clearance in paragraphs 4 and 5 given above. In the old U.S.S. standard it was assumed that a fit was desirable not only on the sides of the tooth, but at the crest and root as well. The new standard makes provision for definite clearances at the crest and root.

As a matter of fact practice has been moving in this direction for some time. First came the realization that the nut is not materially weakened if a tap drill larger than basic is used. Education on this point has reached the stage where a tap drill which allows only 75 per cent depth of engagement is accepted as satisfactory. Next came the adoption by the tap makers of standards which increase the outside diameters by 0.003 to 0.0035 in. over the basic, thus providing for an initial clearance on the outside diameter and allowing the cutting points to wear somewhat without cutting threads which reject a basic plug gage. It has also been common to turn the outside diameter of the screw a little below basic before threading.

All the above procedures are "good practice." They assure that the fit shall take place on the sides of the



No allowance is shown. This condition exists in Class 2 and Class 3, specified herein, where both the minimum nut and maximum screw are basic in pitch diameter.

FIG. 5—FORM OF THREAD FOR MINIMUM NUT AND MAXIMUM SCREW

thread only, where it is wanted, and not at crest or root where it is not merely useless but harmful as well, as tending to conceal poor workmanship on the sides of the thread. In all this it is assumed that screw threads are used to hold parts together or apart in direct tension or compression only, and that they are never to be used as dowel pins, for lateral control. This is important. No self-respecting mechanic or designer will permit a screw to be used as a dowel pin where close lateral control is necessary.

There is one expedient to obtain root-and-crest clearance which has been employed by some important firms that is quite objectionable. This is the carrying of the crests of the threads in dies and chasers to points sharper than the basic form, so that the resulting thread on the screw, when made to basic pitch diameter, has a minor diameter considerably below basic. This is bad because it weakens the screw at the minor

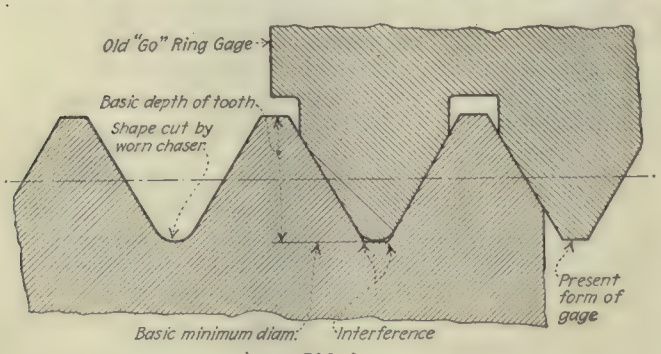


FIG. 6

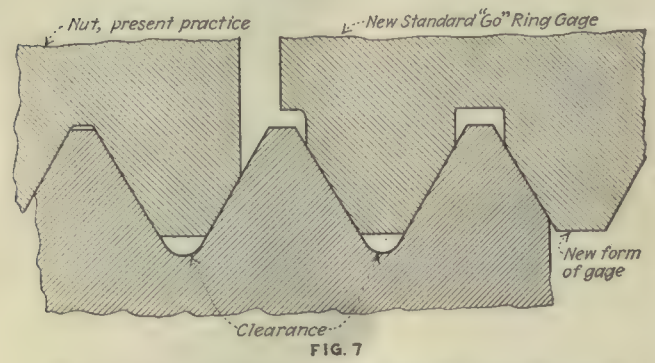


FIG. 7

FIGS. 6 AND 7—DIAGRAMS TO SHOW DIFFERENCES BETWEEN OLD AND NEW RING GAGES

diameter where it is weakest anyway; and the screw is usually weaker than the nut at that, in any ordinary design of threaded parts.

In reality this harmful practice has arisen not so much to obtain clearance for the crests of the thread in the nut, as to get corresponding clearance for the threads of the *ring gage* with which the screw, bolt or stud is tested. Gage makers have hesitated to make the minor diameter of a ring gage larger than basic in spite of the almost universal use of oversize tap drills, because there was no minimum limit set for that dimension short of the basic minor diameter—so to basic minor diameter have they been made.

Effect of Wear at Crest of Chaser

The writer's work includes the manufacture of self-opening die holders and chasers for the same, on a large production basis. One of the most frequent complaints sent in by customers is that a thread cut to fit a basic ring gage is loose in a nut or tapped hole which has been tested as being a tight fit with a basic threaded plug gage. The customer assumes that the chasers have the wrong shape in some way. The real trouble is simple. The ring gage has sharp corners at the crests of the teeth. The chasers originally have sharp corners at the crests, but they wear somewhat with use. When they commence to round over the fillets thus produced at the roots of the screw thread interfere with the sharp crests of the ring gage, which thus rejects the work. The operator thereupon sets the die to a smaller pitch diameter until the piece enters the ring gage. Then, of course, the screw is loose in a standard nut, because the fillets do not interfere with the crests of the thread of the nut or tapped hole, since in that case the minor diameter was formed by an oversize tap drill, larger than basic. The ring gage thus rejects work which is perfection so far as actual practice is concerned. All this trouble, as shown in Figs. 6 and 7 is avoidable by the setting of a maximum minor diameter for the screw very considerably larger than basic, by an amount that will be given later in connection with the tolerance tables. One of the first steps that should be taken in the adoption of the new standard is that of the oversize minimum tap drills for the tapped holes, and the oversize minimum minor diameter for standard "Go" ring gages, to be furnished by all responsible gage manufacturers. The charts used in optical measurement already take care of this situation.

Value of Crest and Root Clearances

This definite provision of clearance at the minor diameter, and permission for clearance at the major diameter, are of additional value in allowing the use of threading tools (taps, dies, chasers, lathe tools, etc.) with rounded crests, which give a more durable cutting edge than the sharp corners of the basic U.S.S. form. The limits of this permissible rounding will be given later under the section of the report devoted to "Tolerances."

While we are on this matter of crest and root clearances, attention should be called to another harmful practice occasionally met with in the electrical industry. There is a class of work in connection with the terminals for large leads in certain apparatus where it is required to make electrical contact on a thread for the carrying of a heavy current. To reduce the resistance of the contact and avoid heating and excessive corrosion a good fit is necessary. In their desire to obtain the largest conducting surface possible some elec trical engineers have been led to specify contact on the flats at the crest and root as well as on the flanks of the teeth. This is extremely dangerous, as with any ordinary means of gaging the chances are more than even that the contact will be on the major or minor diameter only, and not at all on the flanks. In the long run a larger contact will be obtained more surely by concentrating on a high-grade fit on the flanks only.

All cases of this sort should be inspected by optical projection. It is the writer's opinion that one good look at a thread contour magnified 200 times is worth an hour's fumbling with the miscellaneous collection of gages necessary to tell the whole story of the accuracy of a thread in contour, pitch diameter, lead, concentricity, etc.

The relation of this new thread form with a permissible rounded root to international standardization will be discussed in a later chapter.

The next installment deals with thread series.

The Methods and Principles of Frank B. Gilbreth, Inc.—VI

By K. H. CONDIT
Editor, *American Machinist*

The toolroom and its place in the production scheme—Duties of the toolkeeper — Tool classification, storage and maintenance — The Taylor tool stand and its use

In A previous article it was stated that one of the three prerequisites to maximum production was an adequate supply of material ready for the worker's hands. It is equally important to make sure that he has the right tools for the job and that he does not have to wait for them when he is ready to use them. In a shop of any size, it is quite impossible to keep track of tools without a well arranged and systematically kept tool room. The Gilbreths, therefore, make the tool room one of the first points of attack in reorganizing a machine shop.

Before going into details of tool room construction and arrangement, it may be well to set down a few general rules applying to tools which the Gilbreth engineers have developed by experience. The first question that naturally presents itself is, what is a tool? Mr. Gilbreth says that anything which is used more than once is a tool. A captious critic could probably discover exceptions to this definition, but it seems to cover the majority of cases. Under its terms, hammers, step-ladders, lathes, or shop trucks, fall in the same category.

The first rule laid down with regard to tools is that one man must be responsible for keeping them in repair. In some unusual cases, it may happen that he will also make the repairs, but it is far better to have some one alse make them on his order. If the man responsible for keeping tools in repair has to do the work himself, it is only natural that he will procrastinate, putting off the more difficult jobs until he has more time, with the inevitable result that such jobs are often not completed when they are needed.

The tools used in a machine shop may be divided into four different classifications. In the first class, we may put the tools used by one man only. Such tools should stay with their user, and may be kept in any way which seems best to meet the local requirements, as, for instance, a tool box, a locked drawer or a tool cabinet.

The second class will include those tools used at one machine only, such as the special socket wrenches furnished as regular equipment with a lathe or a milling machine. These tools should stay at the machine.

In the third class are placed tools used by more than one man, or at more than one machine. They should go to the tool room when not immediately needed. The final classification will take in certain tools which meet the requirements of class 3, but are generally not kept in a tool room, such as step-ladders, shop trucks, tote boxes, etc.

Arrangement must be made for periodic inspection of all tools of all four classes by the man responsible for their good condition, either by sending the tools to the tool room or by having the man responsible go to where the tools are kept.

Most engineers are familiar with the Taylor standardized tool storage racks. They were used by Mr. Gilbreth until he evolved his present improved design.





FIGS. 19 AND 20—SAMPLES OF THE CONTENTS OF FORGOTTEN BENCH DRAWERS

The Taylor rack is made of wood and consists of a box 17 in. deep divided into eight compartments 24½ x 24½ in. The rack is twice as high as it is wide, thus giving an arrangement four compartments high and two wide. The back of the rack is closed by 3-in. slats spaced 3 in. apart, so that a rack similar in design, but with its slats opposite the spaces in the first rack can be backed up to it and thus give closed backs to both racks.

The principal objection to this design of storage rack is that it is heavy and cumbersome. In addition, it is so high that if any tools or parts are placed on top, a step-ladder is required to reach them. It may even be too high for some tool rooms. The natural question at this point is, what is the objection to heavy and cumbrous tool bins? The answer is that the first location chosen for the tool room is very seldom the final one. To allow for this human failing, Mr. Gilbreth makes his tool storage rack of the same dimensions but only one tier high instead of four, and then piles these racks one on top of another to the required height. By making them smaller, he is also able to use lighter wood, and thus to save weight in the total assembly. The bins are all standardized and are easily portable. His usual practice is to place these units three high, and use enough of them so that only the lower two in each rack are needed for the tools brought in as a result of the first collection order.

It is a strange fact that, no matter how drastic the order issued for all tools to be turned in, and no matter how sure every man in the shop is that they all have been turned in, there are usually enough discovered later to fill the top tier of the rack. An idea of what may be expected to turn up in forgotten bench drawers may be gained from Figs. 19 and 20, photographs taken in different shops but showing practically the same state of affairs.

Assuming that all tools have finally been collected, an inventory is taken which will show the right number of some kinds, too many of others and too few of still others. It will also show up some of the wrong kinds that should be discarded. A useful form for taking the perpetual tool inventory is shown in Fig. 21. A decision must be made by those in authority as to the proper number of each kind of tool to be kept

AST 2—PERPETUAL INVENTORY OF TOOLS IN TOOL ROOM

Price ..... 1 Extended ..... 2 Examined ..... 3 Approved 4

Symbol 5
No. of Sheets 6
Sheet No. 7
Department .....

QUANTITY 9	SIZE OR WEIGHT 10	DESCRIPTION 11	REMARKS 12	PRICE PER UNIT 13	TOTAL PRICE 14

This stock of Tools to be kept Permanently on hand, in Tool Room, and the quantity of each, according to list. Strictly adhered to. No changes to be made without proper written authority.

FIG. 21—FORM FOR TAKING AND KEEPING PERPETUAL TOOL INVENTORY

AST1—BALANCE OF TOOLS

DESCRIPTION 1

Symbol 2
No. of Sheets 3
Sheet No. 4

Size ..... Max. No. ..... Min. No. ..... No. to Order 5

Date Ord'd 13	No. of Pieces 14	Purchase Order No. 15	Date to be Deliv'd 16	Date Rec'd 17	No. of Pieces Damaged 18

Size ..... Max. No. ..... Min. No. ..... No. to Order 6

Date Ord'd	No. of Pieces	Purchase Order No.	Date to be Deliv'd	Date Rec'd	No. of Pieces Damaged

Size ..... Max. No. ..... Min. No. ..... No. to Order 7

Date Ord'd	No. of Pieces	Purchase Order No.	Date to be Deliv'd	Date Rec'd	No. of Pieces Damaged

Size ..... Max. No. ..... Min. No. ..... No. to Order 8

Date Ord'd	No. of Pieces	Purchase Order No.	Date to be Deliv'd	Date Rec'd	No. of Pieces Damaged

Size ..... Max. No. ..... Min. No. ..... No. to Order 9

Date Ord'd	No. of Pieces	Purchase Order No.	Date to be Deliv'd	Date Rec'd	No. of Pieces Damaged

Size ..... Max. No. ..... Min. No. ..... No. to Order 10

Date Ord'd	No. of Pieces	Purchase Order No.	Date to be Deliv'd	Date Rec'd	No. of Pieces Damaged

Size ..... Max. No. ..... Min. No. ..... No. to Order 11

Date Ord'd	No. of Pieces	Purchase Order No.	Date to be Deliv'd	Date Rec'd	No. of Pieces Damaged

Size ..... Max. No. ..... Min. No. ..... No. to Order 12

Date Ord'd	No. of Pieces	Purchase Order No.	Date to be Deliv'd	Date Rec'd	No. of Pieces Damaged

Damaged beyond repair, place a small vertical mark in Column under "No. of Pieces Damaged." As soon as vertical marks equal the "No. to Order," then order the required number If any more pieces are damaged or rej'd, place the proper vertical mark in the line corresponding to that order

FIG. 22—BALANCE OF TOOLS FORM

AST-3—LIST OF TOOLS CHARGED TO WORKMAN

Each Workman is provided with a Locker or Closet in which to lock up the Tools charged to him. Other Tools needed can be obtained from the Tool Room on leaving a Numbered Check as a receipt. All Tools out on Check must be returned immediately after they have been used.

All damage or loss of Tools will be charged to owner of Check held as receipt unless such damage or loss is proved to have been unavoidable.

PIECES 1	NAME 2	SIZE 3	TOOL SYMBOL 4	PRICE 5
	BRUSH			
	CENTRE PUNCH			
	CHISELS			
	CALIPERS			
	CHECKS No.			
	DRIFT			
	FILES			
	FILE CARD			
	FILE HANDLES			
	HAMMER			
	KEY No.			
	LOCK No.			
	OIL CAN			
	SCREW DRIVER			
	SCRIBER			
	VISE CLAMPS			
	WRENCHES			

I have received the Tools listed above and agree to be held responsible for the care and safe keeping of the same.

Signed 6

Month	Day	Year 9

Workman's No. 7

Locker No. 8

FIG. 23—FORM FOR LISTING TOOLS CHARGED TO WORKMAN

on hand ready for use. This number is entered in column 9 of Fig. 21. The headings on the other columns are self-explanatory. Note that this form conforms to Gilbreth standards, in that the directions are placed in the binding margin and the waste space

SM-17

TOOL LIST FOR

OPERATION SYMBOL

MACHINE NO. _____ DRAW. NOS. _____

TOOLS CALLED FOR ON THIS TOOL LIST MUST BE ISSUED IN A TOTE BOX. THE LIST SHOULD BE PLACED IN THE TAG POCKET ON THE BOX AND ACCOMPANY THE TOOLS TO AND FROM THE MACHINE.

CLASS	NO.	SYMBOL	SIZE

CHECKS REQ'D	MAN'S NO.	HOUR	MONTH	DAY	19	SIGNED

WHEN THE TOOL LIST IS NOT CORRECT THE GANG BOSS MUST AT ONCE REPORT THE ERROR TO THE MAN WHO SIGNED THIS LIST

FIG. 24—TOOL LIST FOR A MACHINE

usually above the table lines is reduced to a minimum.

When once the proper number of each kind of tool has been set and entered on the perpetual inventory form, it becomes the duty of the tool keeper to make the tools conform to the inventory. For this purpose, the balance of tools form shown in Fig. 22 is used. Examination of the explanatory note on the margin of this form will show how it is to be used. It may seem a little confusing that column 18 is filled out before any one of columns 13 to 17, but in practice this appears to work out without difficulty.

The tool list shown in Fig. 23 for keeping track of tools charged to a workman may be modified, as shown in Fig. 24, to serve as a tool list for any particular machine. In the latter form, it is placed in the tag pocket on the end of the tote box, in which the tools listed on it are placed.

The inventory forms are bound in inexpensive, lightweight covers, which can be had for about 30 cents, and are much lighter and easier to handle than

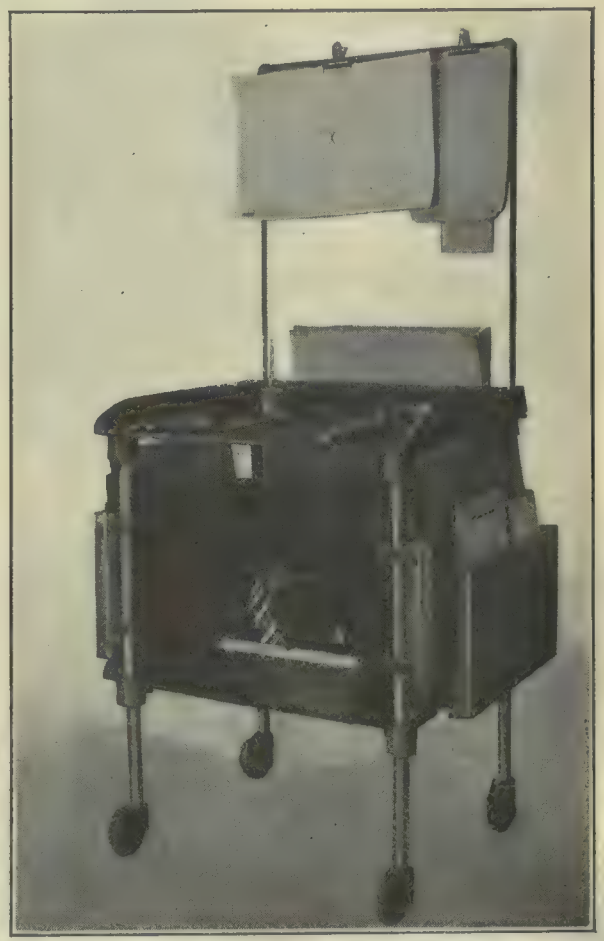
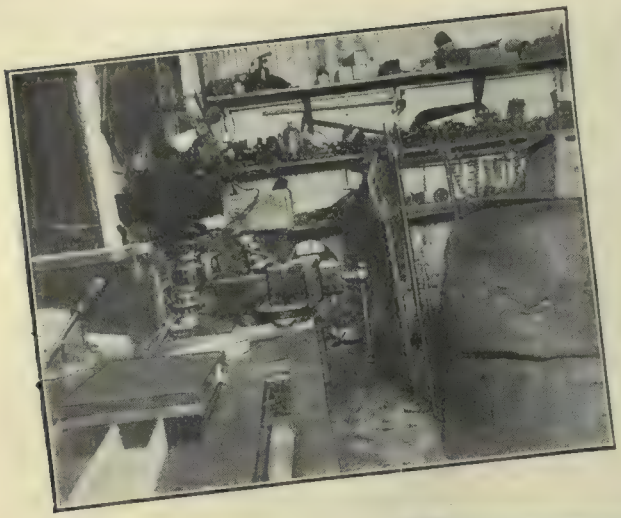
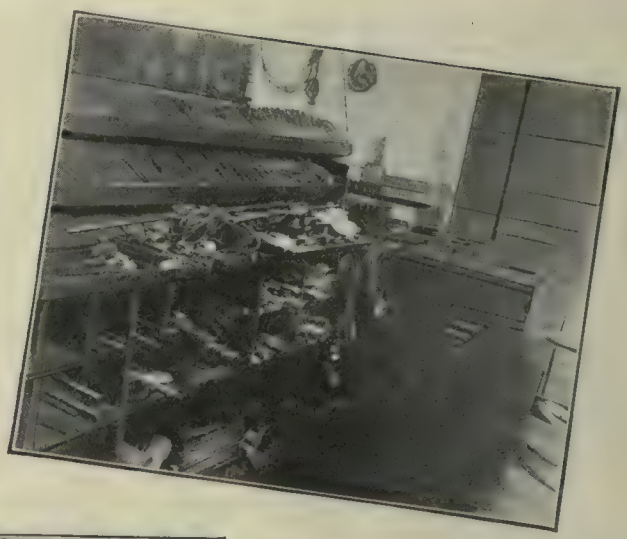


FIG. 25—TAYLOR TOOL STAND

the elaborate cloth covered board cover sometimes seen. The books of inventory forms are stood wrong side up on the tool keeper's desk or table. The name of each is printed right side up. The reason for this odd procedure will be clear if you will stand a book upside down in front of you, put one hand on top of it, and bring that hand toward you. As the book falls open, it will be in the right position to be read, and you have only made one motion with your hand instead of three or four.

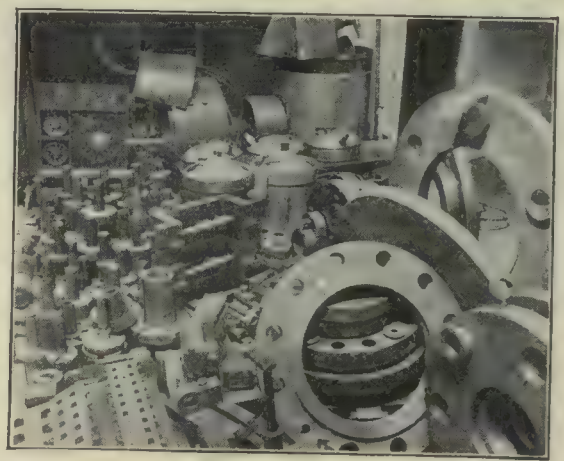
Tools should always be ready for one job ahead,





(ABOVE) A HORRIBLE EXAMPLE OF TOOLROOM DISORGANIZATION.

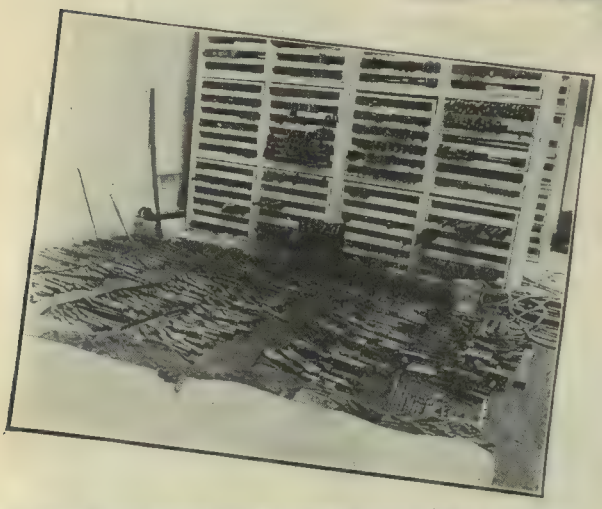
(BELOW) TRANSITION PERIOD, SHOWING TOOLS LAID OUT ON THE FLOOR WAITING TO BE CLASSIFIED AND ASSIGNED SPACE IN THE RACKS.



(ABOVE) ANOTHER HORRIBLE EXAMPLE.

(LEFT) A COLLECTION OF TOOLS—THE FIRST STEP IN REORGANIZATION.

(BELOW) DRILLS AND CUTTERS TEMPORARILY ON WOODEN SLIDES IN STEEL RACKS.







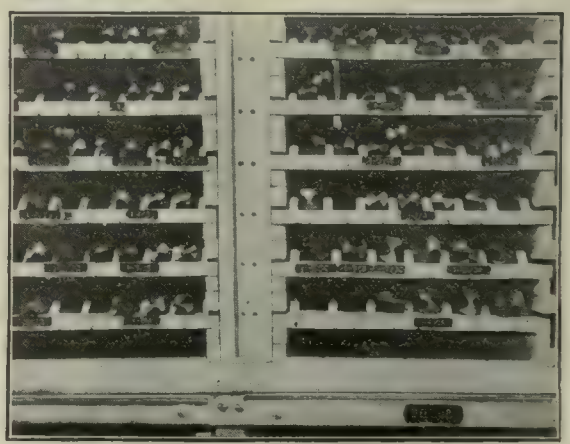
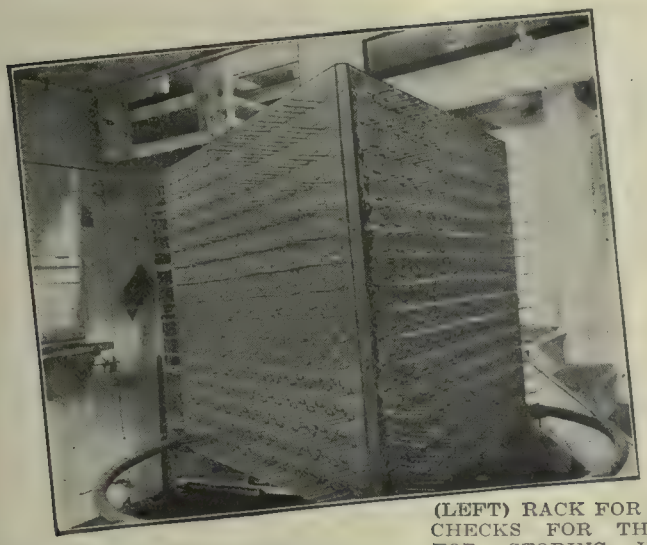
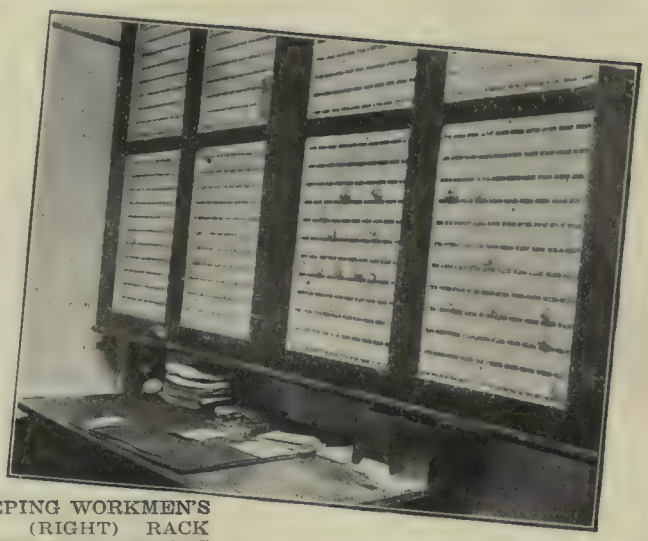


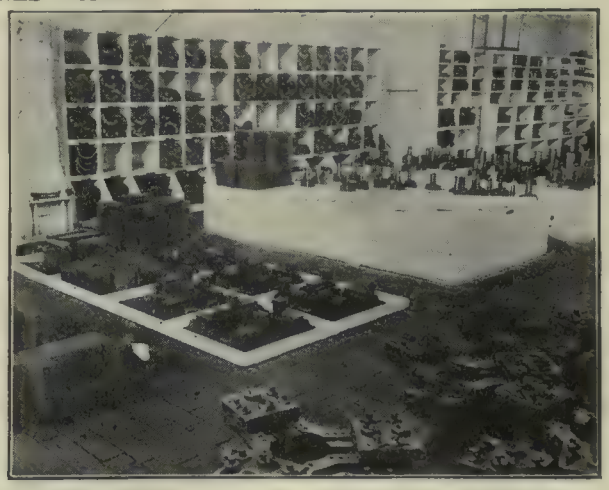
FIG. 26—TOOLROOMS BEFORE AND DURING TREATMENT



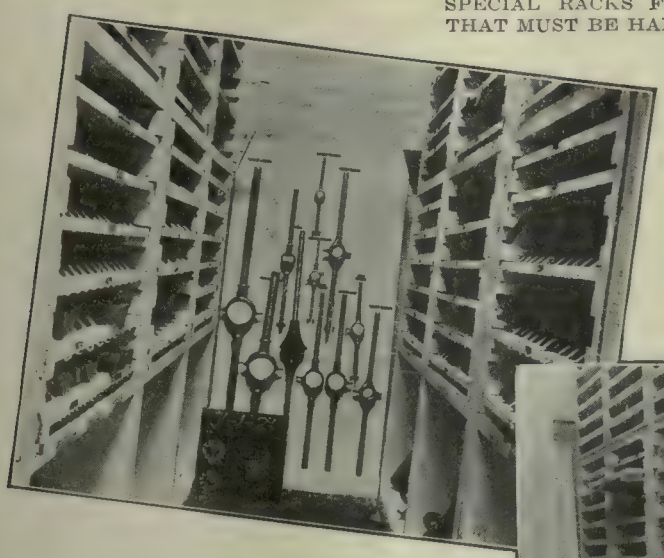


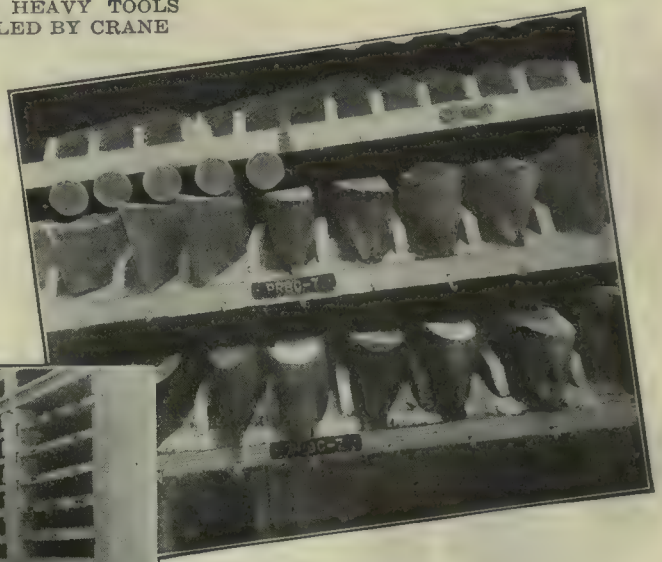
(LEFT) RACK FOR KEEPING WORKMEN'S CHECKS FOR THEM. (RIGHT) RACK FOR STORING UNASSIGNED CHECKS





SPECIAL RACKS FOR HEAVY TOOLS THAT MUST BE HANDLED BY CRANE







(ABOVE) A FINISHED JOB SHOWING TOOLS ON HORIZONTAL SLIDES AND LONG-HANDLED TOOLS HANGING UP.

(ABOVE) TOOLS ARRANGED SO THAT CUTTING EDGES CAN BE INSPECTED. (LEFT) HORIZONTAL SLIDES READY TO BE FILLED.

FIG. 27—TOOLROOMS AFTER TREATMENT

depending, of course, on the length of the job. In some cases, it may be advisable to have them at the workman's bench, in others it will be sufficient to have them in their tote boxes on the file rack in the tool room ready to be drawn.

A standard Taylor tool bench or tool stand is shown in Fig. 25 to illustrate the disposition of the various forms already mentioned. On the rack at the back of the stand the workman clips the drawing, instruction sheet and tool list which he wants to study. They may be those for his test job, or if he has that well in hand, for the next job. In the latter case, he uses

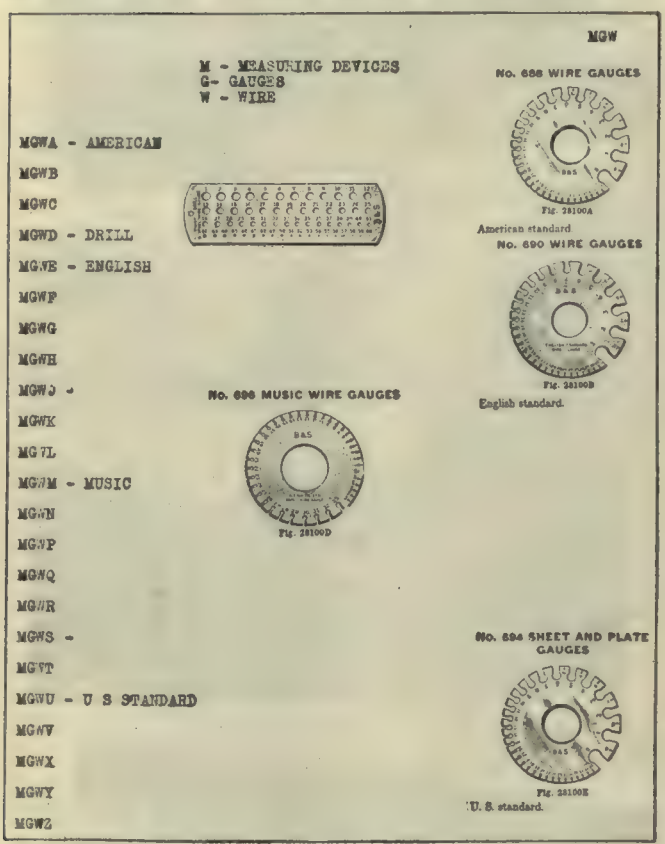


FIG. 28—A PAGE FROM THE GILBRETH TOOL CLASSIFICATION BOOK

his resting time to study the next job, so that he will be ready for it.

In the can at the left side of the bench, instructions, drawings and tool lists for the jobs ahead of him are placed. They stick up above the edge of the can, so that the foreman can see at a glance whether this particular man has work ahead of him. As he finishes a job, the sheets applying to that job are placed in the can at the back of the bench. As the inspector inspects the job, he removes the sheets from the rear can and puts them in the right-hand can. If the foreman spots too many sheets in the rear can, he knows at once that the inspector has not been on his job, and acts accordingly. The right-hand can is finally emptied by the blueprint boy.

So much for the principles on which tool room system is based. The illustrations grouped in Figs. 26 and 27 show various tool rooms before and after treatment. Note that in the rearranged tool room edged tools are always placed with their edges out, so that anyone making an inspection can tell at once whether the tools are in proper condition for use or not.

Classification of tools as worked out by Mr. Gilbreth is a study in itself and beyond the scope of these articles. The basic principle is that tools used for similar purposes, such as mallets, hammers and sledges, are classified so that they reside in the same part of the tool room. As may be gathered from the marking on the racks in the tool room illustrations the symbols used are mnemonic. In Fig. 28 is shown one page from the Gilbreth tool classification list to illustrate the principle involved.

Industrial Accidents in the United States

A report on industrial accidents in the United States has recently been issued by the United States Bureau of Labor Statistics as Bulletin No. 339.

The development of the vast system of workmen's compensation throughout the country has resulted in the assembly and publication by the several compensation jurisdictions of a great volume of statistical data. About one-half of the report deals with these data in an attempt to show what can be gathered toward a presentation of the accident situation on a national scale. So far as possible the record has been arranged on a uniform classification of industries, cause of injury, nature of injury and location of injury. Unfortunately lack of information regarding the amount of exposure in the various industries renders this body of information less significant than it otherwise would be.

There are two purposes to be served by a study of accidents. First, their prevention so far as this is possible and second, the adequate compensation of those accidents which can not be prevented. Five things are necessary to know regarding accidents if their study is to be of the greatest service in accident prevention, viz.: The number of accidents, the industries in which they occur, the causes, the amount of exposure to hazard, and the severity of the accidents.

In this study information was obtained from 42 states concerning the number of fatal and non-fatal accidents; 22 states reported accidents by industries; 18 states reported causes of injury, 12 nature of injury, and 11 location of injury; only two states showed the amount of exposure, and only three reported the severity.

There was a reduction in fatalities in 1921 over those occurring in 1918. The number of fatal accidents recorded by the states in 1918 was 12,531 while in 1921 there were but 9,394 reported. The former year, however, represents the peak of industrial activity since a larger number of persons were engaged in industry in 1918 than in any other year.

The report also brings together tables from the reports of the Interstate Commerce Commission for railways, from those of the Bureau of Mines for mines and quarries and from those of the Bureau of Labor Statistics for the iron and steel industry. More elaborate treatment of these groups may be found in the publications of the bureaus mentioned.

A section is devoted to miscellaneous industries such as the manufacture of agricultural machinery, the automobile industry, building construction, paper mills, etc. These have largely been assembled by the National Safety Council and serve to supplement the showing of the industrial classifications in the several states. Indeed since these are presented by means of standard rates they give a much better idea of conditions with reference to accidents than is afforded by the number of accidents as shown in the state reports.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Tools for Beading Tapered Cups

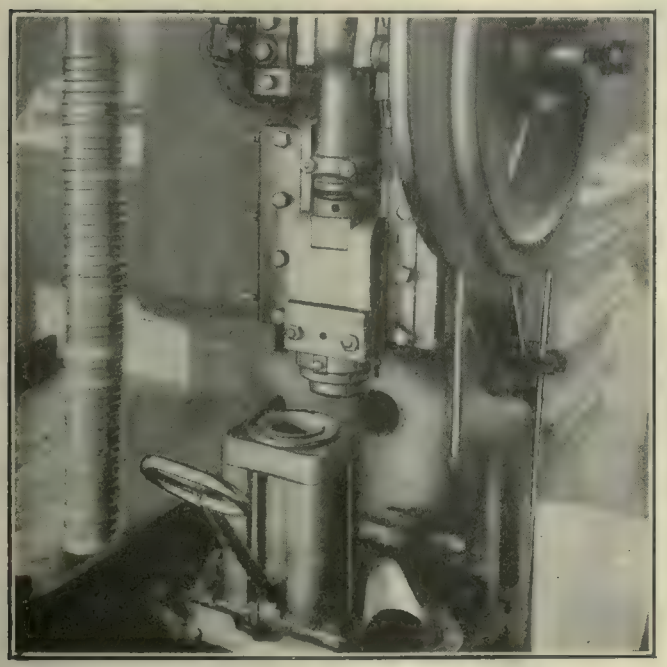
By John Williams

The sheet metal cups, vases, or whatever they may be called, a stack of which may be seen in the accompanying illustration, require a bead to be rolled upon the large end after the longitudinal lock-seam has been closed, and their tapered shape renders them a somewhat difficult proposition because of a tendency to buckle under the pressure of the beading tool.

The die, shown in its outward position in the press, is gibbed to the die-bed in such manner that it may slide to and from the column of the press a distance of several inches, far enough for the work to be loaded into and removed from the holder without interference with the upper tools. When in its rearward position, the slide contacts with a stop screw and the upper and lower tools are in alignment.

The lower tool is a conical holder of steel, hardened, and ground to fit the shape of the work. There are no bottoms in the cups at this stage, and when they are set into the holder they surround a four-part expansion arbor that projects upward from the bottom of the holder to about one-half the height of the cup.

The lever with the ring handle, to be seen in front of the lower tool, has a movement up and down through an arc of about 90 deg., and has pinion teeth cut in a part of the periphery of the small hub at its lower end. This pinion meshes with the rack that is a part of the expanding plug of the arbor. When a cup is set into the holder the lever is in its lower position and the expansion arbor will enter the open small end of the cup.



BEADING TAPERED CUPS OF SHEET METAL

When first set into the holder, the work projects above the top of the latter for about half an inch. The operator then lifts the handle of the lever to about the position in which it appears in the picture, this action expanding the arbor to conform to the shape of the cup and drawing it firmly down against its seat with just enough material projecting above the holder to form the bead. When this position is reached the lever will swing no farther, but continued pressure applied by the hand of the operator causes the entire tool to slide as a unit toward the press until it contacts with the stop screw before mentioned. The double purpose of expanding the arbor within the cup and of moving the die to operating position is thus effected with one movement.

When the bead has been rolled, a pull on the same lever brings the tool to its outward position for unloading and at the same time throws down the lever to a horizontal plane, from whence, upon being released by the operator, it will fall to its lowest position by gravity; completing the collapse of the expansion arbor within the cup and at the same time operating an ejector that shoots the beaded cup out of the holder.

Construction of Beading Punch

The beading punch does not differ in shape, so far as its rolling surface is concerned, from ordinary tools of this type, but the tapered nature of the work necessitates a departure from the usual construction.

A piece of round stock is first sawed apart lengthwise, two cuts at right angles, thus reducing it to quarter sections. The sawed surfaces are then smoothed up and the quarters sweated together with spacing strips between them so that the workman again has a round piece to work upon, but with the advantage that he can separate it into its original quarters by the mere application of sufficient heat to melt the solder.

The punch is made quite short in proportion to its length and is fitted in a holder to which it is held by four inwardly projecting fingers that enter a peripheral groove in the punch in such manner that the latter has practically no end movement with relation to the holder, but is not clamped against lateral movement.

On the end of the punch opposite the curling surface (the top as it is held in the press) an annular groove is cut, and to this groove an expanding snap ring is fitted. The depth of the groove in relation to the length of the punch is such that when the ring is in place it is nearly on a level with the exterior curling surface.

On being finished, the punch is hardened and tempered, and, as a matter of course, the first thing that happens in the fire is that the punch separates into four quarters. The spacing pieces are taken out and discarded. Assembled into the holder, the snap ring holds the parts of the punch outward against the confining walls of the holder, but when the pressure of the operation comes upon it the parts can move inward against the action of the snap ring as the punch settles into the tapered cup.

Automatic Tools for Making an Instrument Case

By E. D. Benson

The enormous demand of the automotive industries for instruments such as ammeters and speedometers has developed many interesting manufacturing methods and tools.

In Fig. 1 are shown the different operations on an instrument case, performed automatically from blanking

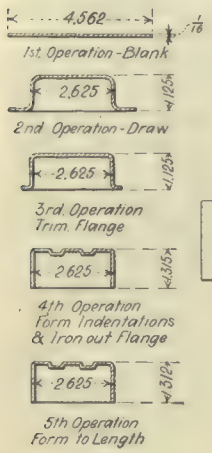


FIG. 1

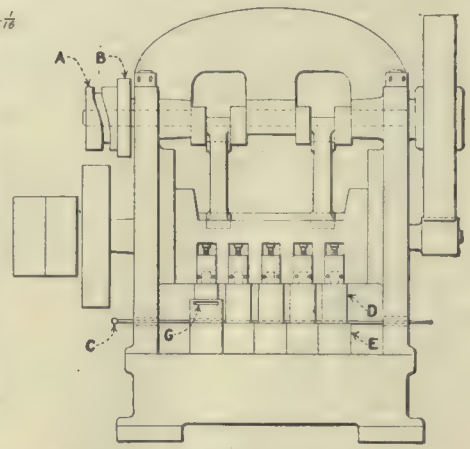


FIG. 2

FIG. 1—STAGES OF OPERATIONS. FIG. 2—THE PRESS USED

to finishing the case. The stock is $\frac{1}{16}$ dead soft cold-rolled steel, fed from rolls through the press from front to back. As the blank is punched out it drops down to carrier bars. In the carrier bars are five sets of jaws. The first set is made to hold the blank, the second set to hold the first draw and so on. As the slide of the press goes up all the jaws close at once, then move over one position to the right, open up and return. In this way each shell is carried to the successive die and one complete shell is made every stroke of the press.

The press used is shown in Fig. 2 and is of the double-crank type. *A* is the cam to actuate the slide bars. *B* is the cam to open and close the jaws in the slide bars. *C* shows location and side of slide bars, there being two which are parallel one on each side of the dies. The punches and dies in position in the press are shown by *D* and *E*. *G* is the slot in the stripper through which the stock is fed automatically by the roll feed mechanism, not shown.

The punches and dies are shown in detail in Fig. 3. *A* and *B* are the blanking punch and die. The plunger *C* holds the blank down on strips *D* in order that the jaws on the carrier bars *E* can get a better hold. The first drawing punch and die are shown by *F* and *G*. Shedder ring *H* has an annular locating ring, to locate the blank as it is left by the carrier over the drawing punch. It also has a slot *I* to allow the shell to pass to the right.

The shell is carried by the carrier bars over to the right and under the flange-trimming punch and die *K* and *L*. Its exact location is made by a sliding locating ring. The scrap stock from the trimmed flange is cut in two pieces by the scrap cutters *M* on either side of the trimming punch *K* and falls through the openings *N* in the die shoe. The shell is ejected from the die by the knockout *O* and held in location for the gripping jaws by plunger *P*.

The punch and die for ironing out the flange and thus increasing the draw and also indenting the shell end for the bearings are shown by *Q* and *R*.

The shedder ring *T* is depressed by the ring *S*, thus allowing the shell to locate on the punch *Q* before the die comes into action. The last operation, that of sizing the shell for length, is done in the punch and die *W* and *V*.

As the slide of the press goes up the ejector *X* lifts the shell from the sizing punch *V* and allows the three spring-actuated slide jaws *Y* on shedder ring *W* to complete the lifting of the shell from the punch and place it in position for the jaws in the carrier bars *E*, which carry the shell to the finished work-box chute.

The press runs continuously at from 50 to 55 strokes per min. and produces one complete case every stroke.

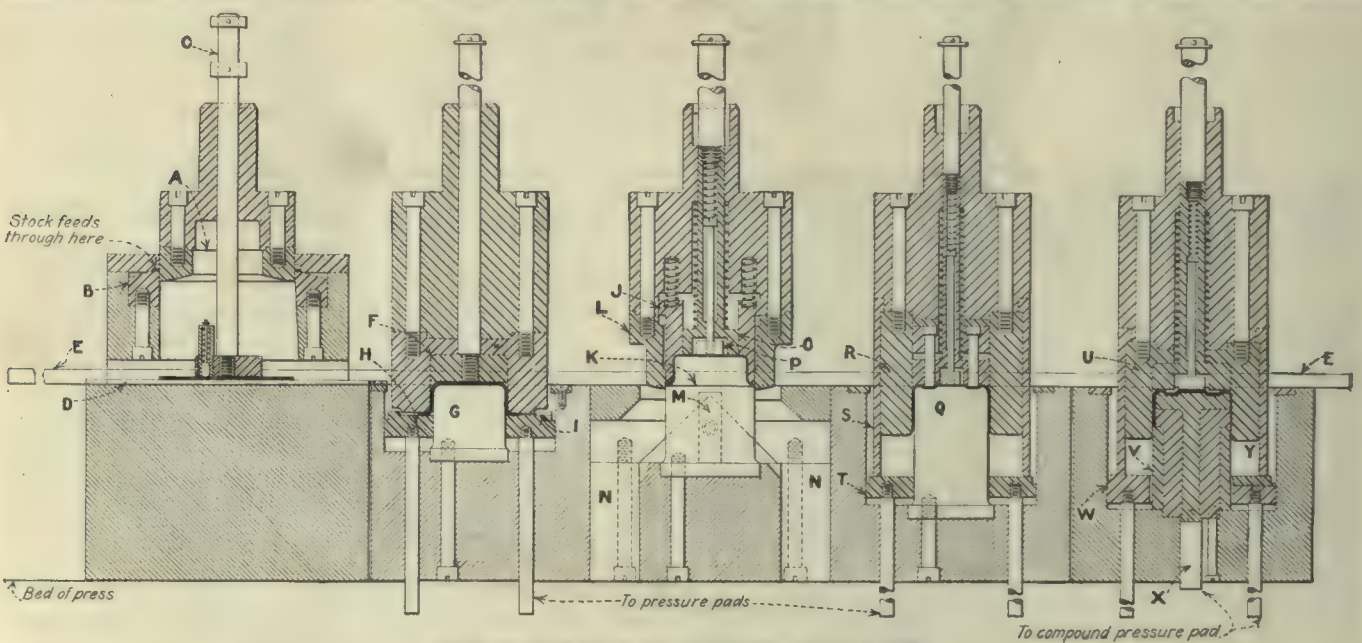


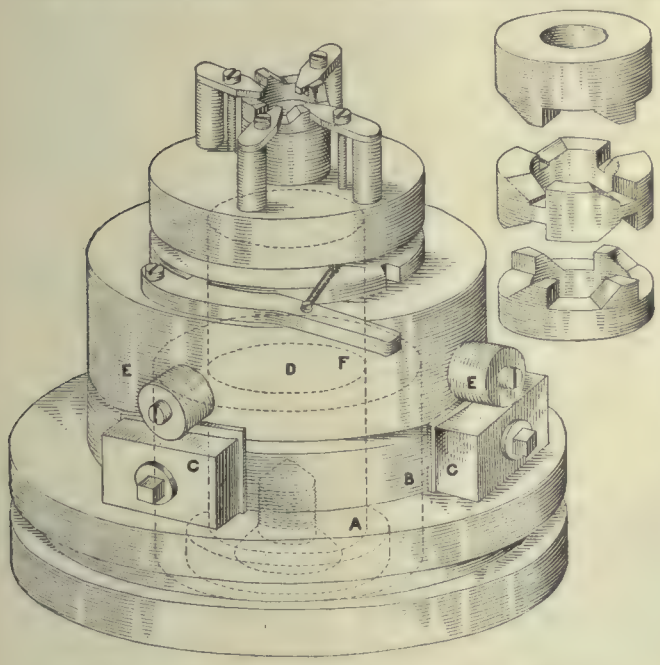
FIG. 3—DETAILS OF PUNCHES AND DIES

Shaper Fixture for Planing Clutch Teeth

By H. Rose
London, England

Some time ago our shop was called upon to furnish a large number of small clutches. The job presented no serious difficulties except in the machining of the angular relief on the backs of the clutch teeth, which must be quite exact in order to match nicely and must all be alike for interchangeability. To finish this part accurately and uniformly and to get out the work on a production basis in the matter of time, we made the holding fixture, shown in the accompanying sketch, to go on the shaper.

The device is small and is made entirely of steel, no



FIXTURE FOR PLANING ANGULAR RELIEF ON CLUTCH TEETH

castings being used. The base *A* is round and has a square-sectioned groove sunk into its periphery to accommodate the clamps which hold it to the shaper table. To an accurately finished hole in this base, the turned projection on part *B* is nicely fitted, so that the upper part of the device can be rotated or moved up and down with respect to the base without side shake or tilting.

Three formers *C*, are made of heavy sheet steel, the upper edges being ground to an angle that will impart the required rise and fall to the central, or work holding, part of the fixture to correspond with the shape of the clutch teeth. These formers are spring-tempered and ground together to insure uniformity. They are secured to the base by suitably shaped clamps that force them to conform to the circular shape of the shoulder against which they abut. Right or left hand helics are produced upon the work by merely reversing the position of the formers.

The holding part of the fixture *D* is made to turn in part *B*, but is so secured to the latter that it can move up and down only as part *B* is moved by the rollers *E* bearing upon the formers. Four notches in part *D* with which the projection on lever *F* engages, serve to locate it in each of the four required positions with respect to the formers. The lever also provides the means of feeding the work to the cut.

The original intention was to attach a worm driven feed-motion to part *D* so that power could be applied, but as it was found to be quite practical to feed by hand with this lever, the power feed was never made.

With this fixture the four angular relieved surfaces of each work piece are planed at one setting, with the assurance that all will be alike and that the several pieces of the lot will interchange.

Punching Insulating Material

By J. F. Cavanagh

Punching and stamping parts made from sheet insulation, such as Bakelite-Dilecto, is facilitated by heating the sheet and warming the tools slightly. It is rather difficult to heat a sheet uniformly on a hot plate and furthermore, but one sheet can be heated at a time in this manner.

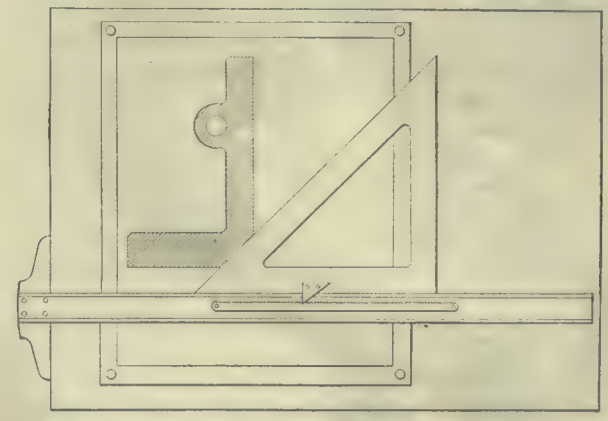
A very satisfactory way to heat a number of sheets at one time is to provide a shallow tin pan of sufficient size and support it over a gas plate as near the press as possible. A few pieces of iron rod should first be laid in the bottom, then several sheets of the insulation to be stamped, preferably with pieces of wire between them. Enough lubricating oil should be poured into the pan to cover the sheets and the gas lighted. Use a thermometer to regulate the temperature of the oil.

When the sheets or strips, as the case may be, are removed and placed in the die, the oil adheres tending to hold the heat and also to lubricate them. This method permits the rapid production of stampings from heat proof fiber that cannot be easily produced otherwise.

A Simple Device for Spacing Section Lines

By G. A. Luers

The sketch shows a simple and effective device to assist the draftsman to draw in section lines evenly. It consists of part of a worn hacksaw blade suitably



SECTION LINING DEVICE FOR DRAFTSMAN

attached to the blade of the T-square, and a piece of thin sheet steel, fastened to the triangle for a pawl.

In use, the triangle is moved back one, two, or three notches of the saw blade as required for each line drawn, the click of the pawl over the teeth of the blade indicating to the draftsman how far it has been moved.

Because of its simplicity the device can easily be manipulated with one hand.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors
August 30, 1923

The Cost of Changes in Design

IT'S A WISE inventor or engineer who knows when to stop improving and let well enough alone, for the time being, at least. No one wants to throttle or discourage improvements and real advance, but if the business is to succeed, the cost of manufacture must be considered. And constant changes cost real money and tend to prevent profits.

It frequently happens that the inventor or engineer has the improving bug so strongly that it takes a firm handed and hard hearted manager to keep him within bounds. We have talked so much about "constant progress" and "never be satisfied," that we have lost the balance between serviceable products and a wild desire to be always putting out something new.

One of the surest ways for the production manager to check constant changes and at the same time to build up an alibi for the increased cost, is to keep a detailed record of the total cost of these changes. It frequently seems foolish to the inventor to object to making what seems to him like a slight change after a job is under way. It only took him a few moments to erase one line and make another, on the drawing board. But it's a vastly different thing to make even a slight change in the pieces themselves, particularly after part of the lot has gone through.

If the production manager will follow the cost of such changes in detail, and present them to the general manager with his protest, it will take a smoother tongued inventor than usually happens, to get away with it. But if, as sometimes occurs, the general manager and the inventor are one and the same person, it's a good plan to hunt another job before the sheriff comes to tack up his sign.

Of course there are a few notable exceptions to this —and their scarcity is what makes them notable. Maintaining a correct balance between preventing too many changes, and still keeping the product a bit ahead of its competitors, is a real test of management.

The Increasing Interest In Higher Education

A REMARKABLY enlightening digest of a report on the public education problem has just come to our attention. It was prepared by N. B. Henry under the direction of the committee on education of the Chicago Association of Commerce and is well worth reading.

Perhaps the most striking statement is the one relating to high school enrollment. According to the report, one in ten of the population of the United States reaching high school age in 1890 entered high school. In 1922 the proportion was one in three. As high school education is more than twice as expensive per student as elementary school training it is not astonishing that the tax rate is on the increase.

The desire for higher education is undoubtedly an excellent thing for the country as it raises the standard of intelligence of the average citizen. Under existing conditions there is one drawback, however. It is the preference of the high school graduate for a white collar job. Financial returns being equal, the boy can hardly be blamed for selecting the occupation that seems pleasanter and cleaner. As a consequence there is a shortage of good, competent mechanics and an oversupply of clerks.

Here is something for employers and manufacturers to think about. What can be done to make the job in the shop attractive? A fair wage and a good future must be offered to draw the more desirable type of high school graduate. He is good raw material for future executives, he does not need so much shop schooling as the ordinary apprentice and his mind is better trained to absorb instruction more quickly.

Not only must the job be made worth while but some means must be discovered to reach the boys and tell them about it. Isn't it a good opportunity for the various manufacturers' organizations?

A Sign of the Times

EVERYONE is convinced of the fact that mechanical transportation is rapidly forcing the horse into the obscurity of obsolescence. The situation is accepted with the calm matter-of-fact assurance with which Americans receive any mechanical achievement. Wonders have burst upon us so frequently of late years that we have almost lost our capacity for surprise and it takes something very unusual or more than usually commonplace to jar us into realization.

The daring attempt of a Maughan to fly from New York to San Francisco between sunrise and sunset elicits more admiration than surprise. The very practical application of his venture, if it proves successful in the end, and the hard work and serious thought expended in supplying him with the vehicle for his flight, are lost to view in the sporting flavor of the attempt. Do you ever stop to think how such a suggestion would have sounded ten years ago? Probably not, for we are living too fast and too much in the present to spend much thought on the past.

On the other hand some very commonplace thing may pierce our armor of indifference and bring home to us the speed at which we are traveling into a completely mechanical age.

Not many days ago we (speaking editorially) had this very thing happen to us as we were jogging peacefully through an unfamiliar part of New England in our own tin plate chariot. Our four-year-old Bluebook advised us to take a right hand road at a fork marked by a large stone watering trough. The mileage was right and the road signs agreed with the Bluebook but there was no watering trough. Instead there was a flaring roadside gasoline pump. Could one ask for better evidence of the tendency of the times?

Shop Equipment News

Cincinnati Centerless Grinder

A centerless grinder with interesting features has recently been developed and is now being marketed by the Cincinnati Milling Machine Co., Cincinnati, Ohio. The machine will grind shoulder work as well as straight cylindrical parts and is therefore available for push rods, shackle bolts, valve tappets and similar pieces.

A grinding wheel 20 in. in diam. is mounted on the left end of the main frame casting as shown in Fig. 1. Opposite to it, a wheel 12 in. in diam., and known as the feed or control wheel, is arranged to control the rotative speed of the work in traverse between the wheels. In its movement the work is supported on a work support blade, mounted on a work rest placed between the wheels. The feed or control wheel is carried in a bracket which can be swung about a horizontal axis and clamped in an angular position relative to the grinding wheel. The speed of the control wheel determines the rotative speed of the work held between the wheels and its inclination determines the feed or lap per revolution of work. Proper grinding is done only when the speed and feed of the work are adjusted to the requirements of the job and for this purpose the control wheel speed change box provides 16 changes of speed from 11 to 442 r.p.m. The range of the machine is, therefore, wide and it has sufficient flexibility to be classed as a jobbing machine.

The tilting housing is gibbed to a sub-slide to which it can be securely locked, and upon which the work rest is also mounted. Both the control wheel housing and the sub-slide can be moved forward individually or as a unit by means of the large pilot wheel shown at the right in Fig. 1. This individual adjustment decreases the time required to set up the machine and is a real advantage when the machine is used for jobbing work. In setting up the machine for a new job it is only necessary to move the sub-slide carrying the work rest into proper relation with the grinding wheel, and then to move the control wheel housing on the sub-slide until the piece is ground to the proper size between the wheels. The unit adjustment is used to compensate for wheel wear and a fine adjustment of the slides is secured by means of a crank and dial reading in ten thousandths of an inch.

The machine is furnished either belt- or motor-driven but the motor drive is strongly recommended. A 10 to 15 hp. motor running from 1,200 to 1,800 r.p.m. is required and is mounted on the bed as shown in the illustrations. In the lower part of the frame under the grinding wheel spindle is a constant speed shaft driven through a chain from the motor or by a belt, in the case of a belt-driven machine. A 5-in. belt runs up to the main grinding wheel spindle from this shaft, and a swing idler, adjustable from outside the machine, keeps the belt at proper tension. The drive for the control wheel is taken from the same shaft and transmitted to a speed box bolted to the bed. From the last shaft in the speed box the control wheel is driven by means of a 3½-in. belt. Proper tension on the control wheel driving belt is secured by means of a double compensating idler adjusted by a small handwheel adjacent to the adjusting pilot wheel. This special adjustment is necessary to make the belt run properly on the control wheel spindle when the wheel is set in an angular position. The illustration, Fig. 2, shows the drive arrangement.

Since any tendency toward vibration would prevent accurate and satisfactory work, special attention has been paid to the solidity of the grinding wheel mounting and adjustments for wear in the bearings. The grinding wheel spindle is a heat-treated chrome nickel steel forging, and is mounted in the main frame of the machine which weighs 4,000 lb. The bearings are of the half-box type and are lined with a special white metal, dovetailed in. The spindle is held down in the bearings by the downward pull of the driving belt. The spindle oiling device consists of two disk type splashers which dip in oil reservoirs and carry the oil up to collectors in the bearing cap from where it is distributed over the bearing. Shoes in the cap may be

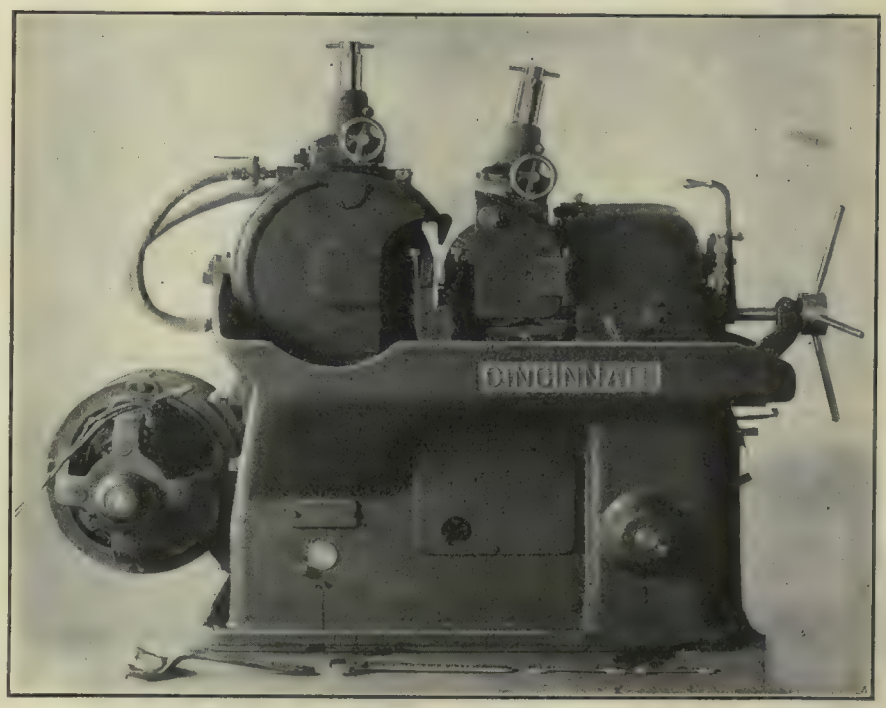


FIG. 1—CINCINNATI CENTERLESS GRINDER

brought down on the spindle by adjusting screws and are provided as a safeguard in case the belt should break. The end thrust is carried by means of a double-row self-aligning ball bearing, and it is possible to adjust the position of the spindle while running.

Both grinding wheels are mounted on collets, a method which is advantageous when wheels have to be changed frequently as it is not necessary to redress the wheels excessively when they are placed on the spindles. The wheels can be changed rapidly and easily as the guards are hinged and the entire front or operating side of the machine opens up.

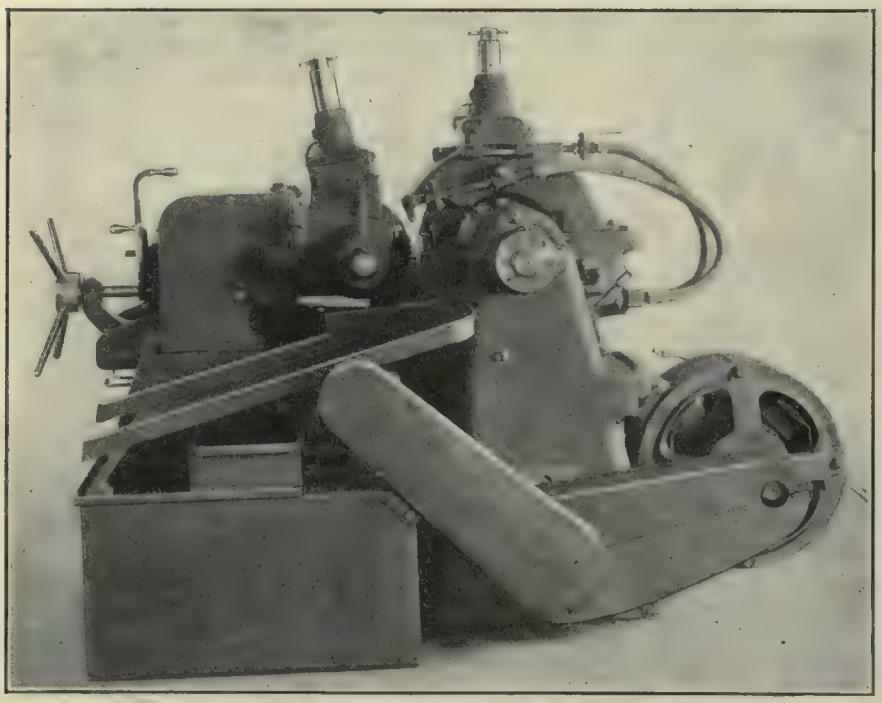


FIG. 2—REAR VIEW OF CINCINNATI CENTERLESS GRINDER

The wheel truing devices for the wheels are convenient, as they are mounted on the guards where they remain in position, ready for use at any time. The diamond is carried in a sleeve mounted in a sliding bracket which is moved across the wheel by means of the handwheel shown at the front in Fig. 1. The sleeve may be moved up and down in the bracket for different diameters of wheels, and a micrometer dial for fine adjustment is provided at the top. The control wheel truing device also has adjustments to take care of the angular setting of the wheel. The highest control wheel speed, 442 r.p.m., is to be used for truing and is instantly available by shifting a lever in the speed box.

The guides for the work rest are of high-speed steel and can be easily removed for resurfacing. Each guide section is adjusted and locked independently by means of a thumb nut so that changing from one size of work to another is easily done. The wearing surface of the work-holding blades is stellite, electrically welded to steel to give a hard and durable wearing surface. A flat top blade is used principally for roughing and a 45-deg. angular or knife edge blade for finishing, although the flat top rest can also be used for finishing.

The standard work rest is used for plain cylindrical grinding and Fig. 3 shows the machine being operated on this class of work. The piece to be ground is placed on the work rest in contact with the wheels and passes through between them, falling into a chute, shown in Fig. 2 at the rear of the grinding wheels.

For shoulder grinding the standard work rest is replaced by the shoulder-grinding work rest as shown in Fig. 4. A 90-deg. movement of the lever on the control-wheel feed moves the control-wheel housing either forward or backward through a distance of 0.030 in. With the wheel withdrawn the work is laid upon the angular work rest and located endwise by an adjustable stop. As the lever is moved, the control wheel is brought forward and pushes the work against the grinding wheel, the desired size being secured when the lever has made its full movement. As the operator withdraws the control wheel, he presses the ejecting knob, on which his left hand rests, and the piece is pushed forward into a pan set to receive it.

A centrifugal pump is mounted on a removable lubricant storage tank set at the rear of the machine as shown in Fig. 2. The pump is driven by a belt. The bed of the machine at the grinding-wheel end forms a primary settling basin from which the lubricant overflows to a secondary settling basin on top of the storage tank. It is then delivered to the tank through a cloth bag and a clean supply of cutting lubricant is insured.

The capacity of the machine on the standard rest is from $\frac{3}{8}$ to $1\frac{1}{2}$ in. in diam. and a special rest can be provided to take work from $1\frac{1}{2}$ to 3 in. in diam. The standard blades take work up to 10 in. long and accessories can be furnished which will permit the grinding of work up to 8 ft. long. Both grinding wheels have a 3-in. face and a 5-in. hole. Wheels with 4-in. face can be supplied if desired. The net weight of the motor-driven machine is 5,000 pounds.

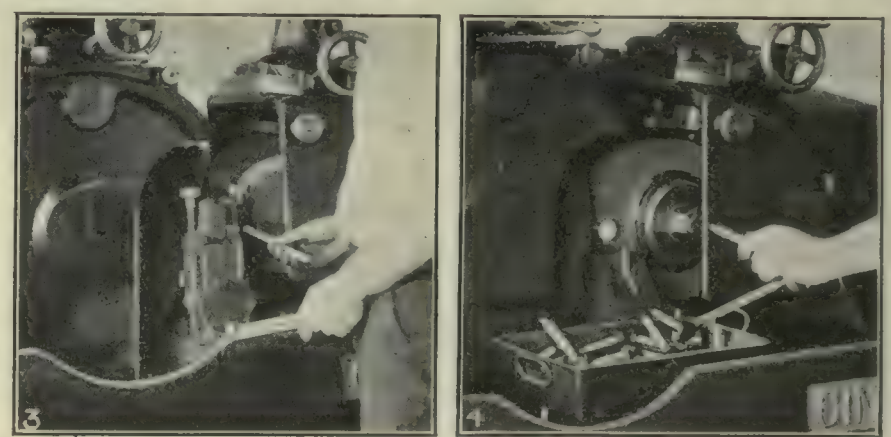
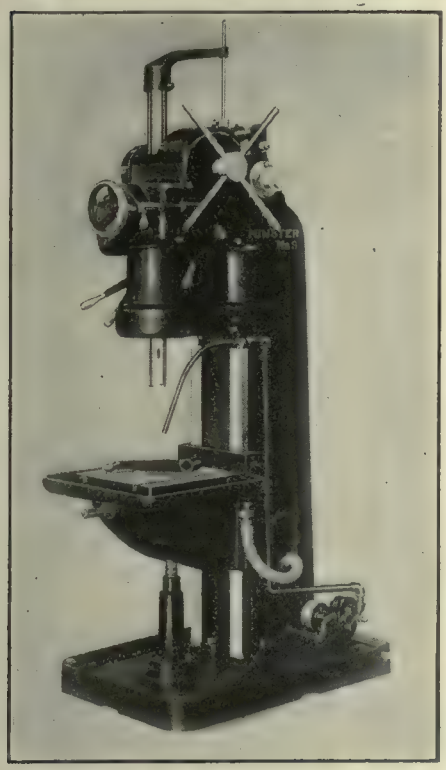


FIG. 3—GRINDING STRAIGHT CYLINDRICAL WORK ON CINCINNATI CENTERLESS GRINDER. FIG. 4—SHOULDER WORK GRINDING

Minster No. 9 Drilling Machine

The Minster Machine Co., Minster, Ohio, is now marketing its No. 9 "Hi-Duty" drilling machine, which is designed to handle drills up to 1½ in. in diam. and has several interesting features, as shown in the accompanying illustration. The machine is of rugged construction and all the drive



MINSTER NO. 9 DRILLING MACHINE

and feed gears are enclosed in the head housing at the top of the column.

The drive shaft of the machine is driven by a belt from a motor or a countershaft, and may be fitted with tight and loose pulley, single pulley with single friction clutch, or single pulley with double-throw friction clutch for reversing the motion. The latter arrangement provides for a tapping attachment, the reverse speed being 1½ times the forward speed.

Two mechanical speed changes are provided which, with a series of change gears give a range of speed from 73 to 550 r.p.m. in four steps. The gears are conveniently located at the front of the head and close to the lower end of the spindle. The sliding gears giving the two speed changes are shifted by a lever conveniently located at the left side of the machine.

Sliding gears in the feed drive also provide two mechanical feed changes, and these, together with a set of change gears, give a series of four feeds from 0.006 to 0.159 in. per revolution of the spindle. Hand feed for the spindle is made possible by placing the sliding gear shift lever at the neutral position. The spindle construction provides for 15 in. length of feed. A guide rod, upon which is mounted an adjustable stop, can be set to trip the feed at any desired point, and an adjustment can be made so that the spindle will automatically return to its original position. The diameter of the spindle is 2⅜ in. and the diameter of the sleeve is 2 11/16 in. The spindle has a No. 4 Morse taper and is located 10½ in. from the face of the column.

The machine is equipped with a heavily ribbed plain table which is mounted on a wide bearing on the column. The finished surface of the table is 16x16 in. and a vertical movement of 15½ in. is available. The maximum distance from the end of the spindle to the table is 30 in. A compound table with the usual adjustments can also be furnished.

An oil reservoir is located in the lower part of the main head casting and a geared pump in the head forces the oil up through the vertical clutch shaft, from where it runs back to the reservoir over the gears and bearings. The cooling compound reservoir is located in the base of the column from where the coolant is delivered to the tools by a rotary geared pump.

The net weight of the machine with plain table is 2,065 lb. and the driving pulley speed is 550 r.p.m. For motor drive a 5-hp. constant speed motor running at from 1,100 to 1,300 r.p.m. is recommended if the machine is to be operated at its full capacity.

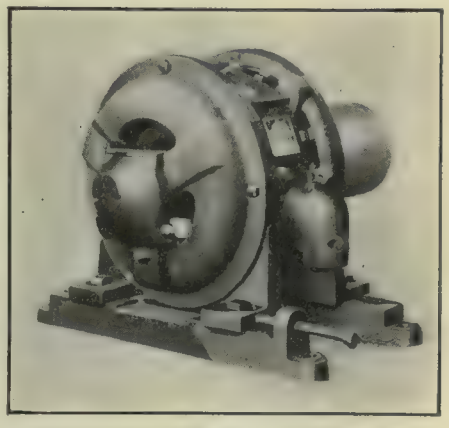
Reliance Type AA Induction Motors

A series of two- and three-phase induction motors has been added to the line of industrial motors manufactured by the Reliance Electric & Engineering Co., Cleveland, Ohio, and are now being marketed. These motors are designated Type AA, and are of the squirrel-cage type, built in capacities from ½ to 25 horsepower.

The frames are of the riveted type in which the stator laminations are assembled between the end flanges, the end flanges being held together by heavy rivets. The feet are cast integral with the flanges, and planed parallel to the shaft. This operation, and the machining of the end flanges for the bearing brackets, is done after the riveting has been completed to insure correct alignment.

The stator coils are wound of cotton-covered enameled wire and well insulated in the slot and between the phases. The complete stator is subjected to a varnishing and baking operation to make the coils resistant to the destructive effects of dirt, moisture, oil, acids and alkalies.

The bearing brackets completely protect the heads of the stator coils



RELIANCE TYPE AA INDUCTION MOTOR

and carry the bearings, which are of the ring-oiling type, with a large oil reservoir in the housing. The brackets are interchangeable for both ends and can be rotated to allow for floor, wall or ceiling mounting. The bearings are of phosphor bronze, shouldered in the brackets and securely locked against rotation.

The rotor core is made up of special electrical sheets punched to receive the rotor bars which are hard drawn copper and made to fit tightly in the slots. Copper end rings are cast on the ends of the bars after they are assembled in the core. It is claimed that this construction makes the rotor practically indestructible at a point usually weak. To insure a uniform air gap the surface of the rotor is ground to size. The shaft is made from high-carbon steel, and ventilation is assisted by fans attached to the rotor core.

These motors are regularly supplied with slide rails, a standard paper pulley and, in sizes above 5 hp, an oil-immersed starting compensator having both no-voltage release and overload protection.

Pratt & Whitney 16-Inch Lathe, Model B

The Pratt & Whitney Co., Hartford, Conn., has recently placed on the market an engine lathe designed for use in the tool room and in high production manufacturing operations. Designed for a self-contained motor drive, using a geared head, the lathe is also available with either geared-head single pulley drive, or a cone head and countershaft drive. Fig. 1 shows the lathe with geared head and motor drive.

The lathe swings 16½ in. over the shears and 9⅝ in. over the carriage.

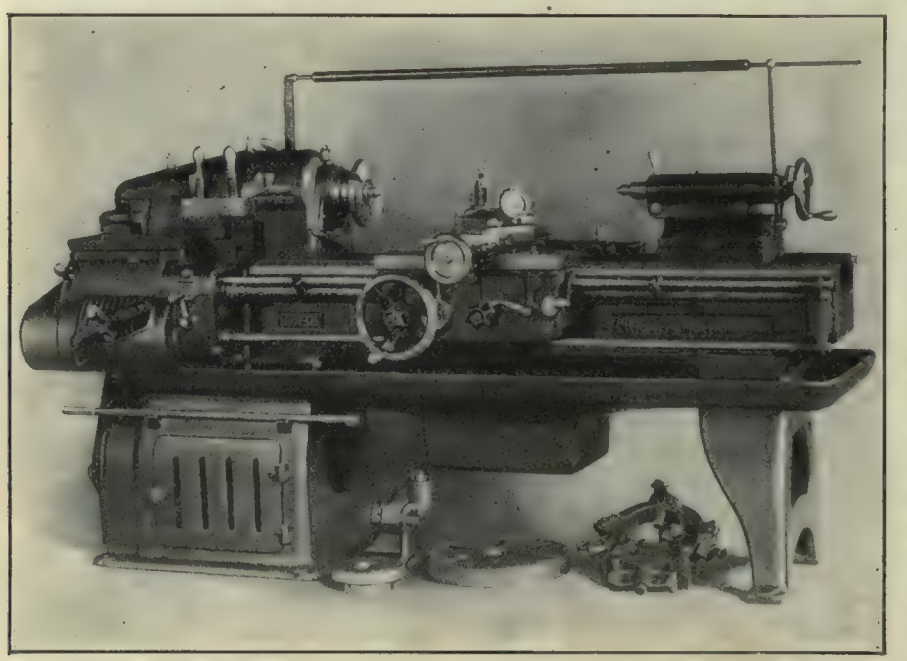


FIG. 1—PRATT & WHITNEY 16-INCH LATHE

It is made in 7-, 9- and 11-ft. bed lengths, the first being the standard size as usually furnished. The geared-head lengths between centers are 39, 63 and 87 in., while the corresponding cone-head dimensions are 36, 60 and 84 in. The floor space occupied by the standard 16x36 in. machine is 3 ft. 3 in. by 8 ft. 8 in., and the over-all height is 4 ft. 10 inches.

For the geared head a compact headstock has been worked out by placing the "back gears" beneath the spindle, together with the main drive gears. This results in greater compactness and the elimination of overhanging parts. When the back gears are "out," the main driving gear is locked to the spindle by a full gear clutch similar to that used in the transmission of automobiles. It is engaged or withdrawn by means of the small lever on top of the headstock, and may be engaged in as many positions as there are teeth in the gear. The back gear operating lever is at the inner end of the headstock, below the driving plate, and is provided with a positive lock for both the "in" and "out" positions.

The first drive shaft is located back of the bed and below the level of the shears. The lathe is started and stopped by means of a Carlyle Johnson friction clutch operated by a shoulder-high control rod running the entire length of the machine. This rod in the stop position applies a brake, and in the running position the speed gears cannot be shifted. The maximum ratio of drive shaft to spindle is 45 to 1 and the minimum nearly 1 to 1.

The spindle speeds in the geared head are controlled by two interlocking levers on the front of the headstock as shown in Fig. 1. Eight speeds from 13 to 525 r.p.m. in geometrical progression are possible, and are easily determined by an index plate and pointers. The speed gears run partly in an oil reservoir which is located in the base of the headstock, and all enclosed gears are either in the oil or are splash oiled from the reservoir. The spindle gears are supported upon bearings independently of the spindle.

The live spindle is hardened, ground and lapped to its bearings. It runs in split-sleeve composition bearings, tapered on the outside and fitted with ring units to allow compensation for wear. The front bearing is 2⅞in.x4⅜in., and the rear bearing 2⅞in.x4in. in size. A thrust bearing composed of hardened and ground steel running against cast iron sustains the end pressure. There is a 1⅛-in. hole through the spindle, the front end being bored to a No. 16 Jarno taper and fitted with a bushing to take a No. 4 Morse taper center. The outside of the spindle nose is made with two separate bearing surfaces, the one next to the shoulder being parallel and the outer one tapered. The thread, of 3½-in. pitch, standard U. S. form, lies between the two bearing surfaces, the object of this arrangement being to center the chuck, drive or faceplate accurately and relieve the thread of any part of the strain. The spindle is separately oiled by cups. All gears are of steel and have the Maag form of tooth. for which exceptional strength and operating efficiency are claimed. All clashing gears are chrome-vanadium steel and are hardened.

The cone headstock, illustrated in Fig. 2, has a four-step cone for a 4-in. belt and is provided with a two-speed countershaft which, with the back gears, renders 16 spindle speeds available. No clutch is used in connection with the cone head, but it is supplied with a brake that is operated by the hand or forearm, the movement being the same as would involuntarily be made by operators accustomed to belt driven lathes in braking the spindle by placing the hand on the large step of the cone.

The arrangement of the motor drive is shown in Fig. 3. A five horsepower motor is placed within a cabinet leg at the head end of the lathe, and is mounted on a hinged platform, the latter acting as a belt-tightening device. A belt from the motor drives the shaft at the rear of the bed, which connects with the spindle through the friction clutch and gears previously mentioned. Electrical equipment, such as low voltage protection, master switch, etc., is provided, and the motor is started or stopped by means of a push button switch convenient to the operator's hand.

The gear box provides 36 changes of thread and feed, ranging from 1½ to 80 pitch and from 0.0012 to 0.0665 in. per revolution of spindle, respectively. No gears need be changed in the train except to cut 11½ pitch or to translate from English to metric pitches.

Changes are effected by means of two levers shown upon the box in Fig. 2, which is provided with a "di-

rect reading" index plate to be used in the following manner: The ratio lever at the left end of the box has three positions, corresponding to the three horizontal spaces upon the plate. The various positions of the rocker lever correspond to the vertical columns. To set the box to any desired pitch of thread or rate of feed the operator has only to place the two levers so that the horizontal and vertical lines indicating their position intersect at the proper numeral. Rates of feed as well as the pitch of thread appear on the index.

The shifting pinion of the gear box runs in a heavy and rigidly supported tube, or trough, the upper portion of which is cut away over its full length just sufficiently to allow the pinion to mesh with the tumbler gear. The bore of this tube is ground to an accurate diameter and is the bearing which carries the pinion itself, the latter bearing only upon an extension of the tops of its teeth. By this construction the pinion is solidly suported by the tube in whatever position it may be, and the splined shaft that drives it is relieved of any side thrust due to the action of the gears.

The leadscrew is 1⅝ in. in diameter and has a single, right-hand, Acme thread of 4 pitch. It connects in direct line with the short shaft in the gear box upon which is the nest of gears. The connection is through a positive clutch that can be engaged at two points with reference to its rotation. The small crank handle to the right on the gear box operates this clutch and at the same time disengages the feed rod so that when the latter is running the leadscrew is idle, and vice-versa. End pressure of the screw is borne by accurately lapped thrust washers made of tool steel, and mounted in a rigid bearing on the right end of the gear box.

The apron of the carriage is of the double-plate type and all active studs are bronze bushed and supported at both ends. The rack pinion is carried by a substantial ball bearing. A clutch provides for disengaging the traverse handwheel so that it may be idle when the lathe is used for thread cutting. All gears and bearings in the apron are oiled from a reservoir in the wings of the carriage.

The traverse and cross-feeds are operated through separate trains and the worm of each train is supported in bearings independent of the feed rod so that the latter is relieved of side pressure and has only to drive the trains. The worms are of steel and the worm wheels are of bronze. The ratio of traverse to cross feed is 1 to 1, so that by locking in both feeds a tool point may be caused to travel at an angle of 45 deg. to the line of centers. This feature, in conjunction with the taper attachment, enables the cutting of tapers that would be beyond the range of the attachment alone.

Direction of rotation of feed rod or lead screw is reversed by means of a lever to the right of the apron. A knock-out rod with adjustable dogs provides for the automatic disengagement of either at predetermined points.

A feature of the cross slide is the mechanism for the quick withdrawal of the slide, for convenience in thread cutting. The regular cross-screw passes through and takes its thrust bearing in a large diameter bushing that has a quick pitch screw cut upon its exterior surface. By locking the screw and bushing together, a reverse movement of the handwheel of the cross-screw withdraws the slide at a rate many times in excess of the regular movement. A positive stop, entirely independent of the thread stop, insures the return of the tool point to exact position.

The compound rest may be swung to any angular position, the base being graduated in degrees for convenience in setting. The operating handwheel of the compound screw is inclined to a 20-deg. angle above the line of the screw, and transmits its movement to the latter through bevel gears. This construction provides ample clearance for the hand when cross and compound slides are set parallel, and allows easier reading of the graduated ring on the handwheel.

The carriage is provided with the usual clamping devices and with a chasing dial. Micrometer dials upon cross and compound screws are graduated to half-thousandths so that a movement of one line indicates a reduction of one full thousandth in the diameter of the work. Felt wipers at the ends of the carriage wings keeps the shears clear of dirt and chips.

The tailstock is provided with the usual set-over feature to be used when it is desired to turn tapers in this manner or to readjust the alignment of centers. It is clamped to the shears by an eccentric clamping device under and in line with the spindle, operated by means of a conveniently placed lever. Instead of the usual split barrel, the spindle is clamped by means of a long wedge keyed beneath it to prevent rotation. This wedge furnishes a positive grip, which is delivered over a considerable length of the spindle and does not tend to displace the center point from true alignment. The wedge is operated by the short vertical handle to be seen behind the tailstock at the forward end.

The tailstock spindle has a No. 4 Morse taper hole for the center and the inner end of the hole is routed to take the tang of a standard taper shank. A crosswise drift hole allows such shank to be drifted out, or they may be ejected by running them back against the screw. The tailspindle

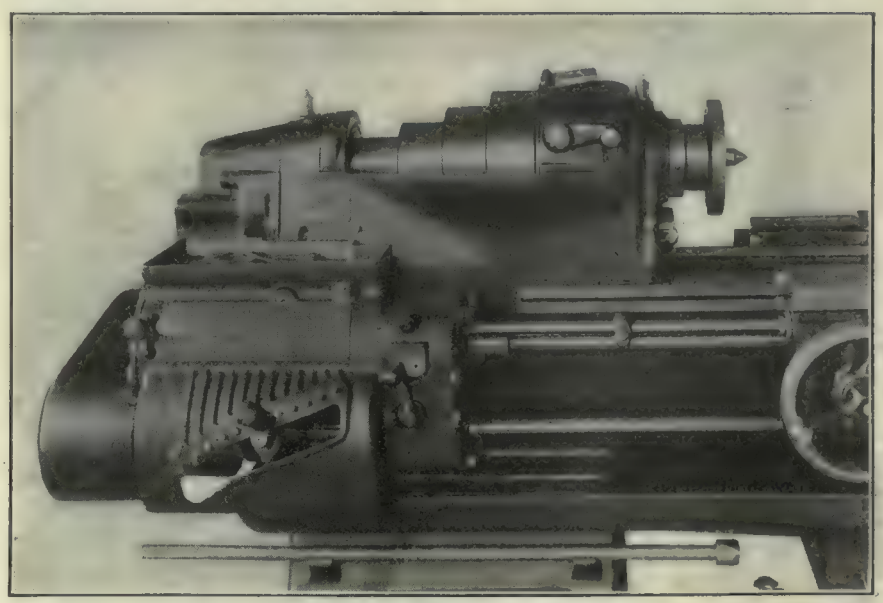


FIG. 2—CONE HEAD FOR PRATT & WHITNEY LATHE

is graduated in sixteenths of inches and has a horizontal line at the height of the centers to facilitate the setting of thread and form tools.

Collet and step chucks, ball turning rest, elevating rest, relieving

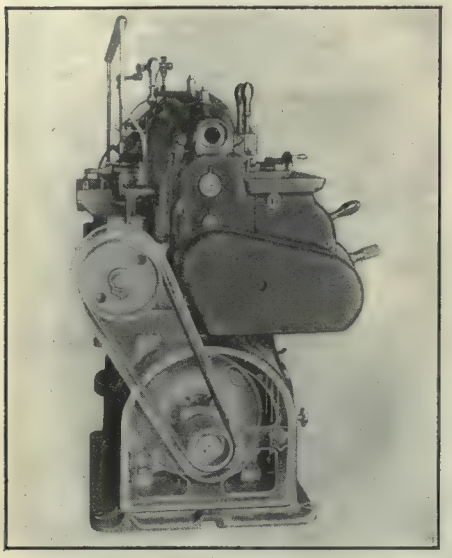


FIG. 3—MOTOR DRIVE FOR PRATT & WHITNEY LATHE

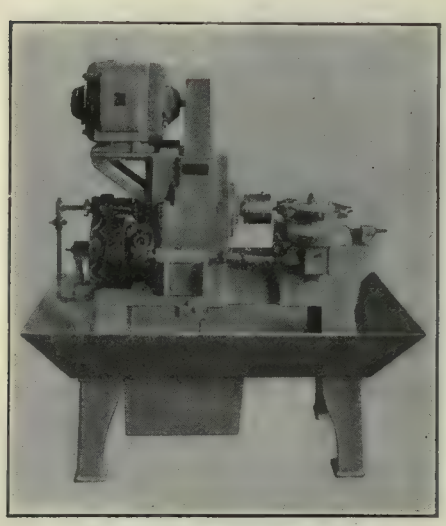
attachments, taper attachments, etc., are furnished as accessories. The regular equipment includes compound rest; drive, chuck, and faceplates; knock-out rod and necessary wrenches. Either lathe with 7-ft. bed weighs approximately 4,000 lb. without the motor.

Rickert-Shafer Automatic Threading Machine

An automatic single-purpose threading machine has recently been added to its line of threading equipment by the Rickert-Shafer Co., Erie, Pa., and the accompanying illustration shows a machine as built for threading spark plug shells.

The self-opening diehead, manufactured by this company, is carried on a spindle which is mounted in Gurney ball bearings and travels to and from the work under the action of the cam at the left end of the machine.

In the machine illustrated, the work is carried in an eight-position turret fixture which is automatically indexed, bringing a new blank into position each time the die-head advances. Fixtures and cams can be supplied for threading operations, within the range of the machine, on such work as connecting rod bolts, steering arms, spark plugs and a variety of work of a similar nature.



RICKERT-SHAFER AUTOMATIC THREADING MACHINE

When the threading operation is completed, the threaded piece is automatically ejected from the fixture.

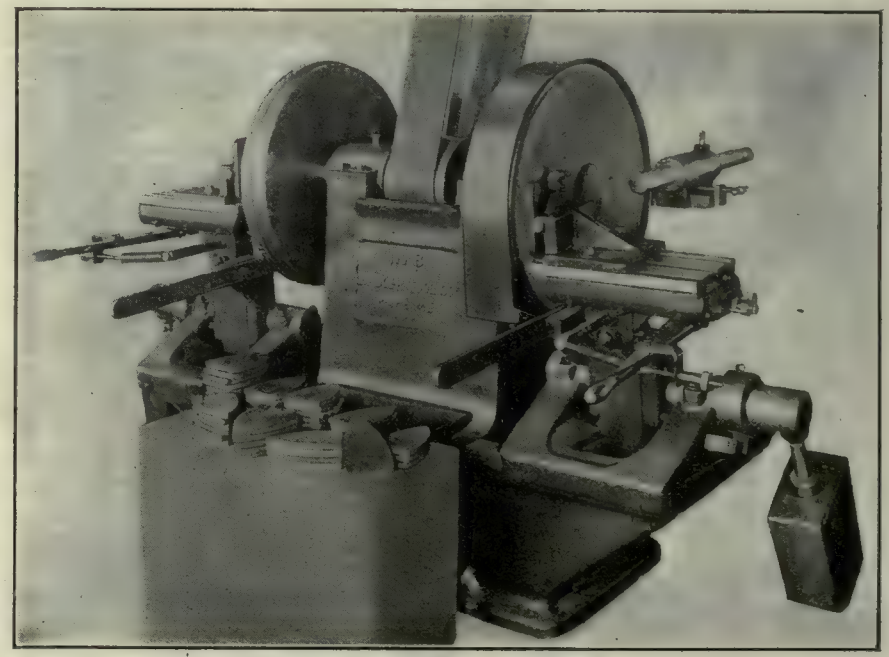
The machine can be driven either by a belt from a countershaft or by a motor. In the motor-drive arrangement, the motor drives the machine through a silent chain. It is claimed that this machine threads spark plug shells at the rate of 28 per min. and that two machines can be handled by one operator.

Badger Surface Grinder

A surface grinder employing two grinding wheels and rocking work tables has recently been developed by the Badger Tool Co., Beloit, Wis., and is now being marketed. The accompanying illustration shows the machine in process of grinding tops and bottoms of sole plates for electric irons.

The spindle carries two 24-in. abrasive wheels of the ring type and is mounted in bearings on the frame. The rocking tables are mounted at either end of the machine below the grinding wheels and their motion is imparted by the two straight levers shown in the illustration. The rocking mechanism is driven from the machine countershaft through a reduction gear at the rear of the machine. The work is held against the grinding wheel by an adjustable spring tension which acts through the hand lever on the table. It is claimed that this arrangement of work tables makes it possible for one man to operate both ends of the machine besides eliminating the heavy physical labor of feeding the work in and moving it back and forth across the face of the wheel.

When the piece in process is finished, the operator disconnects the table rocking lever, grasps the hand lever and draws the work away from the wheel, at the same time rocking the table forward until the work is clear of the wheel. The next piece is then placed in the fixture and the table is swung to the grinding position where the rocking lever again engages and causes the work to move slowly back and forth across the face of the grinding wheel. While this operation continues, the operator may reload the fixture at the other end of the machine.

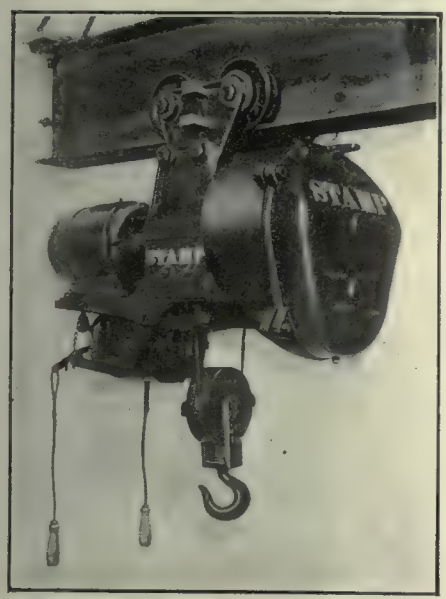


BADGER SURFACE GRINDER

Stamp Type H Electric Hoist

An electric hoist, designated type H, has recently been placed on the market by the Stamp Electric Hoist Co., 968 East 69th Place, Cleveland, Ohio. The hoist has been designed to meet requirements of fast lifting speed and high lift and a feature of the device is the small number of parts.

The frame or housing contains a drum of large diameter which is driven by two reductions of gearing.



STAMP TYPE H ELECTRIC HOIST

A standard Weston load brake is provided and both the gearing and brake run in an oil bath. Hyatt roller bearings are used and the gears are of heat-treated alloy steel. The drum flanges fit the housing in such a way that the cable will not run off the drum.

The motor is carried on a bracket outside the housing and is connected to the hoisting mechanism through a flexible disk coupling. The coupling also acts as a pulley for the motor brake which is automatically operated by a cam on the controller shaft. A trip lever, connected by a chain to the controller wheel, returns the controller to neutral at the upper limit of the hook block.

The motor extension shaft is splined into the coupling and can be withdrawn by hand, together with the load brake, after the front cover has been taken off. The drum can also be removed through the front.

The trolley sides are of steel and the wheels are of chilled iron fitted with flexible roller bearings. The width of trolley can be adjusted for various sizes of beams and the current collectors can also be adjusted. The hook block has a ball thrust bearing, a steel yoke and covered sheave.

The hoist can be supplied for either direct or alternating current with single or variable speed control. Standard units have full-load hoisting speeds from 15 to 50 ft. per min., and lifting heights from 11 to 45 feet.

Ness Electric Spot Welder

An electric spot welding machine designed primarily for operation on alternating current, but which is also adaptable by means of a special device to the use of direct current, has recently been placed on the market by the H. J. Ness Mfg. Co., 305 Broadway, New York City. From No. 30 wire to ¼-in. rod may be welded on the standard machine with a 10 amp. fuse in the circuit, indicating that the current consumption at no time is more than 10 amperes.

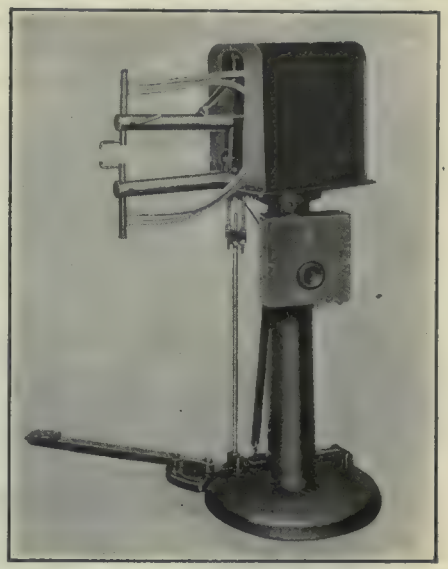
One of the features of this machine is that the transformer is located within 2 in. of the rear ends of both horns and midway between them. It is claimed that the closer the transformer is to the electrodes, the higher the efficiency of the machine, because the losses of current which occur when low-voltage, high amperage current is conducted any considerable distance are lessened. The electrodes are also heated more uniformly because the lead to each is about the same length.

Another feature of the equipment is an oil dash-spot switch which is said to practically eliminate sparking at the switch points, thus lessening the deterioration of these points, and to make the equipment sensitive by reducing the lag between the switch and the electrodes.

The upper horn is carried by a rocking arm lowered on the work by depressing the treadle. The upper electrode comes in contact with the work under spring pressure, the spring being further depressed until the current is turned on. Then the work is heated immediately to the welding temperature after which the current is automatically turned off. The weld is completed under a spring pressure that is adjustable to suit conditions. Finally, the electrodes are opened and the finished work is released.

Three welding steps for each voltage, to suit the different thicknesses of material handled are obtainable by means of a selector switch. Both 110 volt and 220 volt current may be supplied to the machine, in which case the lower voltage is used for work up to No. 10 wire and the higher voltage for No. 9 to ¼ in. More steps are optional. The 110 volt current is shut off and the 220 volt current turned on by means of a three step switch in which the only moving part is the knife.

In tests made when using the first step in welding No. 15 English gage iron wire, 3.75 amp. were consumed; using the second step in welding No. 14 English gage iron wire 4.4 amp.; using the third step in welding No. 10 English gage iron wire, 5.5 amperes.



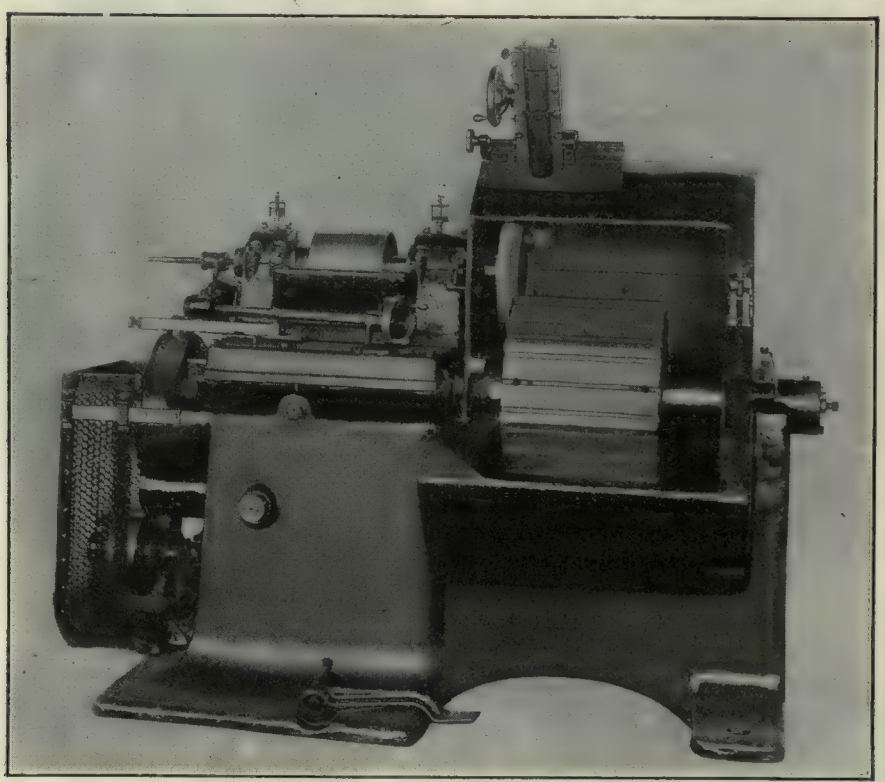
NESS ELECTRIC SPOT WELDER

There are seven adjustments on the machine for regulating the height between the horns, the pressure applied to the electrodes in welding, etc. The treadle position may be shifted 35 deg. to suit the convenience of the operator. The horns are cold-drawn copper bars, 2 in. in diameter, and are water cooled. The electrodes are secured in them by means of a hand-operated lever and cam lock on each horn. The distance between the horns when closed on the regular machine is 5 in., and on sliding-horn machines 5 in., minimum, and 16 in. maximum. The greatest movement of the upper electrode is 2½ in. and the distance from the floor to the welding points is 42 inches. The machine may also be motor driven for automatic operation, in which case ½-hp. motor is supplied. The weight of the alternating-current welder is approximately 450 lb., and of the direct-current equipment, about 550 pounds.

Gardner Semi-Automatic Disk Grinder

A recent addition to the line of grinding and polishing machinery manufactured by the Gardner Machine Co., Beloit, Wis., consists of an 18-in. semi-automatic disk grinder. The machine is designed for the grinding of parts which require the finishing of but one flat surface at a time.

The main feature of the machine is an octagonal drum upon which the parts to be ground are carried to the grinding position in fixtures mounted in the slots of the drum. The speed at which the drum revolves is variable, depending upon the amount of stock to be removed, the size of the area to be finished, and the speed with which the operator can unload and reload the fixture.



GARDNER SEMI-AUTOMATIC DISK GRINDER

The drum, as will be seen in the illustration, has two T-slots and one straight groove machine on each face, the latter to receive a tongue on the fixture and align the work with the grinding wheel. The drum shaft is 3 in. in diameter, has a bearing each side of the drum, and the end-thrust of the grinding operation is taken by a special thrust bearing at the end of the shaft. The motion of the drum is controlled by a pedal which operates a disk clutch at the left end of the machine. To start the drum the pedal is depressed and its release brings the drum to a stop.

The grinding spindle is mounted in a grinding head which is arranged to slide longitudinally in guides. As the work approaches the grinding position, the grinding head automatically advances until it reaches a positive stop. The head is pressed forward against the work by a spring whose action is controlled by a cam, and a constant pressure is exerted upon the work until the grinding is finished. The head is then returned by the cam.

The spindle is made from heat-treated alloy steel and is mounted in bronze bearings which are adjustable for wear. The thrust is carried by a hardened and ground steel collar which bears directly upon the spindle bearing, adjustment being provided by a nut and locknut on the opposite side of the bearing. The bearings are lubricated by sight-feed oil cups.

The grinding head proper is mounted upon a sub-base and is adjustable upon this base by means of a screw and handwheel. The handwheel shaft is geared to the screw so that adjustment is convenient for the operator, and the micrometer head provides close adjustment to compensate for wear of grinding disk or thrust collar. The ways upon which the grinding head slides are provided with shields for the exclusion of dirt and foreign matter and with gibs for taking up the wear.

The grinding member consists of an 18-in. steel disk wheel faced with the Gardner improved abrasive disk, or an 18-in. abrasive ring carried in a special chuck. The former is for dry and the latter for wet grinding. A cast-iron hood guards the grinding member and may be attached to an exhaust system. The wheel dresser is mounted upon a slide carried by the hood and is provided with a lateral screw adjustment for wheel wear. The vertical movement of the dresser across the face of the wheel is produced by means of a hand-operated pinion and rack.

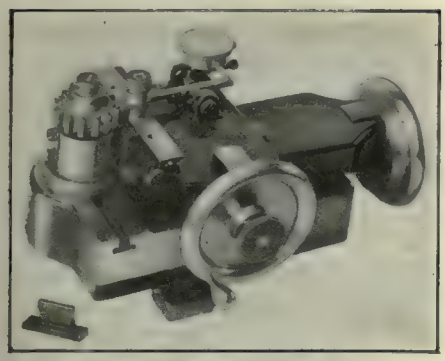
The spindle speed is 1,400 r.p.m. and the driving pulley speed is 560 r.p.m. The faces of the drum are 7x14 in. The machine requires 10 hp. for maximum duty.

American Grinder Co. Gear Tester

A gear tester, developed and manufactured by the American Grinder Co., 6534 Benson St., Detroit, Mich., has recently been placed on the market. The instrument is primarily intended for ground gears but can be used equally well on cut gears for developing, checking and charting involute curves and testing tooth spacing.

The machine consists of a base with a longitudinal slide upon which a transverse slide is mounted as shown in the accompanying illustration. Both slides are moved by screws with hand-wheels and micrometer heads. A slot is machined at one end of the base in which a stud for mounting the gear to be tested is clamped. On the transverse slide are mounted the contact finger or needle and an indicator by which the readings are taken.

For testing the involute curve of a tooth on a spur gear, an adapter with a base circle disk and steel tapes 0.005 in. thick are used. The indicator may be set to read direct or to multiply the readings by four. It is evident that as the transverse slide is moved, the contact finger will trace a true involute relative to the gear, since the tapes cause the slide to move a distance equal to the peripheral motion of the base circle disk. To take readings the transverse slide is set at zero and the contact finger is set at right angles to the slide by means of a gage. The gear is then set on the stud with



AMERICAN GRINDER CO.
GEAR TESTER

the indicator reading zero, and if the indicator remains at zero as the transverse slide is moved, the tooth curve is shown to be a true involute. Any deviation from the true involute is shown on the indicator and may be charted. To assist in gathering data for charting the curve, a plunger automatically retards the handwheel every 0.010 in. The charted curve for a true involute will be a straight line.

Tooth spacing is checked by using a fixed contact finger clamped to the slide, in connection with the indicating device. Tooth to tooth spacing or 90-deg. spacing may be checked. When it is desired to maintain a master curve or duplicate an established form, the longitudinal slide is used, first plotting the master and then checking the other curves with the chart. By making special adapters, spiral, bevel and other gears may be tested for spacing and contour. The normal capacity of the instrument is from ½- to 8-in. spur, helical and bevel gears, and the maximum is up to 12-in. spur gears

Greenfield Improved Snap Gage

The Greenfield Tap & Die Corp., Greenfield, Mass., is now marketing a line of improved snap gages which

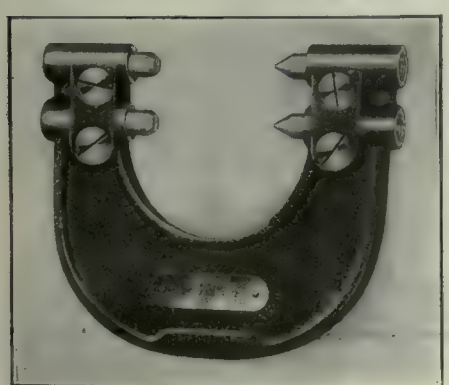


FIG. 1—GREENFIELD IMPROVED SNAP GAGE

is the result of a careful study of the usual defects found in such equipment and a design which is an endeavor to eliminate them. The general construction of the gage is shown in Fig. 1, and Fig. 2 shows the locking device for the anvils.

The locking device is the main feature of the gage and it will be noticed that the bearing of the individual locking bushings is on a flat on the anvils, so that they are held securely and prevented from turning. The gaging faces are maintained in alignment.

A stiffening web has been added

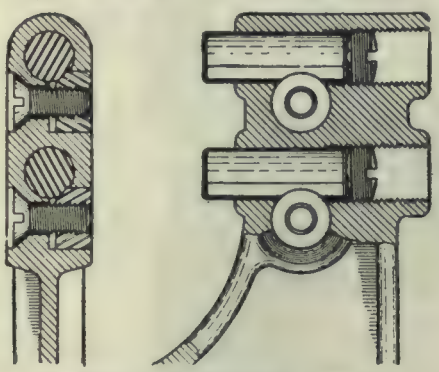


FIG. 2—GREENFIELD ANVIL LOCKING DEVICE

to the outer edge of the frame and makes holding the gage in the fingers easier when oily. Provision is also made for holding the gage in a stand. The frame number is cast in each frame, and a name plate is provided for special marking. Each size of gage has a wide range of adjustment.

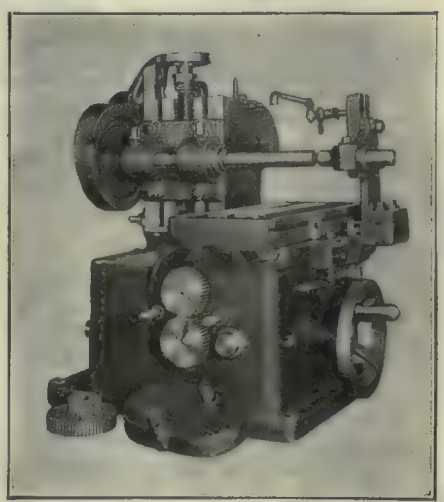
Weed Semi-Automatic Bench Milling Machine

A semi-automatic bench milling machine for the rapid and accurate production of small interchangeable parts has recently been placed on the market by the Weed Engineering Works, 738 Union Ave., Bridgeport, Conn. It is especially useful in the manufacture of small parts for firearms, sewing machines, typewriters and similar work.

In the design of the machine an effort has been made to secure greater rigidity and freedom from chatter than is found in the usual small bench milling machine. The machine is equipped with tight and loose pulleys with a convenient shifter for a belt 1½ in. wide. The driving pulley is 6 in. in diameter and runs at 300 r.p.m. The spindle is a steel forging, hardened and ground and running in bronze bearings. The arbor is hardened and ground and dogged to the spindle. The arbor diameter is ⅝ to ⅞ in., and the spindle has a No. 7 B. & S. taper.

The working surface of the table is 3⅝x12 in. The table has a large oil recess on all sides, and is fitted with an adjustable taper gib. The feed motion of the table is 10 in. and the feed is engaged by a feed trip lever which operates forward and reverse clutches. The trip lever is operated either by hand or by feed dogs on the table. The working feed is driven by a worm and gear, and the reverse through bevel gears from a shaft at the back of the machine. Feed changes are made by changing gears at the front of the machine and four changes are available from 1.145 to 5.26 in. per min. Spindle speeds are changed by changing gears in the driving head, and six speeds from 80 to 268 r.p.m. may be used. The automatic quick return of the table takes place at the rate of 92 in. per minute.

The tank for cutting lubricant is located in the base and a pump of ample capacity is provided. The maximum distance from top of table to spindle center is 5½ in. and the minimum, 1¾ in. The net weight of the machine is approximately 450 pounds.



WEED SEMI-AUTOMATIC BENCH MILLING MACHINE

For semi-automatic operation the work is secured to a proper vise or fixture by the operator and the feed lever is tripped by hand. The table then feeds to the completion of the cut when the adjustable stop reverses the feed mechanism and the table is returned at the higher speed to the starting position. It is stated that one operator can handle several machines, the number, of course, depending on the length of the cut.

Elwell-Parker Electric Fork Lift Truck

An electric fork lift truck is a recent addition to the line of industrial tractors and trucks manufactured by the Elwell-Parker Electric Co., Cleveland, Ohio.

The machine is essentially an electric truck with provisions for carrying a 2,500-lb. load beyond the front axle. The forks which support the load are so designed that their lower side will touch the floor, and they can be stopped and held at any position between the lower and upper limits of lift. The forks may be shaped at the outer ends so that bundles, bales, boxes, castings or other commodities or packages may be lifted and transported.



ELWELL-PARKER ELECTRIC FORK LIFT TRUCK

The length of the forks depend upon the weight to be carried, as the load must be balanced over the front axle by the rest of the truck. The front axle, therefore, carries a heavy load and is strongly made and fitted with roller bearings.

The lifting mechanism consists of a separate motor, with a worm gear reduction, which is attached to a movable platen supported on the truck frame by three rocking links. The electric mechanism is assembled as a unit.

The power or propelling unit consists of a heavy duty Elwell-Parker motor direct connected to a worm and wheel drive through a flexible coupling. A bevel pinion differential running in oil together with drive shafts and clutch plates bolted to the outside of the wheels comprise a full-floating driving axle. The drive shaft universal joints are of chrome-vanadium steel. The drive wheels turn on 7-in. ball bearings.

All four wheels are steerable. The knuckles on both front and drive wheels are located close to the center of the tires. It is claimed that this construction insures easy steering and avoids any "kick-back" at the steering handle when the wheels strike irregularities or obstructions.

Automatic Cross Feed for "American" Heavy Service Shapers

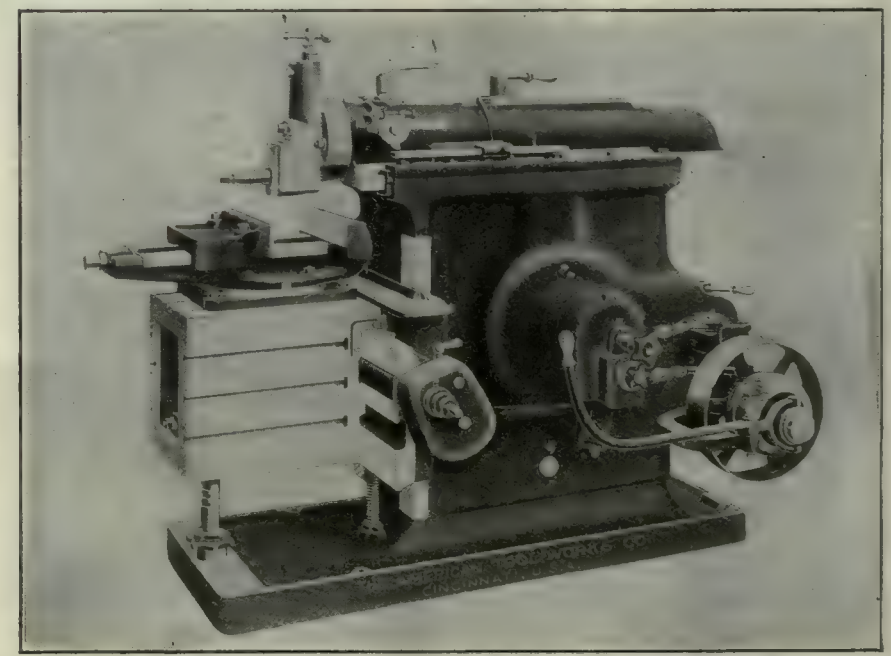
The American Tool Works Co., Cincinnati, Ohio, has developed an automatic feed mechanism for its heavy service shapers, which is designed to secure ease of operation and safety in manipulation, together with durable construction.

The mechanism is shown attached to a shaper in the illustration. With this device the feed occurs only during the return stroke of the ram and throughout the entire stroke. The mechanism is therefore protected against shocks, the feed rate is positive, and smooth, quiet action is insured.

The feed may be engaged, disengaged or reversed by the manipulation of one conveniently located handle. Throwing the handle to one side or the other engages the feed; movement of the handle from one extreme to the other reverses it; and leaving the handle at the center position causes disengagement.

Fifteen feeds are provided, ranging from 0.010 in. to 0.150 in. per ram stroke. Each feed is clearly indicated on a graduated dial and can be secured while the machine is in operation by turning the feed star knob until the desired feed indicated on the dial comes opposite a fixed pointer.

An automatic safety device is one of the features of this mechanism. It is claimed that this device will



AUTOMATIC CROSS FEED FOR "AMERICAN" HEAVY SERVICE SHAPERS

protect the feed mechanism against damage if the tool should gouge the work or the saddle be fed into either end of the rail. It is also stated that this safety means requires no adjustment, will pull heavy loads without slipping, and is not affected by atmospheric conditions, heat or oil.

Yale Low-Platform and Tractor Trucks

The Yale & Towne Manufacturing Co., Stamford, Conn., has recently added a low-plaform truck and a three-wheel tractor truck to its line of industrial transportation equipment.

The Yale Model K-23 low-platform truck is illustrated in Fig. 1, and is a general utility truck with a load capacity of 4,000 lb. The low-platform design reduces the amount of lifting of material necessary in loading the truck. As in other trucks of this series, recently described in the *American Machinist*, the complete assembly of the mechanism is made up of a number of standard subassemblies or units. This feature simplifies the mechanism and is of advantage in maintenance when several trucks of the series are in use. The wheel base is 54¼ in., the over-all width is 38 in., and the over-all length is 110¾ in. The total height is 53⅜ in. and the platform space is 38x60 in. The height of the platform above the ground is 11 in. All four wheels steer and are of the disk type, made of pressed steel and provided with rubber tires. It is stated that the truck will travel at 6¼ mi. per hr. on a level concrete roadway with a 4,000-lb. load. The series motor runs at 1,800 r.p.m., continuous rating, on 36 volt current furnished by an Exide or Edison battery. The frame is of pressed steel with the main longitudinal members in one piece.

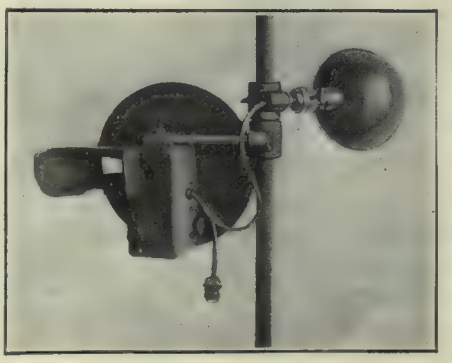
As shown in Fig. 2, the Yale Model K-24 three-wheel tractor truck is designed for hauling and small load carrying service in particularly congested spaces. The center of gravity has been kept low to reduce the tendency to "buck" or overturn against stalling loads, or to tip over sidewise while rounding corners. The frame is of pressed steel, arc-welded into a one-piece structure which combines battery compartment, bumpers and deck, and is suspended on helical springs over each wheel. The driving unit is the same used in other trucks of the series, as is the other electrical and controlling equipment. The wheels are rubber-tired, the drive wheels being of pressed steel and the front wheel a semi-steel casting.

The weight of the tractor with an Edison battery is 2,250 lb., and the wheel base is 42½ in. The width is 35 in. and the length is 82 in.

It is claimed that the tractor will haul four loaded trailers, a 16,000-lb. load, at a maximum of 4½ mi. per hr. on a level roadway. The seat is mounted on a swivel to make mounting and dismounting from the truck more convenient.

Rotostat Instrument Co. "Rotostat"

An instrument for the visual inspection of rapidly moving machine parts, known as the "Rotostat," has recently been placed on the market

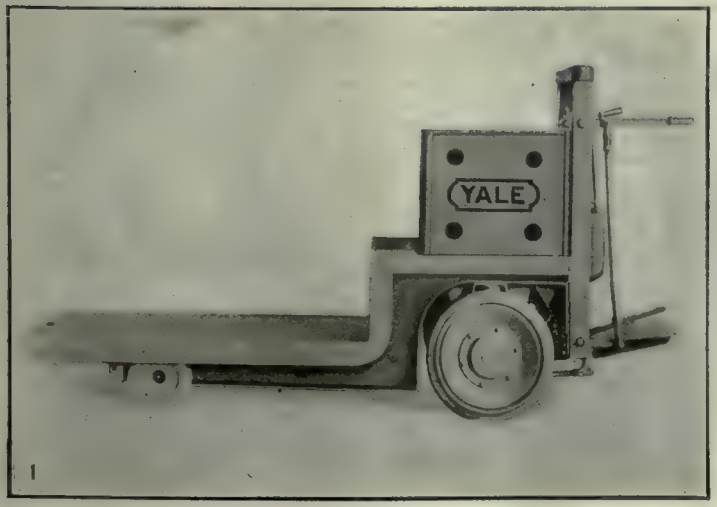


THE ROTOSTAT

by the Rotostat Instrument Co., 600 West Lehigh Ave., Philadelphia, Pa. This device is useful in detecting errors in timing of interlocking parts, unexpected interference, deformation of parts under centrifugal stresses, instantaneous and periodic speed variations and other facts about rapidly moving parts.

The instrument is connected to a convenient lighting socket and the moving object is viewed through the hood at the left in the illustration. The control knobs, which are located on the box at the center, are then manipulated until the object under observation appears to be standing still or moving at the required speed. An adjustable lamp and reflector is mounted with the instrument on a standard, the position of the instrument also being adjustable. No special illumination, battery, or special electrical equipment is necessary and a dim light is not required for good observations.

For machine shops the instrument is useful in visualizing the action of cutting tools and testing complicated automatic machinery. It is stated that erratic motion due to backlash of gears, slipping of belts and errors of balance are easily detected.



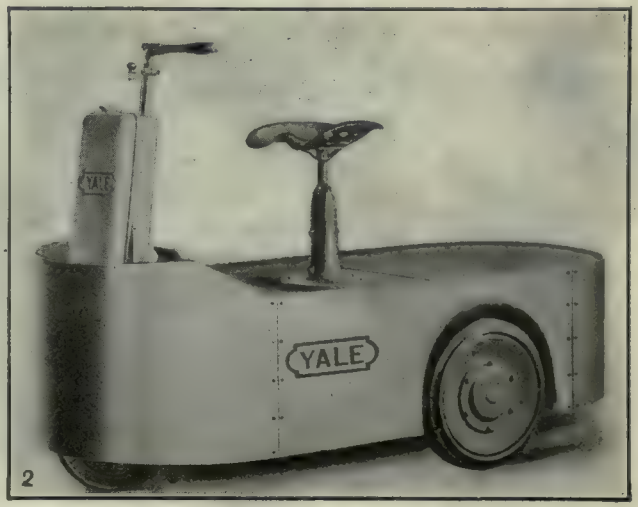


FIG. 1—YALE MODEL K-23 LOW-PLATFORM TRUCK. FIG. 2—YALE MODEL K-24 THREE-WHEEL TRACTOR TRUCK

Fox Duplex Horizontal Multiple Drilling Machine

The Fox Machine Co., Jackson, Mich., has recently built a duplex horizontal multiple drilling machine for machining nickel-steel automobile steering knuckles, and the machine is now being placed on the market for work of a similar nature.

As shown in the accompanying illustration, there are two spindle heads which are arranged to slide upon the long horizontal rails. The rails are bolted to columns at either end of the machine bed and to a pedestal at the center. A revolving work fixture is mounted above the pedestal, and has four stations, the loading station being at the front of the machine.

Each head carries six spindles and has an independent feed and knockout. The two bottom spindles are $2\frac{3}{4}$ in. in diam. for drilling and carry $1\frac{3}{8}$ in. drills. Two special boring spindles are located at the back of each head and are mounted in taper bearings which are adjustable for wear. The two top spindles are also $2\frac{3}{4}$ in. in diam. and carry $\frac{7}{8}$ in. reamers.

The motor is mounted at the rear of the machine and drives the machine through a silent chain. The machine drive shaft also drives the spindle driving shaft through a silent chain.

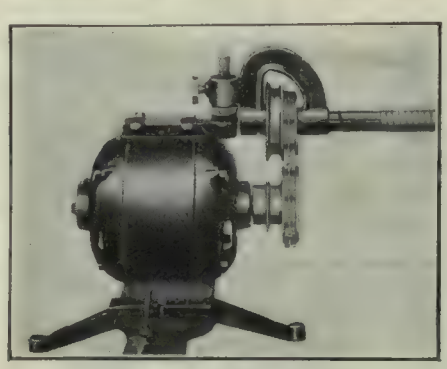
On the work mentioned above, the drills rotate at 250 r.p.m. and the drill feed is 0.839 in. per min., which is equivalent to 0.0034 in. per revolution of spindle. The feed controls are shown in the illustration at the front of the machine.

The cutting lubricant tank and pump are mounted at one end of the machine and the pump is driven by a belt from the motor.

Haskins Multiple-Speed Countershaft

A heavy type multiple-speed countershaft, for use with Haskins flexible shaft portable grinders, has been placed on the market by the R. G. Haskins Co., 516 West Monroe St., Chicago, Ill.

The main feature of the countershaft equipment is the link type belt, which has been designed to eliminate slippage and secure a positive drive when running at high speed on a short drive. The links are constructed of leather and fiber and joined by a steel connection. The pulleys have been widened and shaped to fit the links, so that as the belt engages the pulley, the link is wedged in just enough to secure a firm grip but not enough to cause any appreciable loss of power.



HASKINS MULTI-SPEED COUNTERSHAFT

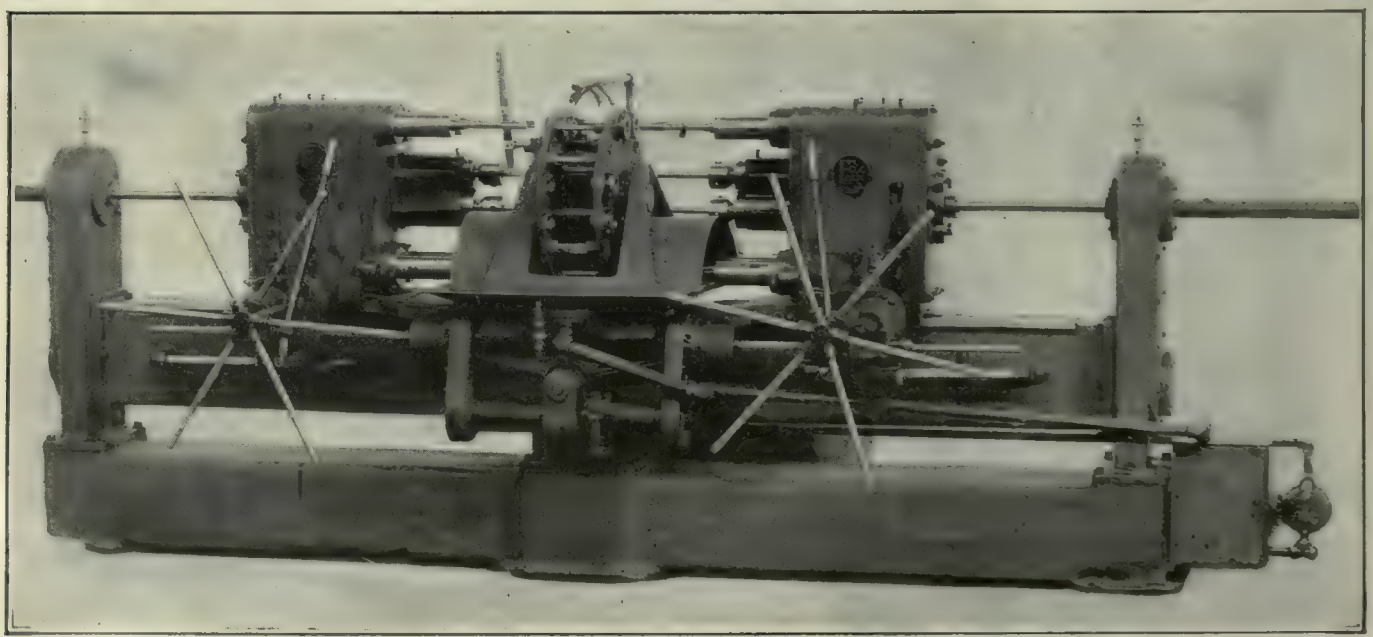
The countershaft provides a convenient method of attaching the shaft to the motor and gives the operator an opportunity to select a speed to fit the work. The link type belt is now furnished with all Haskins equipments.

Japanese Imports of Machine Tools

American machinery manufacturers interested in obtaining a broad view of happenings in their respective lines in Japan will find useful figures in the current issue of *Commerce Reports*, taken from the Japanese customs statistics.

A graphic analysis of these figures by the Industrial Machinery Division of the Department of Commerce shows clearly the comparatively insignificant part played in this business by the United States in the earlier years; the phenomenal growth of American participation in certain lines with corresponding waning of the British volume; and the subsequent regaining of lost ground by the British in some cases. However, it is worth noting that in many lines the American manufacturers are holding their own and even increasing their hold though the British have regained their former prestige, possible to a large extent in those lines of endeavor where the original machinery installed was British and the repairs and replacements were of necessity British.

In the earlier years the British controlled the market, but in the first part of 1915, owing probably to the war demands on British manufacturers, their participation in this business fell to a negligible quantity, while the American participation took a sharp upward trend in nearly all important lines.



FOX DUPLEX HORIZONTAL MULTIPLE DRILLING MACHINE

News Section

Planning World Power Conference for Next Summer

Next Summer the British Empire Exhibition is to be held at Wembley, London. In July, by permission of the Executive Council of the Exhibition there is to be held in connection therewith a World Power Conference, initiated by the British Electrical and Allied Manufacturers' Association, Inc., but participated in by many technical and scientific institutions and industrial organizations in Great Britain and other countries.

The announced purpose of the World Power Conference will be to consider how the industrial and scientific sources of power may be adjusted nationally and internationally in the following ways: By considering the potential resources of each country in hydro-electric power, oil and minerals; by comparing experiences in the development of scientific agriculture, irrigation and transportation by land, water and air; by conferences of civil, electrical, mechanical, marine and mining engineers, technical experts and authorities on scientific and industrial research; by consultations of the consumers of power and the manufacturers of the instruments of production; by conferences on technical education to review the educational methods in different countries, and to consider means by which existing facilities may be improved; by discussions on the financial and economic aspects of industry, nationally and internationally; and by conferences on the possibility of establishing a permanent World Bureau for the collection of data, the preparation of inventories of the world's resources and the exchange of industrial and scientific information through appointed representatives in the various countries.

The importance with which the conference is regarded in Great Britain is evidenced by the eminent engineers, scientists and industrialists and financiers connected with its organization and management of which the Right Honorable, the Earl of Derby, K. G. is president.

In response to invitations for American participation more than twenty American engineering technical and industrial organizations have appointed representatives to a Committee of Arrangements.

Working committees have been appointed and General Chairman Merrill is now in London gathering information as to the scope and details of our expected participation.

Invitations will be extended to other organizations that may be interested and it is the purpose and hope to make a contribution to this first effort toward a systematic study of the world's power resources and their utilization.

Three Roads Show July Gains

Three of the four railroads making reports of their earnings for July showed increases compared with the same month of last year. The Norfolk Southern, the smallest of the four, was the only one to show a decrease, and in that case the decrease was but $11,000.

The Philadelphia & Reading R.R. continued to show the recovery that it has reported in the last few months, with a net income of $1,954,742, as compared with a deficit of $192,512 in the same month last year. Although this was less than for June, when the railroad reported a net of $2,943,125, it was almost as great an increase as the June figures were in comparison with the June of last year, when the net income was $599,099.

In its July report the Wabash R.R. continues to show an increase in net income over the same month of last year with $633,295, against $532,868. This is in striking contrast to the same month in 1920, when the Wabash reported a deficit of $1,028,288. Gross income for the seven months' period of this year was $37,210,386, an increase of approximately $4,000,000 in comparison with the same period of last year. Net operating income for the same period was $4,778,053, against $2,963,305 in 1922.

The Western Maryland R.R. reported a net income of $386,391, against $249,369 in the same period of last year. This is accounted for in a large measure by the large increase in the gross revenues which were $2,005,106 for July of this year, in contrast with $1,215,616 in the same month of last year.

Spends 17 per Cent for Equipment

More than one-half of the funds expended by the Pennsylvania Railroad System during 1922 were immediately paid out in salaries and wages to the 220,000 employees according to a report compiled recently. This report was designed to show just how the "Pennsylvania dollar" was expended in 1922.

Out of every dollar received by the railroad during the year 51.4 per cent was paid to labor. The second largest slice out of the dollar went for the purchase of materials and supplies used in the every-day railroad operations. This expenditure required 17.07 per cent.

Coal for the company's system took 7.29 per cent. For taxes paid to cities, states, and the United States in 1922 a total of 4.54 per cent was taken from every dollar received by the railroad. At this rate, the railroad points out, the taxes, which have been increasing steadily of late, have now approximately reached a point where they are equal to the amount of dividends paid to the stockholders who own the railroad.

Record Car Loading in Seven Months

A new high record for car loadings in the first seven months of a year was revealed by the announcement that 27,957,211 cars were loaded in this period of 1923, just made by the Car Service Division of the American Railway Association. These figures were compiled from reports from railroads in all parts of the country.

Not only was this a greater loading than for a similar period in any previous year, but it was 4,683,387 cars more than were loaded in the same period of 1922. This is an increase of 20 per cent over last year, when car loadings suffered by the decrease in coal loadings due to the miners' strike.

One of the outstanding reasons for the increase in car loadings was the increase in general business. The loadings of merchandise and miscellaneous freight, generally accepted as a criterion of the manufacturing conditions throughout the country, were 1,638,140 more than last year, with a total of 16,466,907 cars.

Norton Company Holds Harvest Day

On Saturday, Aug. 25, the employees and executives of the Norton Co. assembled at the New England fair grounds on the outskirts of Worcester, Mass., for the "Harvest Day" which has been an annual event since 1914. Established originally as an exhibit of the farm products grown in the company gardens, the affair now includes a flower show, a pet show for the children, exhibits of fancy work, home cooking and arts and crafts, and an automobile parade with prizes for the best decorations. There was also an exhibit of the complete line of Norton products. This feature was introduced last year and was found to be popular because many of the employees have little chance to see what is going on in other departments of the plant during the year.

July Steel Ingot Output

Steel ingot production in the United States approximated 3,515,966 tons for the twenty-five working days in July, according to an estimate made by the American Iron and Steel Institute. This compares with an estimate of 3,748,890 tons produced in the twenty-six working days in June and 4,195,800 tons, the high monthly record in the history of the country in the twenty-seven working days in May. Output in July last year approximated 2,952,806 tons.

Waldo H. Marshall Dies Suddenly

The death of Waldo H. Marshall, president of the Consolidated Machine Tool Corp. of America, occurred Aug. 23 at his Summer home, Barnstable, Mass., following an illness of a week. Mr. Marshall's death came as a shock to his associates and many friends in the industry as he had been actively engaged in business up until the time he was stricken with appendicitis and he had been in the best of health for some time past.

Mr. Marshall had been identified with



WALDO H. MARSHALL

the locomotive building and operation and kindred industries since his graduation from college until he became associated with the Consolidated Machine Tool Corp. His first practical experience was in the drafting room of the old Rhode Island Locomotive Works. After considerable editorial experience both in Chicago on the *Railway Review* and in New York on the *American Engineer*, he became assistant superintendent of motive power of the Chicago & Northwestern Railway in 1897, going to the Lake Shore Railway in 1899 and advancing successively from superintendent of motive power to general superintendent and to general manager in 1903. Leaving this in 1906, he became president of the American Locomotive Co. and retained this position until 1917. From here he became identified with J. P. Morgan & Co. and in January, 1918, he was appointed chief of the production division of the Ordnance Department, U. S. A. He was also a member of the Naval Consulting Board and of the Committee on Industrial Preparedness of New York.

Following the war he was associated with the T. A. Gillespie Co. and the Gillespie Manufacturing Co., being chairman of the board of the latter company.

Upon the formation of the Consolidated Machine Tool Corp. of America Mr. Marshall was made vice-president and held this office until he succeeded to the presidency made vacant by the sudden death of Columbus K. Lassiter on March 3. Mr. Marshall was largely instrumental in the formation of the corporation together with the late Mr. Lassiter.

Mr. Marshall was also a director of the American Brake Shoe & Foundry Co., the Bucyrus Co., and of the Chatham and Phenix Bank of New York City.

The body was brought to his New York home, 375 Park Ave., and the funeral was held from the Central Presbyterian Church. Only a few weeks ago Mr. Marshall's wife died. He is survived by his son and his daughter. He was fifty-nine years of age.

Eaton Axle Co. Buys Bumper Concern

An announcement has been made by J. O. Eaton, president of the Eaton Axle & Spring Co., of the acquisition of the inventory, machinery, patents and good will of the Cox Bros. Manufacturing Co., Inc., reputed the oldest manufacturer of automobile bumpers now in business.

The Cox company has plants in Cleveland and Albany and service stations in New York and Chicago. It is intended to open additional service stations in Cleveland, Boston, Albany and Philadelphia.

According to officials, the company is operating at the rate of $2,000,000 a year and profits are said to be satisfactory. It is figured as an important addition to the Eaton Axle & Spring Co., which is manufacturing Eaton and Torbenson axles and Perfection springs in plants at Cleveland and Pontiac, Mich.

Manufacturers Approve Safety Schools

A large number of Baltimore industrial plants have approved a plan which has been launched by the Baltimore Safety Council and which provides for safety schools for foremen and others engaged in the plants. Officials of the Safety Council expect about 1,000 men to take the course.

The course will include the organization of shop safety committees, addresses at plant safety meetings of superintendents, foreman and workmen, motion pictures dealing with accident prevention, standardization of accident statistics, fire prevention surveys and the study of labor turn-over and employment problems.

Electrifying Railroads in Brazil

Orders for new equipment totaling about $1,000,000 for electrifying 35 additional miles of the Paulista Railway, Brazil, have just been placed with the International General Electric Co. This extension constitutes part of the extra portion contemplated when the first contract with the International General Electric Co. was closed in 1920, providing for 28 miles of double track electrification, and brings the total electrified mileage up to 63 miles starting at Jundiahy and extending north to Tatu.

Production Steady in Buffalo

A survey of employment conditions in the automotive industry in the Buffalo district shows that there has been a decline in production during July and the first half of August and, to some extent, this condition is passed on to the smaller machine shops that depend on the automotive industries to any degree. While the reductions in force of the principle automobile factories have been in progress for some weeks, the machine shops making parts for these factories have not been effected radically as yet and are making their reductions far more gradually.

The Pierce-Arrow Motor Car Co. reports that its present employment figure is about 75 per cent of normal. However the company's production for the first six months of this year has been greater than in any six months in its history. About 3,900 men are employed at present and it is expected that the employment figures will gradually work up to normal, beginning with September.

Atterbury Motor Car Co. is running about 60 per cent of normal and about 10 per cent ahead of last July and August. The new Chevrolet assembling plant is putting on men already and expects to have approximately 600 employed by September. The normal employment eventually will be 1,500.

The Ford Motor Co.'s Buffalo plant is employing 750 men, which is 150 more than were employed in the Spring and nearly full capacity. The Dunlop Tire & Rubber Co., which was shut down last year, is reaching sizeable production figures and has not experienced any reduction this Summer.

Averages of employment in all Buffalo factories showed a reduction of about 3 per cent during July. However, most of the shops making heavy machinery are runinng to capacity and there is healthy activity in the forging plants, shops making railroad equipment and railroad repair shops.

South Has Many New Machine Tool Shops

Some idea of the remarkable development the foundry and machine shop industries of the South have experienced this year is shown in a recent report received in Atlanta from a reliable source by the Southern Metal Trades Association.

From January to July inclusive it is shown that more than 300 projects were carried out by metal trades industries of the southern states, either in new construction by existing companies or in new construction by new companies formed during that period.

In foundries and machine shops, the total reached about 175, while in other metal working plants the total exceeded 150.

In addition to this it is interesting to note that in the lumber industry the total of such projects amounted to more than 400, and in the woodworking industry, outside of lumber plants, more than 300. In the textile industries of the South the total was nearly 400.

It now seems practically certain that 1923 will prove the greatest year the South has ever experienced in the development of its industries.

Many Inquiries in Pittsburgh Market

In common with conditions in the iron and steel market, the machine tool industry is reflected in the quietness that prevails throughout the trade. Several sellers of new equipment say there is a moderately fair inquiry from surrounding districts, with occasional business resulting. However, it is said that many of these inquiries look so good that transactions are confidently looked for in the near future. Then there are other sellers of machine tools who appear to be in the inactive zone, and report the market as duller than it has been in the past four or five weeks.

The National Tube Co., which is the "leading interest" in tubular goods production, took definite action last week on its list of machine requirements for the new tube works at Gary, Ind. When the list was closed it consisted of a miscellaneous character for tool room installation, and included two small lathes, a slotter, a drilling machine, a boring mill, hack saws and other small equipment. The successful bidder was Manning, Maxwell & Moore, Inc.

Needed Equipment

Sales that have been consummated lately were of a compulsory nature, such as had to be secured in order to insure operation of plants, and in the main were replacements rather than new installations. It is difficult to close a sale of used machinery also, even when it consists of odds and ends and such small items as bench lathes and drills. From the middle West inquiries come almost every day in better volume than from any other section, and in a number of cases deals are being held up for the return of sales managers who have taken advantage of the dull period to slip off for a vacation. A seller last week was successful in closing a deal for a large boring mill that went to a shipbuilding company on the Eastern seaboard.

There has been a slight decrease in inquiries for cranes, but the builders say this is only temporary, and while there were no awards last week, several deals are hanging fire and may be consummated at any time. Quotations have been submitted, and it will not take long to do business when the right man gets on the job. A new 15-ton crane is to be placed at the new addition to the Railway Steel Co.'s plant at Latrobe, Pa. Several railroad orders in cranes are looked for very soon, according to dealers here.

Railroads Will Buy in St. Louis

The machine tool market in St. Louis has been rather spotty for the past two weeks. Some companies report a good business and are going along on full schedule, while others have found it necessary to cut down their forces somewhat and still others have reduced the number of working hours per week.

Railroads are not much more active in the market now than they have been for the past two months, but with most of them reporting a capacity business, manufacturers anticipate that this field will be more productive for the machine tool industry shortly.

Automotive plants that manufacture passenger cars are employed to capacity, but the truck makers have slowed up.

The Baltimore & Ohio R.R. recently purchased a large tract of land on the East side of the Mississippi River which it intends to use for new yards and for the erection of a large terminal.

Collections are reported better than for the past few weeks and the labor situation is satisfactory. Conditions generally are better than at this time last year and manufacturers are content with the year's total.

Milwaukee Reports Improved Trade

A distinct recovery from the dullness of machinery business during the greater part of June and July has been experienced in the Milwaukee trade in August, and as the month comes to a close the effect has been heightened by a steady growth of inquiries as well as sales. Manufacturers as well as dealers shared in the improvement. Individual sales in no case reached the proportions of round lots, the bulk of business being in single machines or a few items. The railroads and the automobile industry figured most prominently in sales.

The outlook, as viewed by leading men in the selling end of the machine tool trade, is encouraging for continued active business between now and Dec. 1. No one expects anything sensational to develop in the way of bulk sales, but steady, consistent buying which will form a fair volume in the aggregate, is expected. New orders coming to foundries and machine shops are increasing after being on the decline for thirty to sixty days, and steady employment of shop facilities until the end of the year seems to be fairly well assured at this time.

Full Employment Reported

The monthly summary of local conditions issued by the largest bank in Milwaukee says the situation is again one of full employment, following a letdown in the demand for common labor late in June. For a period, covering May, June and July, there was a falling off in bookings of orders by the leading iron, steel and machinery firms, but the trend since Aug. 1 is better. In the automobile, parts and accessories group business has been well maintained, and only in one month since the first of this year has there been a reduction in the payroll numbers of this group. It is also stated that prospects for the foundries and machine shops dependent upon the automobile industry are reported to be exceptionally good.

The local used tool market, while not uncomfortably filled with second-hand equipment, has perhaps more to offer now than in more than a year's time. The liquidation of a number of metal working concerns, several of more than moderate size, is being accomplished without achievement of the aim of keeping them intact, as had been expected, and the result is that the properties are moving into new hands in small lots rather than in bulk.

New York Dealers Optimistic

Two prominent machine tool dealers in New York City had no hesitancy in stating that they expected a full return to the earlier prosperity of this Spring sometime during September and one of them stated that he would set the fifteenth of the month as the starting point for a rush of orders. Meanwhile all dealers in both new and used machinery are consoling themselves with a comparison of figures. Business this August is far ahead of that of the same month last year and is equal and in some cases ahead of July of this year. Every dealer in the Metropolitan district will have a record breaking year in both volume of business and number of sales if business does no better than stays as good as it is at present.

Railroad buying continued this year and the Central of New Jersey R.R. completed purchases on a list recently sent out. The Baltimore & Ohio R.R. also was in the market with a good list and deals were expected to be completed either this week or the first of next.

One big industrial in the Metropolitan district has signified its intention of replacing much of its equipment and, while the name of the concern was not learned, it was understood to be a large one and the amount involved well over $50,000.

Automotive buying has not been up to the anticipated mark, but there have been some few machines bought during the past week and many more are needed in the shops around New York City.

Used machine tools sold well this week and no trouble was found in purchasing in plants that are replacing with new tools.

Busy Fall Expected in Chicago

The past week did not bring any improvement in machine tool sales in the Chicago district. Second-hand machinery is selling fairly well. Dealers in new machinery anticipate an improvement during the next three or four weeks. The Western Electric Co. purchased a few tools during the week and the Elgin, Joliet & Eastern R.R. placed an order for several machine shop tools. The Southern R.R. purchased six machine tools.

Inquiry for pig iron is again extremely quiet in the Chicago district. There have been practically no sales of importance during the last week. Reports of active trading in the Chicago pig iron market which have come from the East are not authentic as selling agencies here report an extremely quiet market with little more than car load lots wanted and few of them. There have been several sales recently as high as 700 tons, but nothing larger than this could be verified. Blast furnaces are still forced to pile a good portion of their product and production is being further curtailed.

There has been a slight reduction in the number of persons employed by the metal trades in the Chicago district but there is demand for skilled workers.

Personals



J. P. MOSES

J. P. MOSES of Joseph T. Ryerson & Son, Inc., Chicago, has just been appointed general manager of railroad sales, with offices in Chicago. He succeeds H. A. GRAY, who has resigned to enter another field of business. Mr. Moses has been with the firm of Joseph T. Ryerson & Son, Inc., for over 22 years and is well known in railway circles.

H. T. BRADLEY, of Jos. T. Ryerson & Son, Inc., Chicago, who has been serving the railroad field for many years in the East, has been appointed manager of Eastern railroad sales with offices in New York City. Mr. Bradley came with the Ryerson company in 1906 and spent a great deal of his time as a sales engineer in the machinery department. For the past seven years, however, he has been associated with the railroad division as assistant manager. He has concentrated his efforts largely on staybolt iron and special railroad machinery.



H. T. BRADLEY

ROBERT L. CRANE, formerly western New York manager for Henry Prentiss & Co., will have charge of the Buffalo office of the newly formed organization, Crane-Schiefer-Owens, Inc., that has taken over the Crane Machinery Co., Buffalo. Mr. Crane was the general manager for the Crane company.

FREDERICK W. SCHIEFER, recently resigned from the Rochester office of Henry Prentiss & Co., New York, will have charge of the Rochester office of Crane-Schiefer-Owens, Inc., recently formed in Buffalo with offices in Buffalo, Rochester and Syracuse.

W. E. CROSS of Clemson Bros., Inc., Middletown, N. Y., recently returned from a four months' trip to Europe. His many interesting experiences were chronicled at some length in the Middletown papers as well as his opinion of business conditions in Europe.

EUGENE L. BEISEL, formerly with the Reeve-Fritts Co., Chicago, will represent Charles H. Besly & Co., Chicago, in New York and Pennsylvania. Mr. Beisel's headquarters will be at 79 Norwalk Ave., Buffalo.

E. E. GAGNON has accepted a position with the Whitman & Barnes Manufacturing Co., Akron, Ohio.

S. R. CUMMINGS has accepted a position as research engineer with the Hoover Suction Sweeper Co., North Canton, Ohio.

JOHN F. CUNNINGHAM, JR., has been appointed assistant manager of the production department of the Schenectady works of the General Electric Co.

N. W. STIRLING has been made president and treasurer of the Stirling Machine & Boiler Co., Jersey City, N. J.

DR. THOMAS ADDISON has retired as Pacific Coast manager of the General Electric Co. and will be succeeded by J. A. CRANSTON, formerly Northwestern manager. Dr. Addison has been with the company for 33 years, and has held his present position since 1892.

A. W. GRAY, works manager of the Billings & Spencer Co., Hartford, Conn., has resigned.

J. H. G. WILLIAMS, assistant works manager and metallurgist of the Billings & Spencer Co., Hartford, Conn., has resigned.

F. E. BALLDA has been appointed assistant to H. C. OVIATT, general mechanical superintendent of the New York, New Haven & Hartford R.R. with headquarters in New Haven.

JOHN REID has been appointed superintendent of the Readville shops of the New York, New Haven & Hartford R.R., succeeding F. E. BALLDA.

WILLIAM HURST has been appointed shop and tool specialist at the Readville shops of the New York, New Haven & Hartford R.R.

ELIJAH WILDES has been appointed general foreman of the Readville shops of the New York, New Haven & Hartford R.R.

T. J. FOLEY has been made supervisor of production of the Readville shops of the New York, New Haven & Hartford R.R.

JOHN B. EMORY has been appointed works manager of McCord & Co., West Pullman, Chicago.

EMORY W. JONES has been appointed district sales representative of the Carborundum Co., Refractory Division, at Perth Amboy, N. J. His territory includes northwestern Pennsylvania, northern Ohio, and part of Michigan. His headquarters will be in Cleveland and Detroit.

JAMES HOLIHAN will be in charge of sales for the General Accessories Co., of Pontiac, Mich., in Detroit. Mr. Holihan was formerly with the Briscoe Manufacturing Co.

M. D. HOPKINS will represent the Max Ams Machine Co., New York, in the Chicago territory. His office will be located at 20 East Jackson Boulevard. Mr. Hopkins was formerly with the Angelus Sanitary Can Machine Co., of Los Angeles, Calif.

GEORGE C. SHADE has resigned as purchasing agent of the Fort Pitt Bridge Works, Canonsburg, Pa.

R. L. CLARK has been made general superintendent of the Billings & Spencer Co., Hartford, Conn.

W. R. CROKE has been made superintendent of the small tools department of the Billings & Spencer Co., Hartford, Conn.

Obituary

GEORGE L. HARVEY died recently in Chicago. Mr. Harvey was an early designer of steel cars and was also the inventor of the Harvey friction draft gear spring.

HENRY B. CARTWRIGHT, formerly district engineer of the Seaboard Air Line with headquarters at Jacksonville, Fla., died recently in that city.

Business Items

The Oilgear Co., Milwaukee, Wis., announces the appointment of the E. A. Kinsey Co., 235 South Meriden St., Indianapolis, as selling agent for Oilgear products of the states of Indiana, Kentucky and Tennessee.

Crane-Schiefer-Owens, Inc., will succeed the Crane Machinery Co., and offices will be established in Buffalo, Rochester and Syracuse.

The fire that destroyed the Newark Baseball Park recently did not damage the buildings of the Driver-Harris Co., Harrison, N. J., situated adjacent to the park, contrary to reports that gained circulation following the fire.

The Florida Screw Machine Products Co. was incorporated in August at Jacksonville, Fla., with $50,000 capital, for the manufacture of machinery and machinery supplies. Officers are M. F. Marshall, president; M. Howell, vice-president; T. Duncan, secretary and treasurer.

The Southern Metal Trades Association, Healey Bldg., Atlanta, is preparing to issue within 60 days its 1924 edition of the Blue Book and Buyers Guide of the metal trades industries of the South, according to an announcement by William E. Dunn, Jr., secretary of the organization. This is the second annual issue, and it will list alphabetically all products manufactured by members of the S.M.T.A., and also contain a complete list of the members throughout the South. It will be distributed to buyers of iron and steel products throughout the country.

Rebuilding of the Shenango Furnace Co.'s machine shop at Sharpsville, Pa., which was damaged by fire a few months ago at a loss of about $50,000, has begun. The company recently purchased its requirement of new machine tools.

A fire in the plant of the Davitt Iron Works, Springfield, Mass., recently, caused about $100,000 loss, including much damage to patterns belonging to several industrial concerns in the vicinity.

According to a recent announcement by Morton Jones, of Asheville, N. C., president of Morton Jones & Co., recently organized and incorporated in that city, the company is planning the early establishment at Asheville of a plant to include foundries and shops, for the manufacture of hot air heating furnaces and accessories.

Transfer of the plant, equipment and other assets of the defunct United States Automatic Gearshift Co., Eau Claire, Wis., to B. R. L'Hommedieu of Madison, Wis., was completed Aug. 20. Preparations are being made to resume operation, although the production of hydraulic units for operating automobile transmission gears will be made subsidiary to general mechanical appliance manufacture. The property was bid in at trustee's sale some time ago by Mr. L'Hommedieu for $41,500.

The Whiting Railway Motor Car Co. was incorporated at Tampa, Fla., with $200,000 capital the latter part of August, for the manufacturre of railway cars. Officers are A. P. Stucky, president; J. A. Whiting, vice-president; and F. W. Brown, secretary and treasurer.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THE few changes that occurred in the business outlook last week were all for the better. In the gasoline war the heavy artillery bombardment is all over and though a few skirmishers are firing desultory shots the smoke is lifting from the field and it is seen that the carnage will not be great after all. It is doubtful, too, whether any means other than drastic price cutting could have been devised to overcome the effects of the steady accumulation of stocks which has followed the reckless exploitation of the country's oil resources during the past few years. The oil industry, as a whole, has unquestionably brought its troubles down on its own head. What it needs, perhaps, is a general commander such as moving pictures and baseball have, for unless the industry itself can devise a means of overcoming the waste of flush production public demand in years to come will likely insist on the appointment of such a commander in the person of the government.

The "near war" abroad is also probably nearer settlement. It is true that Poincare's answer to the British note showed no intention to compromise, but he has assented to a meeting with Baldwin at which he may be made to understand the exigencies of the moment somewhat better. Private advices from England tell me that the downfall of Poincare in the French elections next November would not be surprising. They say that Paris opinion is not French opinion, and express great doubt that the premier has the wholehearted support with which he is generally credited here. And if the international value of the French franc should decline further his position will be weakened correspondingly. Belgium, of course, is continually on the verge of taking England's side of the controversy, and on the whole it seems that the European outlook in the distance grows brighter. Certainly there is no reason to expect any further dispiriting effect on the American markets.

Coming back home again, some disquietude is being expressed in certain circles over the fact that the "radicals" may hold the balance of power in the next Congress. Nominally the Republicans have a majority of eight in the Senate and of fourteen in the House, but the shift of only five Senators or eight Representatives of the LaFollette-Brookhart school to the minority can effectually counteract President Coolidge's New England conservatism. The difficulties in the Administration's way are obvious, but those who ascribe undue power to the "radicals" forget that there are also conservatives among the Democrats who may be relied on to line up against them.

It has been the history of the United States, both before and since John Stuart Mill made the observation more than sixty years ago that "Americans when confronted by a grave economic question have often seemed upon the point of doing the wrong thing, but in the end the common sense of the people has prevailed and they have done the right thing."

A year ago at this time it seemed that we were doing many "wrong things." We were still in the throes of the railway shopmen's strike. We were just approaching the end of a long and disastrous coal strike which affected the whole country. The prices of farm products were relatively lower than other commodities and wage advances were being granted in many industries. Complaint over high taxes was general and the political pot was boiling furiously. With all these drawbacks industrial production has made great strides and as compared with the previous year it showed gains ranging from 12 per cent in cotton goods to 177 per cent in pig iron.

> "The slight falling off in production and trade since Spring is but necessary leisure for digestion. The business organism gorged itself in the Spring when activity in many lines, notably building and automobiles, reached unprecedented levels. As a result, digestion is proceeding at leisure and without distress and it should be completed soon and normal activity resumed."

Today some business men are bemoaning a decline in production, and sentiment on the whole is less optimistic than it was a year ago. Yet the facts are these: The railroads are free from labor trouble and are carrying the greatest traffic of their history with extraordinary efficiency. There are no important strikes in progress and if the coal strike occurs it will be confined to anthracite; nor will it cause distress until late Winter. This year's crops are more valuable than last year's and the farmer's power to purchase other commodities is greater. The economy enforced on the government has brought taxation relief appreciably nearer. And production in the leading industries during July compared with the excellent showing of a year ago, showed gains ranging from 1 per cent in cotton goods to 50 per cent in pig iron.

The Federal Reserve ratio of 77.9 per cent is virtually as high as a year ago; credit is abundant and money rates are not seriously higher. The slight falling off in production and trade since Spring is but necessary leisure for digestion. The business organism gorged itself in the Spring when activity in many lines, notably building and automobile, reached unprecedented levels. It was just as impossible for business to keep up the pace as it would have been for an individual. Fortunately the warning to let down came in time. It came from distributors in whose memory the lessons of 1920 were fresh. It came before stocks had been piled up to top heavy proportions in the invisible channels of trade when few could have taken account of them. As a result digestion is proceeding at leisure and without distress and it should be completed soon and normal activity resumed.

The specific record of the week includes firmness in stocks and bonds, maintenance of the improvement in grain and livestock prices, a cotton market which held up well under pressure of the early selling in Texas and improved crop prospects, and steadiness in most other commodities. The railroads report that Summer tourist travel is heavier than last year, which tells only part of the story as doubtless the increase in the number traveling by automobile has been much greater. Life insurance sales, another reliable "business barometer" were 18 per cent greater in July than they were a year ago.

The importance of the decline of commodity index numbers is being overstressed in many quarters. It has been partly the result of normal seasonal influences and partly of conditions affecting a few commodities, such as sugar, which were overbought early in the year. From these levels it is just as reasonable to look for a general advance as a continuation of the decline. The heavy sales of gasoline now reported furnish sufficient evidence of the power of low prices to increase consumption. On the whole the fact that prices have receded from their heights is one of the encouraging features of a generally cheerful outlook.

Winnipeg Company Gets Chinese Contract

Contracts for the construction of 1,200 miles of railroad in China, involving an expenditure of about twenty million dollars have been received by the Northern Construction Co., Winnipeg, Man. The new line will extend from Canton to Chengtu and will pass through some difficult country, necessitating the building of tunnels. Local officials of the company expect to go to the Orient in the near future to take charge of the work.

News of Washington Activities

By Paul Wooton

EXPRESSING optimism that resumption of negotiations between the anthracite operators and miners will result in an agreement so that work in the hard coal fields may continue without interruption, but asserting that should there be a failure to do so they will report the facts and fix responsibility and make "appropriate" recommendations to the President, members of the Coal Commission returned to Washington recently from their conferences in New York with operators and miners which brought about an agreement to resume negotiations later.

While the atmosphere of official Washington is hopeful that the crisis in the anthracite situation has passed and that from the reopened negotiations will come, if not an immediate agreement on all points at issue, at least an arrangement by which work will continue without interruption, spokesmen for the Administration have let it be known that plans have been perfected to forward heavy shipments of substitutes for hard coal—bituminous coal and coke—into the anthracite consuming sections should a cessation of operations in the collieries come Sept. 1, or at any date.

Although "a cessation of production of any essential commodity cannot be viewed as a pleasant prospect," to use the words of one high Government official, and it is realized that to provide substitutes would entail longer railroad hauls in many cases, place a strain upon open-top car supply and create other problems, yet the plan, it is felt, will insure the people and the industries of the anthracite-consuming regions against suffering from cold or a shutdown of plants.

The Federal Fuel Distributor, F. R. Wadleigh, will be placed in charge of distribution of substitutes if production of anthracite ceases. The broad powers of the Interstate Commerce Commission will be employed to execute the plan. Mr. Wadleigh's office as Federal Fuel Distributor expires by limitation Sept. 22, but it is pointed out that he can be appointed an agent by the Interstate Commerce Commission, and this will be done if the necessity arises.

For several months, Mr. Wadleigh has been making an especial study of transportation of coal and this, added to his broad experience in fuel matters, it is felt by officials, marks him as the logical authority to place the system of distributing anthracite substitutes in operation if that action becomes necessary.

The National Coal Association, through its president, J. C. Brydon, speaking for the bituminous operators, has offered a plan to the Government of supplying soft coal to the anthracite-consuming areas, with voluntary committees of operators to assist and with traffic experts to aid the distribution, while at the same time agreeing in advance to submit to voluntary price-regulation or supervision by the Federal government. The plan in view by the Government will be a government plan, but it is highly probable that the offer of the bituminous operators will be accepted, should occasion arise, at least in major part.

It is evident that in the event of another deadlock between the anthracite miners and operators at Atlantic City, the Coal Commission will resort to an appeal to public opinion, through a statement which will attempt to fix in the public mind the responsibility for the condition.

President Coolidge has displayed deep interest in the coal situation. He has left efforts to compose the situation in the public interest in the hands of the Coal Commission, but is being kept closely informed as to developments. It was after a conference with the chief executive that the Coal Commission sent telegrams inviting representatives of the miners and operators to meet members of the Commission in New York, a meeting which produced resumption of negotiations.

Attorney General Daugherty, Secretary Hoover, Secretary Weeks and several senators and representatives have conferred with the President regarding the coal situation in the last week.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb....	$0.0337	$0.0337	$0.0278
Cold finished shafting.....	per lb....	0.0428	0.0428	0.0415
Brass rods.....	per lb....	0.1741	0.1825	0.1413
Solder (½ and ½)	per lb....	0.276	0.276	0.180
Cotton waste...	per lb....	0.1231	0.1231	0.10
Washers, cast iron (⅛ in.)...	per 100 lb.	4.66	4.66	4.06
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100...	3.08	3.08	3.11
Lard cutting oil	per gal...	0.575	0.575	0.575
Machine oil....	per gal...	0.349	0.349	0.36
Belting, leather, medium.....	off list....	37%	37%	46⅔%
Machine bolts up to 1x30 in.	off list....	44¼%	44¼%	59%

International Meeting of Standardizers

A conference of the secretaries of national industrial standardizing bodies was held in Switzerland, July 3 to 7. Thirteen countries were represented, including all of the more important industrial nations of Europe and America. The sessions were held in Zurich and in Baden.

A leading topic discussed by the conference was the interchange of information between the various national bodies during the development of the work in the different countries. At the first conference held in London two years ago, arrangements were made for the systematic interchange of completed work and, to some extent, of information on work in progress. Experience had shown such an early interchange to be extremely important for the work within the different countries from the national viewpoint alone and quite irrespective of the question of international standardization.

While it was not possible to overcome all the difficulties existing by virtue of the important industrial considerations involved, very substantial progress was made. It is believed that the steps taken will lead immediately to a substantially increased amount of interchange of information during the earlier stages of standardization work, and that the way has been paved for a much more extensive interchange in the future.

Provision was made for continuing the work of the conference on the many administrative problems of common interest, through a loose-knit continuing organization. An example of such work planned by the conference is the translation of technical terms of special importance or difficulty in standardization work. There will gradually be built up such a vocabulary of technical terms, mainly in English, French, and German, but supplemented as far as may be feasible and necessary by the corresponding terms in other languages. Another example is the work undertaken by the conference on the classification and nomenclature of standards. The American Engineering Standards Commitee was represented at the conference by P. G. Agnew.

Auto Trade Thrives in Canada

Thriving conditions in the automobile industry in Canada are indicated in a comprehensive report compiled by the Dominion Bureau of Statistics dealing with motor manufacture and export during 1922. The report shows that following the slump in 1921, every branch of the industry began to pick up, and in most cases exceeded the records made in the banner year of 1920.

"The number of automobiles manufactured in Canada during 1922" the report states, "exceeded all previous records, and reached a total of 101,007, or seven per cent more than the maximum production of former years attained in 1920, and 53 per cent more than the output of 1921. The total value of the output was $81,956,429, or $14,906,220 greater than in the preceding year, although $19,509,417 lower than the corresponding figures for 1920."

It is interesting to note the increase in public favor of closed cars, due, in all probability, to the larger number of motorists who are driving cars throughout the Winter. In 1920 the output of coupes was 3,276, and of sedans, 4,681. In 1922 the numbers rose to 5,367 for coupes and 10,431 for sedans. The production of runabouts increased slightly from 3,759 in 1920 to 4,700 in 1922.

Germany's Production Seriously Curtailed

Ruhr occupation is now being felt by industries in all parts of the country—Mark stabilization and its disastrous result—Investing in foreign securities and making big profits

By OUR BERLIN CORRESPONDENT

THE first six months of Ruhr occupation have belied nearly all forecasts pronouncing immediate disaster for industry due to lack of fuel, raw material and the numberless kinds of semi-finished material of which the steel works in the Ruhr are almost the only source of supply. No shortage of any kind has become visible; the string of supply continues unbroken.

But at the beginning of the second half-year a complete change of the situation was evident. Rents in the economic fabric became evident, rapidly increasing in size and numbers until everything seems to approach a state of disorganization and disintegration with chaos close behind. Matters might not have taken this sinister course for a while, but continued in a semblance of order had it not been for the well-meant, but faulty measures of the government. The latter were responsible for the first disaster that befell the industry after the occupation —the business slump, caused by the unfortunate attempt at mark stabilization. The extent of this depression has become evident by its duration long after the mark stabilization had broken down. Just at the time when business commenced to recover from this blow, a second attempt in the same direction, but engineered differently, seems to be breaking industry's backbone completely. The restriction placed upon import caused by the governments' attempt to monopolize the money exchange, dealing out foreign bills in dribs had been in force only a few weeks, when a stringency not only of imported but also of home-produced material made itself felt. Complaints with regard to an insufficient supply of raw material and especially semi-finished products, even of a complete stoppage have been forthcoming in quick succession.

Lack of Raw Material

A number of machine building works had to curtail production at the very beginning of this new development. It is quite clear that the restrictions of import cannot have produced this effect but have only accentuated the approaching exhaustion of the reserves in the country. Naturally this does not apply to products obtained by importation exclusively. The machine building industry scarcely uses such products. A glance into the official statistics shows that the import of such kind of raw material which that industry requires has in the first five months of the year increased only in a small measure, compared with the corresponding period of last year. The exhaustion of reserves marks a highly critical stage in the course of events. Even if ways and means are found to liberate the import business from financial restraint, the import market could not substitute the Ruhr supply of the machine building industry in its entirety. There are numerous brands of material and shapes for which the Ruhr is to the machine building industry the only source of supply in existence.

It was obvious since the Ruhr blockade that a state would be reached sooner or later when the absence of the Ruhr supply must cripple the machine building industry in the German interior. Manufacturers as well as the Government have shut their eyes before this contingency, as the duration of the Ruhr tragedy has generally been underestimated. From all signs, that state of affairs has now arrived. It bears a close resemblance to war times and will no doubt lead to the makeshift methods evolved during the former. The lessons taught in war times are becoming a valuable asset.

If the industry is now more and more becoming dependent on foreign supply, not only of fuel but in nearly every other respect, the important question arises whether there are sufficient means in the country to pay for imports. This question is of a rather complex nature. The financial landslide of recent months is generally ascribed to the largely aggravated state of the trade balance. It is quite clear that a considerable part of the gold funds in the country have gone in exchange of imported goods. It would, however, be an entire misconception of facts to hold the excess of import solely responsible for the present financial calamity. There are other causes of a momentous nature which have sapped the State's life blood in a much larger measure. Foremost amongst them stands the credit system. The enormous inflation of the last months is largely due to the credits extended not only to the industry of the occupied zones, but also to the German interior which have reached gigantic dimensions.

> "The restriction placed upon imports caused by the government's attempt to monopolize the money exchange, dealing out foreign bills in dribs, had been in force only a few weeks when a stringency not only of imported, but also of home produced material made itself felt. Complaints with regard to an insufficient supply of raw material and semi-finished products have been forthcoming."

Juggling the Marks

The downslide of the mark had greatly reduced the value of these huge sums. Since the manufacturers are in the habit of investing all available cash in foreign securities thereby keeping its substance intact and then discharge their indebtedness at a much lower mark rate they are heavy gainers under this system. The State treasury, which supplies these securities, moreover at low rates, is equally the loser and the sole loser.

A case which has caused a good deal of public comment may here be quoted as specially illustrative. Shortly after the Ruhr occupation a Rhenish firm of manufacturers of machinery, iron and steel products, credited with huge means applied for and received a loan of 1,000 million marks, for the purpose of keeping its works going. This sum was admittedly invested at once in "value preserving" securities, or to be more distinct in dollars and pound sterlings, which the state bank then supplied at the rate of 20,000 marks to the dollar. Several months later the firm discharged this debt and successfully arranged for a new and much larger one. At that time the mark rate was 500,000 to the dollar. The firm had therefore only to realize 2,000 of the 50,000 dollars it received to pay back their debt, thereby making a net profit of 48,000 dollars. Such cases are not singular but rather typical. It is no exaggeration of facts to say that about a fourth part of the whole population is thriving on this system.

Paper Credit, Gold Cash

The government has now, with great reluctance opened the road to gold credits, but no one wants such as long as a paper mark credit can be had. The latter is, while the mark continues its downslide, a sure road to wealth. Similar conditions exist with regard to the advance payments made to manufacturers, averaging from one-third to one-half of the purchase price. These payments are supposed to enable the manufacturer to buy the material needed and to pay part of the cost of labor. Naturally the manufacturer does not buy material at the receipt of each advance payment and does not pay his workmen for weeks ahead. Instead he does what the recipient of a loan does, invests in foreign securities. The result to the State treasury is identical. The dangerous depletion of the latter is therefore not due to import purchases alone. A large part of its funds have not left the country but have simply changed hands. The hands which received them were chiefly those of manufacturers. These hands are also keeping a firm grip on gold securities as is shown by recent experience.

When dealing out foreign bills for import in small allotments only it was supposed that manufacturers would supply the rest from their own funds. As could be seen they did not do that, but stinted their works with regard to supply rather than part with their gold funds. The only way out of this muddle is doubtless the return to the gold standard for all business transactions. The country is fast approaching this state, after the stabilization of wages has cleared the road. This does not necessarily mean the abandonment of the paper mark, although it will precipitate its ultimate fate. The strain of the financial situation would doubtless not have been as great had it not been for the diminution of export which

deprived the State of a considerable part of its gold revenue.

It will be remembered that exporters have to surrender part of the foreign bills they receive from export to the Government in exchange for paper marks. This part which was at first 25 per cent has lately been increased to 40 and 50 per cent. The drop of export was chiefly due to the conditions in the Ruhr and the other occupied parts where shipping is practically paralyzed, and also in a measure to the depression of the export business in the interior, following the mark stabilization in February.

The machine building industry is effected less strongly. From January to May, 138,818 tons of machinery have been exported as against 187,387 tons in the corresponding period of 1922.

The deficit has been accumulated during the last two months of the period mentioned and is heard to have further increased in the consecutive months for which authentic figures are not yet available. The May shipments of 24,600 tons were 40 per cent below last year's monthly average.

The import of machine tools in May kept within narrow limits. Except 13 tons coming from Austria and 6 tons from other countries not specified, all in all 41 pieces, no imports are recorded. The monthly average of 1922 was 108 tons or 120 units. The total of imports from January to May 1923 was 307 tons or 344 pieces compared with 542 tons or 639 pieces in the corresponding period of the preceding year.

Cost of Living Shows Slight Increase

The cost of living in the United States on July 15, 1923, was 61.9 per cent higher than in July, 1914, according to the results of a comprehensive investigation just completed by the National Industrial Conference Board. Between June 15 and July 15, 1923, there was an increase of 1.8 points or 1.1 per cent. This was brought about by continued advances in the cost of food and clothing and further increases in rents. Fuel prices were a little lower, while average sundries and light charges remained unchanged. Between July, 1920, when the peak of the rise in the cost of living since 1914 was reached, and July, 1923, the cost of living dropped 42.6 points or 20.8 per cent. Within this three-year period a number of shifts in costs occurred. Food and clothing prices and the average cost of all sundries combined were lower in 1923 than in 1920. Rents, on the other hand, in 1923 were at the highest average yet reached for the country as a whole. Coal prices, after mounting much higher during the Winter of 1922-1923, in July, 1923, were at the same level as in July, 1920.

Maxwell Motors Shows Large Profits

The Maxwell Motors Corp. and its subsidiaries for the six months ended June 30, 1923, reports net profits of $3,072,531, an amount in excess of the total profits for the full years 1919, 1920 and 1922. The net profit is calculated after provision for taxes, insurance, depreciation and interest charges.

Record for Locomotive Deliveries

Seven new locomotives on the average were placed in service on railroads throughout the United States for every day of the first seven months this year, according to figures made public by the Department of Commerce. This report states that 1,543 new locomotives had been delivered to the railroads of the United States from the principal locomotive works.

The vastness of the new motive power is more significant when it is considered that during the same period of last year there were only 342 new locomotives delivered to the railroads in the United States. But even there, railroad men point out, the comparison should not stop. The report of the Department of Commerce shows that 1,652 new engines were either under construction or on order on Aug. 1 of this year. Should these locomotives be delivered during the remainder of the year the total for the year would be close to 3,200.

Freight Record Lowered by Harding Funeral

Loadings of revenue freight for the week ended Aug. 11, totaled 973,162 cars, according to the American Railway Association. This decrease of 59,968 cars under the week of Aug. 4, was largely due, the report states, to the observance of President Harding's funeral.

Although the loadings were under the previous week, they still remained 130,472 cars over the same week of 1922 and 164,893 cars more than were loaded in the corresponding week of 1921.

Merchandise and miscellaneous freight, which are taken as an indication of manufacturing conditions throughout the United States, totaled 550,746 cars. This was a decrease of 34,442 cars under the previous week, but an increase of 10,221 cars over the corresponding week of last year, as well as 69,268 cars over the same week of 1921.

Will Wage Warfare on Accidents

Capital and labor, at the earnest solicitation of Governor Alfred E. Smith and State Industrial Commissioner Bernard L. Shientag, of New York State, have joined hands in the first comprehensive movement to cut down industrial accidents in New York State, now totaling about 300,000 each year with an average of 1,300 fatalities. The employers and the workers who are in the vanguard of the crusade are to have the active help of civic and welfare organizations, and every available agency will be used to carry the message of safety to the industrial establishments of the State.

The first move in the campaign to reduce this annual toll of economic wastage and human suffering was the conference held a few days ago at the State Labor Department's headquarters in New York City. At this meeting, which drew together several hundred men and women, many known nationally for their activities along commercial, industrial and welfare lines, it was decided to form an educational council to cooperate with the Labor Department in the campaign and to divide the State into six districts in order that the most intensive sort of crusade may be carried on. Headquarters of these six districts, which will operate under the direction of the council or central committee, will be in New York, Albany, Binghamton, Syracuse, Rochester and Buffalo.

Hayes Wheel Co. Shows Good Profit

The Hayes Wheel Co., Jackson, Mich., wood and wire wheels and wheel parts, for the first six months of the current year reports gross sales of $9,672,812 as compared with $6,155,431 in the corresponding period of 1922. Net profits for the first half of 1923 are shown as $900,026, against $510,331 in the first six months of last year.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Automobile accessories. Aarau, Switzerland. Purchase and agency. Reference No. 7509.

Automobile frames, transmissions, differentials, and front and rear axles. Posen, Poland. Purchase. Reference No. 7511.

Steel ball bearings. Johannesburg, South Africa. Purchase. Reference No. 7496.

Ebonite manufacturing machinery such as horizontal jacketed vulcanizing pans and grinding and mixing machinery. Croyden, England. Purchase. Reference No. 7510.

Forthcoming Meetings

International Railway General Foremen's Association. Annual convention. Hotel Sherman, Chicago, Ill., Sept. 4, 5, 6 and 7. William Hall, secretary, 1061 W. Wabash Ave., Winona, Minn.

New Haven Branch of the American Society of Mechanical Engineers. Third annual machine tool exhibit Sept. 18, 19, 20 and 21. Mason Laboratory, New Haven, Conn. A. C. Jewett, chairman.

Association of Iron and Steel Electrical Engineers. Iron and steel exposition, Buffalo, Sept. 24 to 28. John F. Kelly, secretary, Association of Iron & Steel Electrical Engineers, 708 Empire Building, Pittsburgh, Pa.

National Safety Council. Twelfth annual congress at Buffalo, N. Y., Oct. 1 to 5. All meetings will be held at the Statler Hotel. Headquarters, 168 No. Michigan Ave., Chicago, Ill.

American Society for Steel Treating. Annual convention at Pittsburgh in connection with the International Steel Exposition, Oct. 8, 9, 10, 11 and 12. W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio, national secretary.

Society of Automotive Engineers. Production meeting at Cleveland, Ohio, Oct. 25 and 26. Headquarters, 29 West 39th St., New York City.

American Management Association. October 29, 30, and 31. Hotel Astor, New York City.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8. Headquarters, Grand Central Palace, New York City.

New and Enlarged Shops

Machine Tools Wanted

Colo., Lamar—E. D. Draper (plumber)—pipe threader.

Colo., Lamar—Golloday & Watson—automobile cylinder grinder.

Colo., Lamar—North Side Battery Shop, 101 North Main—lathe.

Ill., Rockford — G. Watson, 520 Brown Block—18 to 22 in. drill press, electric drill and air compressor.

Kan., Johnson City—H. Berman—lathe, drill press, emery stand, belting and hangers for garage.

Kan., Wichita—West Side Garage, 300 West Douglas Ave.—lathe and arbor press.

Mass., Boston—Basil & Hutchins, Tremont and Camden Sts.—lathe, planer, upright drill, hack saw, pipe and bolt threading machine, shafting, pulleys, belting, also small tools for proposed $50,000 garage.

Mich., Niles—Natl. Standard Co.—complete machinery for the manufacture of beads, air compressors, automobile and railroad jacks, for new plant at Akron, O.

Mo., St. Louis—L. Grohe, 2416 Menard St.—lathes, drills, emery wheels and general equipment for automobile repair shop and garage.

Mo., St. Louis — A. J. Ickenroth, 1012 Yale Ave.—lathe, presses and other general equipment for garage at 6808 Clayton Ave.

Mo., St. Louis—Natl. Metal Trades Assn., 414 Odd Fellows Bldg. (metal working)—medium size drill press.

Mo., St. Louis—D. Wolff & Sons, 2219 South 4th St. (machinery)—lathe, drill press, belting, etc.

N. Y., New York—Pavan Garage, 104 East 126th St.—lathes and miscellaneous tools for garage.

N. C., Winston-Salem—Lindsay-Fiskel-Buick Co.—reamer and burning in machine.

O, Columbus—Acme Motor Truck Sales Co., 171 South Front St., L. Bock, Service Mgr.—grinder, milling machine, etc.

O., Dayton—Recording Devices Co., 5th and Norwood Sts.—about 200 machine tools for the manufacture of automobile parts and accessories

Pa., Vienna (Coon Island P. O.) — J. Sheasley & N. Pound—equipment for garage and repair shop.

Tenn., Knoxville — Duncan Mchy. Co., P. O. Box 265—8 ft. engine lathe, 24 in. swing.

Va., Radford—Radford Motor Co.—lathe, drill press and bench tools.

Va., Richmond—Acme Auto Service Co., 902 Hull St.—drill press.

Va., Richmond—D. T. Burch, 2043 West Broad St.—reamer and burning in machine.

Va., Richmond—H. K. Dabney, 1831 West Broad St. (automobile repairing)—reamer.

Va., Richmond—Franklin & Studebaker Service Sta., 1621 West Broad St.—lathe and drill press.

Va., Richmond—Fulton & Barnes, 1643 West Broad St.—drill press for automobile repairing.

Va., Richmond—A. R. Hall, 1623 West Broad St.—shaper for automobile repair shop.

Va., Richmond—H. T. Holt, 717 Hull St.—lathe, drill press and grinding in machine for automobile repairing.

Va., Richmond — C. Long, 1011 West Broad St.—drill press for automobile repairing.

Va., Richmond—G. B. Nichols, 903 Hull St.—drill press and tinner's tools.

Va., Richmond — C. G. Reynolds, 1209 West Broad St.—drill press and emery wheel for automobile repairing.

Va., Richmond—Richmond Typewriter Exchange, 24 North 7th St.—small lathe.

W. Va., Bluefield—Kirk Motor Co., E. S. Kirkpatrick, Mgr.—lathe, bench tools, etc.

W. Va., Logan—Guyan Machine Shop—cylinder grinder for automobile repair work; slitting shear and punch for ½ in. plate; 250 ton hydraulic wheel press.

Wis., Fair Water—C. Kuehn (machinist)—medium size lathe, 20 in. drill press, emery stands and air compressor, to replace that which was destroyed by fire.

Wis., La Crosse—F. Miller, 433 Avon St.—automobile repair machinery, gasoline tanks and pumps for proposed service station and garage.

Wis., Milwaukee—Heating & Power Appliance Co., 200 Pleasant St.—one engine lathe, 16 to 18 in. swing.

Wis., Neenah—Wisconsin River Paper & Pulp Co., 201 West Wisconsin Ave.—pipe threading machine for pipe up to 6 in. diameter for plant at Stevens Point.

Que., Coteau du Lac—A. Tremblay—complete garage and repair shop equipment.

Que., Hemmingford — Millars Garage — automobile repair equipment.

Que., Knowlton—N. H. Robinson—repair equipment for garage.

Que., La Tuque—J. P. Simard—garage and repair equipment.

Que., Laurierville — Garage Couture, C. Couture, Purch. Agt.—automobile repair shop equipment.

Que., Loretteville—G. P. Riout—machine tools for garage.

Que., Mansonville—J. A. Roberge (garage)—shaper, borer, etc., also machine for pressing wheels.

Que., Marieville—C. E. Prefontaine—automobile repair equipment.

Que., Nicolet—N. Lafond—automobile repair shop equipment.

Que., Ormstown—C. A. Anderson—garage and repair equipment.

Que., Paspebiac—J. E. Levesque—complete automobile repair shop equipment.

Que., Pierreville—Houle & Frere—automobile repair shop equipment.

Que., Quebec—P. Moisau, 926 Rue St. Valier — machine and blacksmith shop equipment.

Que., Roxton Pond—H. Ballard—automobile repair equipment.

Que., St. Bernabe Nord—O. Charbonneau (blacksmith)—machine shop equipment.

Que., St. Chrysostome — M. Struthers (blacksmith)—threading machine and other tools.

Machinery Wanted

Colo., Lamar—Brown Lumber Co., 400 North Main St., J. H. Brown, Purch. Agt.—large size wood lathe for planing mill.

Colo., Lamar — F. H. Friend, Ben-Mar Annex (job printer)—job press and Miller feeder.

Colo., Lamar—C. A. Hansen, Main St.—job press and paper cutter.

Colo., Lamar—Lamar Register, Main St., G. B. Merrill, Purch. Agt.—paper cutter.

Colo., Lamar — Lamar Sparks — 30 in. paper cutter.

Colo., Lamar—Meyer Lumber Co.—wood sander.

Ga, Chipley—J. Stout—Chandler & Price job printing press and wire stitcher.

Ga., Rockmart—Printer, Box 223—linotype machine.

Ill., Chicago—International Linen Co., 169 North Franklin St.—large flax gins, 30 ton pulping plant and one mechanical dryer.

Ill., Herrin—News—rotary press.

Ill., Rockford—Standard Dairy Co., 1532 2nd Ave.—refrigeration machinery, one large power churn and pasteurization equipment.

Ill., Sorento—Home Bakery Co.—dough mixer from 1 to 1½ bbl. capacity.

Ind., Kokomo—Job Shop, Box 602—job press.

Ind., Milton—Bd. Educ.—manual training equipment, including lathes for new $100,000 school.

Ind., Windfall—J. C. Day—9 x 12 in. or 10 x 15 in. job printing press.

Ia., Charlotte—J. Gault—large job printing press.

Kan., Hoisington—R. Cornelius (newspaper and job printer)—saw and trimmer.

Kan., Pittsburgh—Baxter Lumber & Mercantile Co., A. Baxter, Purch. Agt.—machinery.

Kan., Syracuse—E. E. Ellison (leather and harness shop)—finisher and stitcher.

Ky., Louisville—Gray-Von Almen Co., 431 West Oak St.—equipment for handling and testing milk, also refrigeration system for creamery at Bardstown.

Ky., Newport—Newport Rolling Mill Co.—54 in. roller leveler with roller diameter of 3¾ in.

Ky., Paducah—Magle Packing Co.—ice making and refrigerating machinery for proposed $75,000 meat packing plant.

Ky., Paducah—Printer, Box 109—25 x 38 in. cylinder press.

Mass., Boston—Merchants Terminal Co., c/o Monks & Johnson, Engrs., 99 Chauncey St.—conveying machinery for new warehouse.

Mass., Boston—New Method Die Co., 100 Sudbury St.—varnishing machine; booth and dry racks for paper and cardboard; medium size suction fan with motor; medium size air compressor with motor.

Mass., Milford—Hopedale Mfg. Co. (manufacturer of textile machinery), address purchasing department—equipment, including furnaces, ventilating system, conveying machinery, scales, etc., for new $50,000 foundry.

Mass., Needham (Boston P. O.)—School Com.—manual training equipment, including large and small wood and metal working tools, pulleys, shafting, belting, etc., for new high school.

Mass., Sea View—Millcraft Shops (woodworking and pattern making), address the manager—14 in. bandsaw (used).

Minn., Proctor—Job Printer, Box 322—job press.

Minn., Staples—E. D. Lum—newspaper press (used), belting, hangers, pulleys, shafting and linotype.

Mo., Cowgill—News—cylinder press.

Mo., St. Louis — L. Morris, 5602 Etzel Ave.—two pumps, two tanks, compressed air tanks and other general equipment for automobile service station on Julian St. and Page Blvd.

Neb., Omaha—Bee Publishing Co., 17th and Farnam Sts.—combined jig saw, drilling machine, 24 x 36 in. friction drive table and curve plate router.

N. Y., Brooklyn — Bethlehem Knitting Mills, 298 Graham Ave.—Wildman cylinders and dials, 6 cut, 12 to 16 in. size.

N. Y., Buffalo—Amer. Brass Co., 446 Military Rd., W. Bartlett, Purch. Agt.—equipment for steel casting shop.

N. Y., Jamestown—Standard Table Co., 92 Steele St. (manufacturer of furniture), L. G. Cowing, Secy.—woodworking machinery, spray machines, lathes, hand tools, shafting, hangers, pulleys, etc.

N. Y., Long Island City—Cornellist Textile Corp., 45 Jamaica Ave.—brushing machine for pile fabrics, 72 in. wide, 4 brushes (used); one set dry cans, 72 in uprights.

N. Y., Medina—J. C. Pesson & C. W. Grinnell—chemical machinery for proposed $50,000 cold storage plant, to replace that which was destroyed by fire.

N. Y., New York—Harlem Metal Corp., 502 East 133rd St.—miscellaneous metal working machinery.

N. C., Durham—Morven Cotton Mills Co.—machinery for addition to plant.

N. C., Norwood—Norwood Mfg. Co.—textile machinery to increase capacity of plant.

O., Cincinnati—The Cincinnati River-Rail Transfer Co., Front and Harriet Sts.—electrically operated hoists, etc., for proposed freight terminal.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

The markets remain steady except for a half-cent decline in prices of certain metal products in New York. In the same city linseed oil dropped 7c., while lead and zinc rose.

The American Sheet and Tin Plate Co. has announced its prices for the fourth quarter, and there are no changes. Blue annealed sheets will be continued at 3c. per lb., black sheets at 3.85c., galvanized at 5c. This company is reported to have sufficient orders on its books to keep busy for the rest of the year, but a number of independents are in a position to accept orders.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$28.55
Northern Basic	28.77
Southern Ohio No. 2	28.77
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.25
BIRMINGHAM	
No. 2 Foundry	25.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	27.76
Virginia No. 2	32.17
Basic	26.76
Grey Forge	26.76
CHICAGO	
No. 2 Foundry local	28.61
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.51
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	27.77
Basic	26.77
Bessemer	28.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5.00@5.50

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.95	4.45	5.05
Nos. 22 and 24.	3.75	5.00	4.50	5.05
Nos. 25 and 26.	3.80	5.05	4.55	5.10
No. 28	3.85	5.15	4.65	5.20

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00	5.15	4.70	5.35
Nos. 12 and 14.	4.10	5.25	4.80	5.45
Nos. 17 and 21.	4.40	5.55	5.10	5.75
Nos. 22 and 24.	4.55	5.70	5.25	5.90
No. 26	4.70	5.85	5.50	6.05
No. 28	5.00	6.15	5.80	6.35

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv
		BUTT WELD			
1 to 3	62	50½	⅜ to 1½	30	13
		LAP WELD			
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	26	11
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	60	49½	⅜ to 1½	30	14
2 and 3	61	50½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	8.00	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.40	3.90	4.55
Cold finished flats, squares	4.90	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Carbon tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 5/32, 8.35c.; 1/8, 7.85c.; 5/32 to 1/4, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.00
Tin, 5-ton lots, New York			40.50
Lead (up to carlots), St. Louis	6.50	New York	7.25
Zinc (up to carlots), St. Louis	6.20	New York	7.25

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.10	27.00	28.00
Antimony (Chinese), ton spot	8.25	10.50	8.75
Copper sheets, base	23.25	22.50@23.00	23.00
Copper wire (l.c.l.)	16.50	19.75	16.25
Copper bars (l.c.l.)	20.75	23.00	19.50
Copper tubing (l.c.l.)	25.50	28.00	23.00
Brass sheets (l.c.l.)	18.50	23.00	18.75
Brass tubing (l.c.l.)	24.00	28.50	20.50
Brass rods (l. c. l.)	16.75	19.25	15.75
Brass wire (l. c. l.)	19.00	23.00	.....
Zinc sheets (casks)	10.50	10.45	.....
Solder (½ and ½), (case lots)	29.50	27.75	20.00
Babbitt metal (83% tin)	52.00	49.00	38.00
Babbitt metal (35% tin)	25.00	17.00	16.00
Nickel (ingot and shot)	29.00	.....	35 00
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	11.50	12 00
Copper, heavy, and wire	11.50	11.00	11.25
Copper, light, and bottoms	10.00	9.00	10.00
Lead, heavy	5.00	5.00	5.50
Lead, tea	4.00	4.00	4.50
Brass, heavy, yellow	7.50	....	7.00
Brass, heavy, red	9.50	9.50	9.00
Brass, light	6.00	5.00	6.25
No. 1 yellow brass turnings	7.00	6.00	6.75
Zinc	3.75	3.00	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$23.50	$19.50	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.00	17.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	12.60	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7 40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13¼x13¼, per lb.	10.25	36.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	.98	1.18	1.14
White lead, dry or in oil	100 lb. kegs.	New York, 14.00	
Red lead, dry	100 lb. kegs.	New York, 14.00	
Red lead, in oil	100 lb. kegs.	New York, 15.50	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.00@4.50	
Coke, prompt foundry, Connellsville	per net ton	5.25@5.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	30%	50-10%	45-5%
1½ and 1¼x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	15%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	20%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	30%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	25%	45%	40-5%
Bolt ends, with hot pressed nuts	30%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, ⅜ and smaller	60%	.....	....
Semi-finished nuts, ½ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, in., per 100 lb. (net)	5.50	4.00	3 50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	List net	2.75	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	40%	50-10%	60%
Rivets, tinned	40%	50-10%	4½c. net
Button heads ⅜-in., ½-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3 90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1½ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30-10%	30-10%	30-10%
Heavy grade	20-5-2½	30%	20-5-2½%
Rubber and duck:			
First grade	50-10-5%	50-10%	40-10%
Second grade	60-10%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20

O., Wellston — Wellston Mfg. C.—5 ton electric traveling crane, 28 to 40 ft. span.

Okla., McAlester—Guardian—perforator.

Pa., Chewwick—Peerless Sand Co.—conveyors, loaders, complete sand and sand blasting machinery, to replace that which was destroyed by fire.

Pa., Phila.—H. A. Dreer, Inc., 711 Chestnut St.—mechanical equipment, including conveyors, for proposed $175,000 seed warehouse.

S. D., Claremont—A. T. Cox—14 x 22 in. job printing press.

Tenn., Medina—J. W. McCaslin (woodworking)—scroll saw and spindle shaper on Barnes combination machines.

Tex., Marlin—J. A. Keigwin—10 x 15 in. job printing press.

Va., Norfolk—Taylor-Parker Co., Water St. and Commerce Pl.—complete veneering machinery.

Wis., Knellsville (Belgium P. O.)—Farmers' Co-operative Dairy Co., c/o J. Schmidt —vats, separators, belting and shafting for proposed $40,000 cheese factory.

Wis., Madison—G. J. Fessler, 2037 Winnebago St.—band and circular saws.

Wis., Medford—O. H. Maurer—woodworking machinery, lathes, mortiser, planer, etc., for proposed $50,000 sash and door factory.

Wis., Milwaukee—Brusky & Krofcheck, 949 28th Ave.. F. J. Brusky. Purch. Agt. —one combination woodworking machine to include 4 operations.

Wis, North Milwaukee—Scholtka Bros., 36th St. and Wallace Ave. (carpentry and woodwork), W. Scholtka, Purch. Agt.—one band saw, size 20 to 30 in., also one small joiner.

Wis., Watertown—Perfection Table Slide Co., 603 Clyman St., W. C. Schultz, Purch. Agt.—6 in. jointer, large cutoff saw, 4 in. sticker, rip saw, mortiser, boring machine and surfacer.

Man., Winnepeg—Winnepeg Hydro-Electric System, 55 Princess St., C. J. Brown, City Clk.—electric traveling crane, capacity of main hoist 25 tons.

Ont., Arkona—High Pressure Oil & Gas Co.—drilling equipment, etc.

Ont., Listowel — Blackmore Hamilton Furniture Co.—$25,000 worth of machinery and equipment.

Ont., Penetanguishene — International Fibre Wks. — machinery to replace that which was destroyed by fire.

Que., Beloeil Village—A. P. Dion—forge and other blacksmith shop equipment.

Que., Beloeil Village—E. M. L'Heureux—sawmill equipment.

Que., Beloeil Village—J. M. Perreault—machinery for sash and door factory.

Que., La Presentation — L. Germain — forge and other blacksmith shop equipment.

Que., Montreal—Autogenous Welding Co., 121 St. Augustin St.—welding equipment.

Que., Montreal—C. P. Fabien & Co., Ltd., 31 St. Cunegonde St. (manufacturer of refrigerators)—woodworking machinery.

Que., Montreal—Montreal Blue Print Co., 209 Beaver Hall Hill—blue printing equipment.

Que., Montreal—Montreal Welding Co., 563 St. Timothee St.—welding equipment.

Que., Montreal East—Red Star Refinery Co., Ltd.—oil filtering equipment.

Que., St. Bruno—A. Guilbert — sawmill equipment.

Que., St. Chrysostome—T. Brisbin—sawmill equipment.

Que., Varennes — P. Choquette — anvil, forge and small tools for blacksmith shop.

Nfld., Twillingate—Notre Dame Herring Oil Co.—reducing, refining and cooperage equipment for plant, capacity 100,000 ton per year.

Germany, Berlin—Bohn & Bormann—equipment for the manufacture of bicycle spokes of type known as double thick end; also machine for the manufacture of nipples. It is reported that this firm pays a deposit at time of placing order and balance before machines have left manufacturer's plant, all in American dollars.

Metal Working Shops

Calif., Oakland—H. L. McCoy, c/o A. W. Smith, Archt., 1010 Bway., awarded the contract for the construction of a 1 story garage on 8th Ave. and East 12th St. Estimated cost $40,000.

Calif., Oakland—W. E. Travis, 366 14th St. awarded the contract for the construction of a 1 story shop and garage on Market St. near 21st St. Estimated cost $65,000.

Calif., Oakland—The L. A. Young Industries, Inc., 9200 Russell St., Detroit, Mich., manufacturer of automobile seat springs and power machinery, has purchased site and plans to build a group of 2 story factory buildings on 73rd Ave., here. Cost will exceed $75,000.

Calif., Pittsburgh—The Trucson Steel Co., 709 Mission St., San Francisco, plans to build a factory, here. Cost will exceed $40,000.

Calif., Sacramento—The Ochsner Estate, Ochsner Bldg., awarded the contract for the construction of a 1 story garage and salesroom on 14th and K Sts. Estimated cost $40,000. Reo Motor Co. of California, 1309 K St., Sacramento, lessee. Noted July 19.

Calif., Sacramento—The Sacramento Pipe Wks., R St. near 7th St., awarded the contract for the construction of a 1 story factory for the manufacture of pipe, on 16th and North B Sts. Estimated cost $40,000. Noted Dec. 14, 1922.

Calif., San Francisco—Morrow & Garren, Archts., Chronicle Bldg., are receiving bids for steel for the construction of a 1 story foundry for the Great Western Smelting & Refining Co., Spear and Folsom Sts. Bids on balance of the work will be taken shortly. Estimated cost $70,000. Noted Aug. 16.

Calif., San Francisco—J. Pasqualetti, 785 Market St., awarded the contract for the construction of a 2 story garage on Bush St. near Franklin St. Estimated cost $40,000.

Calif., Woodland—The Woodland High School Dist. is having plans prepared for the construction of 1 story manual training shops, 200 ft. long. Estimated cost $30,000. W. H. Weeks, 369 Pine St., San Francisco, Archt.

Conn., Middletown—Wilcox, Crittenden & Co., 3 South Main St., manufacturer of marine and awning hardware, are having plans prepared for the construction of a 3 story, 60 x 60 ft. factory. Cost will exceed $40,000. Private plans.

Conn., New London—S. Sulman, 55 Sumner St., is having plans prepared for the construction of a 1 story, 60 x 90 ft. garage on Church St. Estimated cost $40,000. F. De Grange, 28 Ocean Ave., New London, Archt.

Conn., Waterbury—The Bristol Co., Platts Mills, manufacturer of recording instruments, steel belt lacing, etc., awarded the contract for the construction of a 1 story, 50 x 100 ft. factory. Estimated to cost $50,000.

Ill., Chicago — S. Skobel, 802 Windsor Ave., is having plans prepared for the construction of a 2 story, 80 x 190 ft. garage and automobile sales room at 4628 Clifton Ave. Estimated cost $80,000. D. D. Meredith, 4750 Sheridan Rd., Archt.

Ind., Muncie—The Muncie Malleable Fdry. Co., Highland Ave., plans to build a 1 story, 70 x 100 ft. addition to its plant. Estimated cost $40,000.

Ia., Knoxville—The Quartermaster General, Wash., D. C., will soon award the contract for the construction of a garage, etc., for the United States Veterans' Hospital No. 57, here. Estimated cost $79,800.

Ia., Riceville—The Riceville Oil Co. is having plans prepared for the construction of a 1 story, 36 x 154 ft. garage. Estimated cost $45,000. G. L. Lockhart, 1353 University Ave., St. Paul, Minn., Archt.

La., Shreveport—The Kansas City Southern R.R. Co., 11th and Wyandotte Sts., is having plans prepared for the construction of a car repair shop, here, to replace the one which was recently destroyed by fire. Estimated cost $175,000. A. N. Reese, Ch. Engr.

Mass., Boston—Basil & Hutchins, Tremont and Camden Sts., awarded the contract for the construction of a 1 story, 59 x 184 ft. garage on Columbus Ave. Estimated cost $50,000.

Mich., Detroit — F. E. Bromley, 2642 East Grand Blvd., awarded the contract for the construction of a 1 story, 120 x 340 ft. assembly plant for auto trucks on Christopher Ave.

Mich., Detroit—The Hudson Motor Co., Jefferson Ave., awarded the contract for the construction of a 1 story, 65 x 280 ft. addition to automobile factory on Connors Ave.

Mich., Marquette—N. A. Nelson, Archt., Ironwood, is receiving bids for the construction of a 2 story, 70 x 124 ft. garage for E. W. Cork, here. Estimated cost $65,000.

Mo., St. Louis—H. M. Bixby, State Natl. Bank Bldg., will build a 2 story, 95 x100 ft. automobile shop on Maryland St. Estimated cost $75,000.

Mo., St. Louis—The Roxana Petroleum Co., Arcade Bldg., is having plans prepared for the construction of forty gasoline service stations. Cost between $350,000 and $1,000,000. Private plans.

N. Y., Albany—The Albany Garage Co., 28 Howard St., is having plans prepared for the construction of a 5 story, 75 x 120 ft. garage on Howard St. Estimated cost $300,000. T. L. Gleason, 45 Marden Lane, Albany, Engr. and Archt.

N. Y., Albany—The International Harvester Co. of America, 960 Bway, is having plans prepared for the construction of a 2 story, 50 x 210 ft. garage and service station addition to warehouse. Estimated cost $75,000.

N. Y., Brooklyn—Murray & Mauceri, c/o A. Goldberg, Engr. and Archt., 164 Montague St., will build a 1 story garage on Knickerbocker Ave. Estimated cost $50,000.

N. Y., Brooklyn—The Sterling Constr. Co., c/o M. Klein, Engr. and Archt., 37 Graham Ave., will build a 1 story garage on 54th St. Estimated cost $50,000.

N. Y., Buffalo—The Houde Eng. Corp., 1392 West Ave., has purchased site and plans to build a factory for the manufacture of castings, etc., on Northland Ave. Cost will exceed $75,000.

N. Y., Elmira—The Amer. La France Fire Engine Co. awarded the contract for the construction of 2 story additions to its plant. Estimated cost $75,000.

N. Y., New York—The city, G. A. Whalen, Comr. of Plant and Structures, will soon award the contract for the construction of foundations for a motor repair shop on 16th St. and Ave. C.

N. Y., New York — I. Schwab, c/o C. Schaefer, Jr., Engr. and Archt., 394 East 150th St., is having plans prepared for the construction of a 1 story, 100 x 100 ft. garage on West 158th St. Estimated cost $50,000.

N. Y., New York—The Transit Comn., 49 Lafayette St., will receive bids until Sept. 10 for the construction of addition to shops on Lenox Ave. and 148th St. City Eng. Dept., Engrs.

N. Y., New York—M. Wertheim, c/o Meiser & Uffner, Engrs. and Archts, 501 East Tremont Ave., is having plans prepared for the construction of a 2 story 100 x 145 ft. garage on Bradhurst Ave. Estimated cost $100,000.

O., Cleveland — Ormiston Bros., 2708 Franklin Ave. (sheet metal), have had plans prepared for the construction of a 2 story, 65 x 65 ft. factory at 2487 West 25th St. Estimated cost $40,000. Private plans.

O., Cleveland — The Standard Oil Co., East Ohio Gas Bldg., awarded the contract for the construction of a 1 story, 58 x 60 ft. and 24 x 24 ft. garage and pump house on Berea Rd.; also a 1 story, 28 x 80 ft. and 32 x 92 ft. garage, pump house, etc., on Babbitt Rd. Estimated cost $40,000 and $50,000 respectively. J. H. Watterson, Constr. Mgr. Noted Aug. 16.

O., Steubenville—The Standard Oil Co. of Ohio, c/o J. H. Watterson, East Ohio Gas Bldg., Cleveland, is having plans prepared for the construction of a 1 story garage and warehouse, here. Estimated cost $40,000. Private plans.

Pa., Johnstown—The Penn Public Service Co., 535 Vine St., is having plans prepared for the construction of a 2 story, 56 x 106 ft. garage on Lind St. Estimated cost $70,000. C. J. Lane, c/o owner, Engr.

Pa., Lewistown — The Lewistown Motor Co., c/o D. and B. Wollner, South Main St., plans to build a 3 story, 88 x 180 ft. garage. Estimated cost $100,000.

Pa., Munhall—The Mervis Garage is having plans prepared for the construction of a 2 story, 25 x 110 ft. addition to garage at 414 East 8th Ave. Estimated cost $40,000. A. G. Wickerham, 517 McClure Ave., Homestead, Archt.

Pa., Sharpsburg—The Natl. Eng. & Machine Co., 19th St. along tracks of Pennsylvania R.R., is having plans prepared for the construction of an addition to its factory. Estimated cost $50,000. A. Weeks, c/o owner, Engr. Noted June 26.

Tenn., Nashville — The Chevrolet-Nashville Co., 109 3rd Ave. N., awarded the contract for the construction of a 1 story, 100 x 150 ft. garage and salesroom on 5th and Broad Sts. Estimated cost $50,000.

Ont., Eastview—The Beeby Range Co., Ltd., Ottawa, plans to build a factory on Montreal Rd., here. Estimated cost $100,000.

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Special Tools in the Great Northern Shop

BY FRANK C. HUDSON

Aiding repair work by special devices — Speed-reducing mechanisms for portable pneumatic drills—Gage for pedestal binders—Self-contained roller tool

THE SHOP of the Great Northern Railway, located at Hillyard, just outside of Spokane, Wash., has a large number of interesting tools and other devices to help in getting repair work through the shop. There seems to be a particularly good spirit of

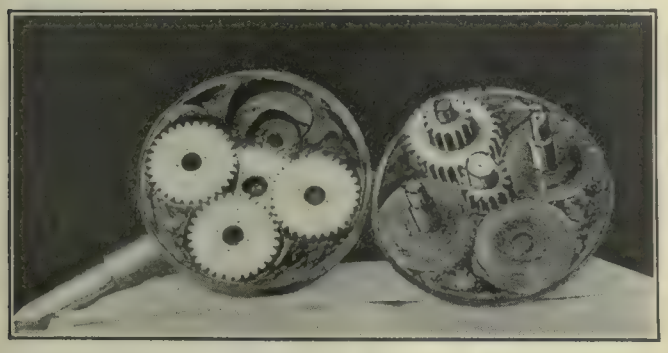


FIG. 1—GEARING OF A REDUCING MOTION

co-operation in this shop, which probably accounts in a measure for the number of such tools.

One of these tools is a speed-reducing mechanism for use in connection with portable pneumatic drills, so that they can be used to apply power at points where slow speed is required. The speed of the drill is reduced sufficiently to make the tool suitable for comparatively slow-moving machines.

In Fig. 1 can be seen the main gear case at the left.

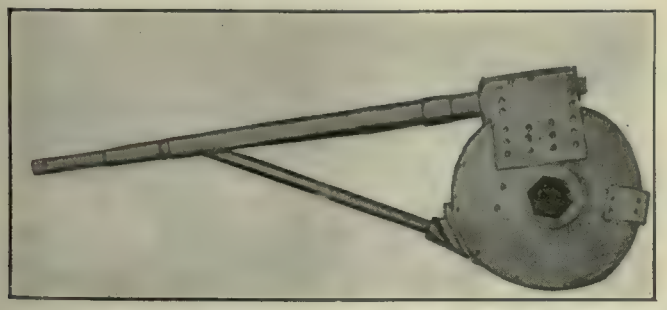


FIG. 3—WORM GEAR PULLER FOR CYLINDER BUSHINGS

The cover is at the right with the driving pinion in the center and one of the reducing gears at the top. It can readily be seen how this cover fits over the case, which is normally packed with gear grease.

Referring to Fig. 2, we see the driving pinion at *A*, and the four main driven gears at *B*. These gears also carry the pinions *C*, which in turn drive the final gear *D*. The gears are all 10 pitch, and as the driving pinions have 15 teeth and the driven gears 30 teeth in each series, there is a 4 to 1 reduction, so that the driving spindle *E* runs at one-fourth the speed of the shank *F* which goes into the spindle of the air drill.

Another device for reducing the speed of an air drill

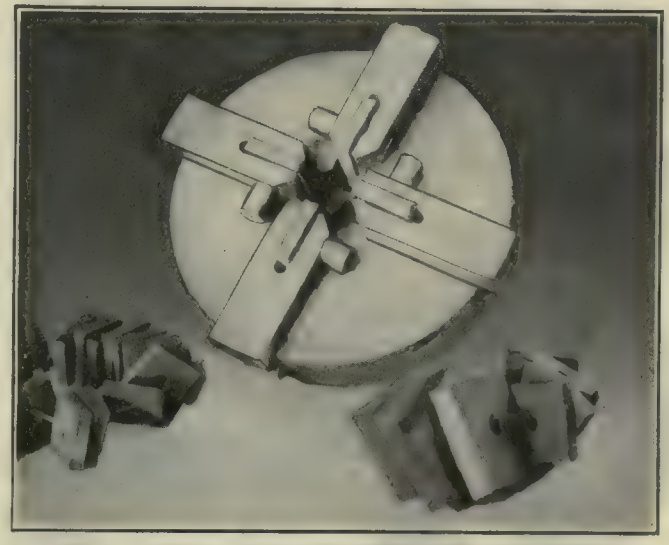


FIG. 4—CHUCK FOR RECUTTING BOLT CHASERS

is shown in Fig. 3; it is used for applying power to a screw for drawing cylinder bushings into place in rebored cylinders. This device consists of a worm and wormwheel mounted in a suitable case, the driving shaft being extended so as to be conveniently reached when the device is in position on the locomotive. The reducing device is made in two sizes, the smaller one

for valve bushings having 54 teeth and the larger size for cylinder bushings, 90 teeth. As the worms are both single-thread, they give a speed reduction of 54 to 1 and 90 to 1, respectively, both working out well on their particular jobs.

When the cutting edges of the thread chasers in bolt-

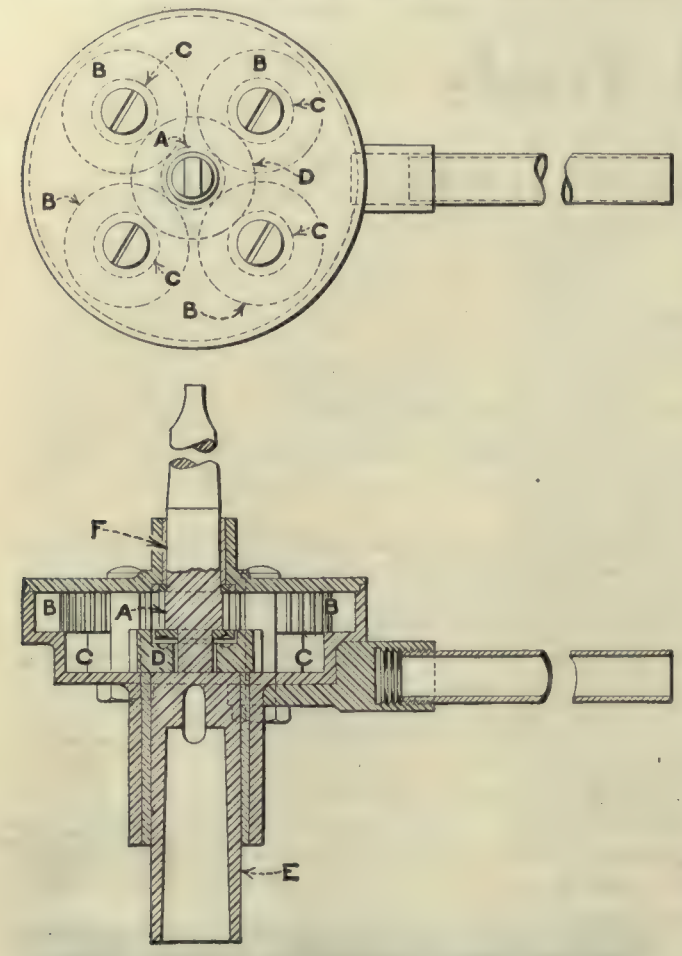


FIG. 2—DETAILS OF AIR DRILL SPEED REDUCER

cutting dies are worn out, the chasers are salvaged by annealing, removing the original thread and recutting in the chuck shown in Fig. 4. These chuck jaws are slotted to hold the chasers, the special filister-head screws shown being used to clamp them in position in the chuck jaws. These jaws are independent, and are graduated, so that the chasers can be set to any desired size for recutting. The reclaimed chasers are strung on wires according to their pitch, as shown, and are kept in the toolroom until needed at the bolt cutters.

A very useful gage for fitting binders on frame pedestals is shown in Fig. 5. In these days of large locomotives, the binder is so heavy as to be difficult to hold up against the pedestal jaws for laying out. With the gage shown, it is an easy matter to set the

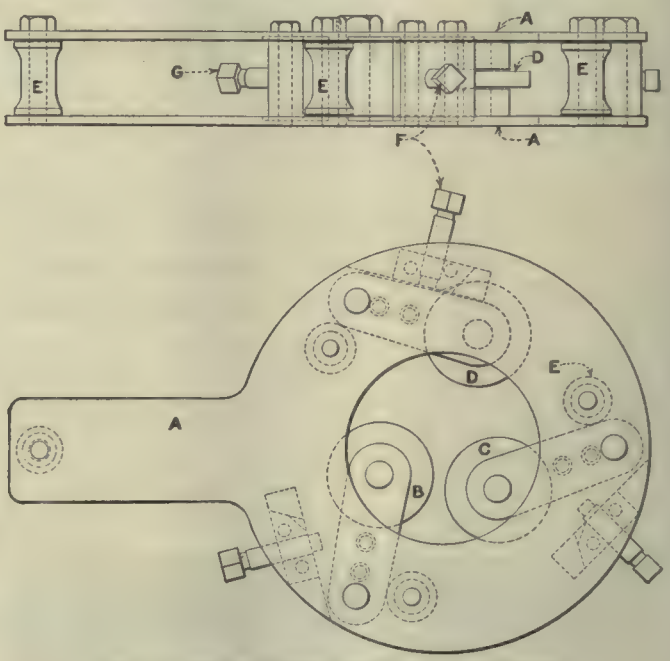


FIG. 6—SELF-CONTAINED ROLLER TOOL

plates *A*, *B* and *C* against the jaws, and in this way form a templet by which the binders themselves can be readily laid out on the bench.

Plates *A* and *C* can be adjusted to any desired angle, while *B* can be moved vertically as well as horizontally on the long bar which forms the beam or frame of the gage. Similar jaws and plates are fitted at the other end of the bar, and they have sufficient endwise adjustment so as to cover all types of locomotives. Details of construction are also shown.

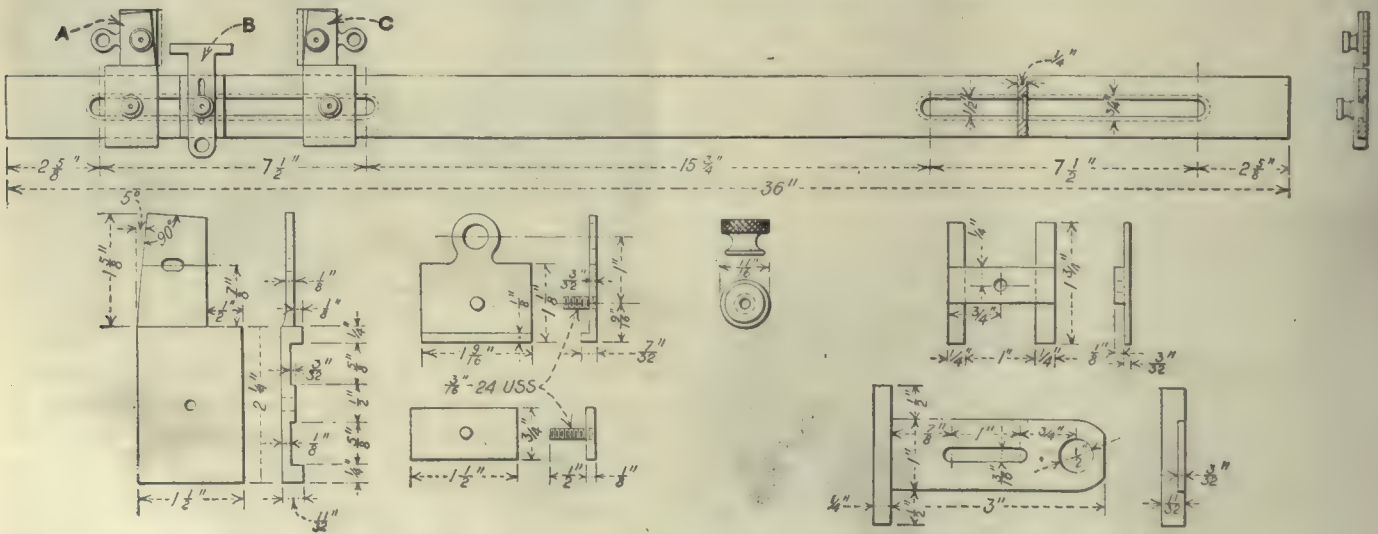


FIG. 5—GAGE FOR FITTING PEDESTAL BINDERS

The finishing of piston rods by rolling has become quite a common practice, but in most cases there is only one roller, which exerts its pressure not only against the piston rod, but against the lathe centers. An entirely different type of rolling tool is shown at Fig. 6, three rollers being held in a substantial frame, so that the tool is entirely self-contained and exerts no pressure on the lathe centers.

There are two side plates *A*, made of ⅜ in. boiler plate, 15 in. in outside diameter and having a 7 in. hole through the center. The overall length is 23¼ in., giving a lever arm 14⅝ in. long from the center of the opening to the center of the end bolt. The rollers *B*, *C* and *D* are 3½ in. in diameter by ⅝ in. face, and are turned with trunnions 1 in. in diameter and 1 in. long on each side. These trunnions are carried in forked arms built up in two pieces and fitted with hardened bushings. The two side plates are spaced by three thimbles *E* 2¾ in. long

The tool is simply slipped over the end of the piston rod, and the rollers adjusted by the screws *F* to give the desired pressure. The end of the holder rests on the tool block, and the movement of the carriage feeds the rollers along in the regular way. We are indebted to general foreman Colville and toolmaker Govett for these devices.

New Theories on Lubrication and Bearings

THE question of grooves in bearings for efficient lubrication is now regarded as settled by Dr. T. E. Stanton, Director of the National Physical Laboratory, England, and Chairman of the Lubrication Committee of the Department of Scientific and Industrial Research.

Dr. Stanton's lecture before the International Air Congress in London, went thoroughly into the whole question of efficient lubrication. He stated as the result of his research that:

Using an ungrooved journal and an ungrooved bearing, with castor oil as the lubricant, it was found that steady conditions could be obtained but that the coefficient of friction was 15 per cent *higher* than with the grooved surfaces and that substituting a grooved *journal* for the plain one did not improve matters. In the case of the Bayonne oil the increase in friction due to using ungrooved surfaces was 22 per cent.

It is clear, therefore, that a system of grooving is essential in order to obtain the minimum friction due to the materials of the surfaces and lubricant employed.

Particular stress was laid on the value of adding small quantities of organic acid to mineral lubricating oils. On this *The Engineer* of London comments: "The insufficiency of the Reynolds theory is in our opinion, presented by the known effect of adding small quantities of fatty acid to mineral lubricating oils. According to the hydro-dynamical view, the nature of the lubricant is immaterial, its viscosity alone affecting the result. Yet to take some figures recorded by Dr. Stanton, figures which are amply borne out by practical experience, the addition of 1 per cent of organic acid to Bayonne oil, an amount quite insufficient to have any noticeable effect on the viscosity, reduced the coefficient of friction in a bearing by no less than 17 per cent.

Dr. Stanton states:

During the last five years many modifications have taken place in the views held by engineers of the action between the lubricated surfaces of machines. The Reynolds theory of lubrication is so well known that I need hardly point out that the logical consequences of its acceptance are that the value of oils as lubricants depends solely on their viscosity, and that the nature and composition of the rubbing surfaces have nothing to do with the efficiency of the bearing. Curiously enough, the acceptance by engineers of these consequences has not been at all general.

Our experience during the last twenty years at the National Physical Laboratory has revealed a considerable demand for wear-tests on metals suitable for lubricated bearings and a general disinclination of clients to be convinced that when the lubrication was satisfactory, wear was impossible, and that one lubricant was as good as another so long as its viscosity was up to a given standard.

The existence of this feeling has been well brought out by Dr. Lanchester, who insisted that, from the days of the millwrights of last century, engineers of wide experience have been fully alive to the fact that animal and vegetable oils were superior as lubricants to mineral oils of the same viscosity, in virtue of some characteristic for which there was as yet no definite test.

It has become more and more certain, however, that there can exist between rubbing surfaces a condition of steady lubrication whose characteristics are totally different from that of the Reynolds type. The modern conception of lubrication is, in the main, due to the advances which have been made in the domain of physical chemistry with regard to the molecular phenomena occurring at the surfaces of solids and the manner in which films of foreign matter are condensed on these surfaces by the process known as adsorption. It is now recognized that solid surfaces having an adsorbed layer of lubricant of only one molecule in thickness, can slide over each other with comparatively small frictional resistance.

Further, it is known that adsorption is dependent upon the chemical constitution of the lubricant and that the greater the work done in the process of adsorption, the less the frictional resistance of the surface to sliding. Acids, alcohols and esters are more strongly adsorbed by water than are paraffins, and it is found that the former are better lubricants than the latter.

There are therefore two essential different kinds of lubrication: In one the surfaces are separated by a film of lubricant many hundreds of molecules in thickness, so that the resistance of relative motion of the surfaces is due to the lubricant in mass and the effect of the reactions at the two interfaces of lubricant and solid surfaces is negligible. In the other the molecular reaction at the common boundary constitutes the whole of the resistance, which is therefore a function of the nature of the surfaces and the chemical constitution of the lubricant. In the former case the frictional resistance is determined by the viscosity of the lubricant and by the relative speed, configuration and attitude of the rubbing surfaces.

It has been found by Prof. W. B. Hardy, that in this kind of lubrication which he has termed "boundary lubrication," the relation known as Amonton's Law, or the Law of Solid Friction, is strictly followed, i.e., the friction for a given normal pressure between the surfaces is independent of relative speed and area of contact. . . .

Several attempts have recently been made at the National Physical Laboratory to set up conditions under which boundary lubrication could be conveniently studied on an engineering scale. The first series of experiments of this kind were made on the well-known machine designed by Dr. Lanchester for testing the efficiency of worm gears. That the lubrication between the surfaces of the worm and worm wheel in these gears was essentially boundary lubrication, appeared to be certain from the results of the efficiency tests, which indicated a marked superiority of the animal and vegetable oils over the mineral oils as regards the temperature at which the gear could be run without a serious increase in the friction.

The experiments show that in general engineering practice, the lubrication of all machine details in which the

relative motion is of a reciprocating character, may be taken as boundary lubrication and that consequently in such cases the improvements in efficiency due to the addition of organic acids to the lubricants employed will be realized.

On the other hand, whenever steady relative motion of the rubbing surfaces can be maintained, it would appear to be possible by the use of a suitable lubricant and correctly proportioned surfaces, to set up a condition of film lubrication of the Reynolds type with its advantages.

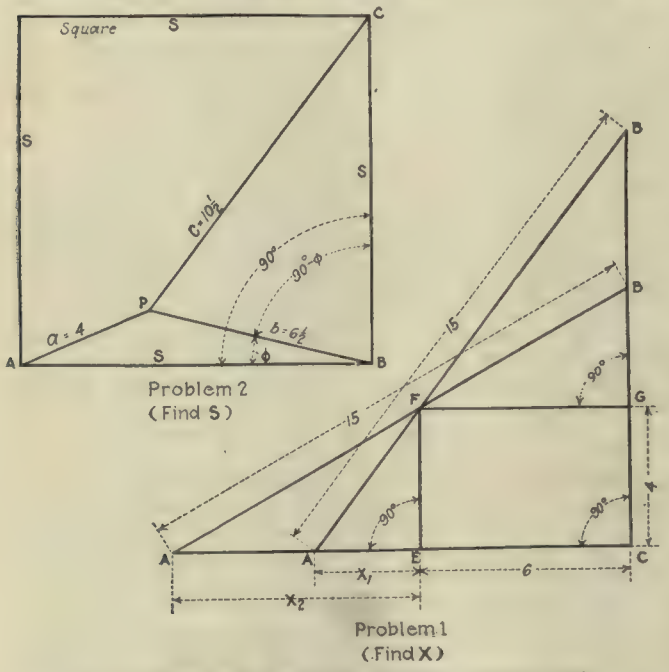
Further, the question of grooves in bearings which has given rise to so much controversy in the past may now, it is thought, be regarded as settled. It was found by Beauchamp Tower, that the presence of an oil groove in the crown of a bearing effectively prevented the formation of an oil film.

Trigonometry Problems from the Drafting Room—Discussion

By Wm. W. Johnson

HERE are complete solutions to the problems submitted under the above title by E. D. Thompson, on page 652, Vol. 58 of the *American Machinist*.

I do not know of any way to present the solution of a cubic or bi-quadratic equation so that it can be understood by the draftsman or shop man who does not understand the theory or solution of equations. When only one root is required, as is usually the case with problems of a practical nature, Horner's method is usually the most satisfactory.



LAY-OUTS FOR MATHEMATICAL PROBLEMS

Referring to the figure illustrating Problem 1, the right triangles ABC and AFE are similar, since their sides are respectively parellel. Therefore,

$$AB:AF = AC:AE$$

But, $AB = 15$, $AC = x + 6$, and $AE = x$. Then,

$$AF = \frac{15\ x}{x + 6} \qquad (1)$$

From the right triangle AFE,

$$(AF)^2 = x^2 + 4^2$$

Then,

$$AF = \sqrt{x^2 + 16} \qquad (2)$$

From equations (1) and (2),

$$\frac{15\ x}{x + 6} = \sqrt{x^2 + 16}$$

Squaring both sides and reducing,

$$x^4 + 123x^3 - 173x^2 + 192x + 576 = 0 \qquad (3)$$

By trial we find that this equation has one rational root which is + 3. Therefore

$$x_1 = 3$$

Equation (3) may now be written

$$(x - 3)\ (x^3 + 15x^2 - 128x - 192) = 0$$

Then the other values of x may be found from the equation:

$$x^3 + 15x^2 - 128x - 192 = 0 \qquad (4)$$

Applying Descartes' rule of signs we find that the above cubic equation has one positive and two negative roots. The negative roots must naturally be disregarded in this problem. By trial we find that the positive root lies between 7 and 8. Applying Horner's method for incommensurable roots, we find the value of x_2 to be 7.0434. Hence, the distance x can be 3 or 7.0434.

The layout for Problem 2 is shown in the illustration. To derive a general formula we will consider the problem: Given the distances of a point in the plane of a square to three vertices, to find the side of the square. Let s = the side of the square, and P the given point. Referring to the figure, let $AP = a$, $PB = b$, and $CP = c$. Let angle $ABP = \phi$, and angle $CBP = 90° - \phi$. From the cosine formulas in trigonometry, we get

$$\cos\ \phi = \frac{b^2 + s^2 - a^2}{2bs} \qquad (1)$$

And

$$\cos\ (90° - \phi) = \frac{b^2 + s^2 - c^2}{2bs}$$

Now,

$$\cos\ (90° - \phi) = \sin\ \phi$$

Then,

$$\sin\ \phi = \frac{b^2 + s^2 - c^2}{2bs} \qquad (2)$$

Squaring equations (1) and (2) and adding them together, we have

$$\sin^2\ \phi + \cos^2\ \phi = \frac{a^4+2b^4+c^4+2s^4+4b^2s^2-2a^2b^2-2b^2c^2-2a^2s^2-2c^2s^2}{4b^2s^2}$$

From trigonometry we find

$$\sin^2\ \phi + \cos^2\ \phi = 1$$

Then,

$$4b^2s^2 = a^4 + 2b^4 + c^4 + 2s^4 + 4b^2s^2 - 2a^2b^2 - 2b^2c^2 - 2a^2s^2 - 2c^2s^2$$

Arranging terms, we have

$$2s^4 - 2(a^2 + c^2)\ s^2 + a^4 + c^4 - 2b^2(a^2 + c^2 - b^2) = 0$$

This is a quadratic equation in s^2. Solving for s, we get

$$s = \pm\sqrt{\frac{(a^2+c^2) \pm \sqrt{4b^2(a^2+c^2-b^2)+a^2(2c^2-a^2)-c^4}}{2}}$$

When the point P lies within the square take the plus signs before the radicals. Substituting numerical values we have $a = 4$, $b = 6\frac{1}{2}$, and $c = 10\frac{1}{2}$.

Then

$$s = \tfrac{1}{4}\sqrt{1{,}010 + 26\sqrt{503}} = \tfrac{1}{4}\sqrt{1{,}593.1192}$$

$s = 9.9785$, the length of the side of the square.

Automotive Service Methods and Equipment

By HOWARD CAMPBELL
Western Editor, *American Machinist*

Nineteenth article—Service operations in a Dorris station—Saving time with testing, reaming and riveting fixtures—Locating "knocks"—Greasing with a force pump

WHILE it is true that the market affords a great variety of automotive service machinery and tools, the wide-awake service manager will find many places in which he can save time and produce better work by making up special tools to fit his particular needs. The equipment of the Dorris Service Station, which is located at the plant of the Dorris Motor Car Co., St. Louis, Mo., includes a number of tools that would be hard to find in a catalog, but which should prove interesting to every service man.



FIG. 1—TESTING VALVE SPRINGS

In order to put out high-quality work, it has been found expedient to test all valve springs before they are used. The operator shown in Fig. 1 is using a testing fixture which has been made from a small scale. An iron strap has been attached to the sides of the scale, coming up over the top of the platform in such a manner that it will form a support for a plunger which is attached to a hand lever. A cup-shaped piece is attached to the bottom of the plunger so that it will fit over the top of the spring when placed in the position shown in the illustration. Tests have been made which show that a valve spring should develop a pressure equal to 220 lb. when compressed to a length of 2 in. The round piece standing by the side of the spring is a gage which is used by the operator to tell when the spring is compressed to the proper length. The two marks on the gage indicate the proper lengths for passenger car or truck valve springs.

Every mechanic who has ever adjusted the brake band on a car knows what a job it is to get the band set to the right tension the first time. In order to make this operation as easy as possible, a brake drum *A*, Fig. 2, has been fitted with two handles and a section of it cut away so that when the wheel is off and the brake drum is placed in position under the band, the adjusting mechanism can be reached with a wrench. This makes it possible to adjust the brake band to the proper tension without difficulty, as it is only necessary to adjust it to a point where the drum can just be turned by hand.

Another handy, though simple, piece of equipment is the wooden block, *B*, shown resting under the axle of the car. This is a hardwood block 10x10x12 in. high, with a handle on one side as shown. When it is necessary to raise the axle off the floor, the jack is used to raise the axle until one of these blocks can be slipped under, then the jack is removed. This releases the jack so that it may be used elsewhere, and also tends to safeguard the operators who are working on the car, as this block will not tip, whereas it may happen

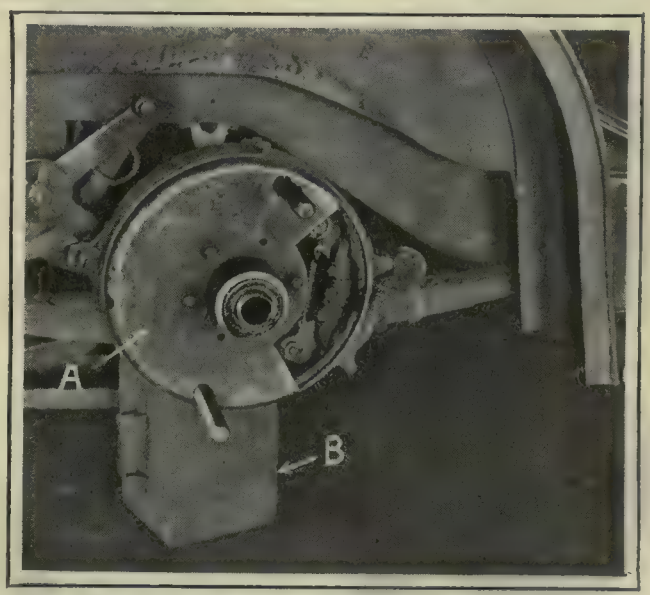


FIG. 2—GAGE FOR SETTING BRAKE BAND



FIG. 3—PISTON PIN VISE CLAMP

that a jack slips or tips over and lets the car down without warning.

The operator shown in Fig. 3 is fitting a connecting rod to a piston pin. The pin is held in a nut which has been faced off square on both sides, bored out until it is a slip fit over the pin, and then slotted through one side. By the use of this nut a piston pin can be gripped firmly without injury. This is used for fitting piston pins to connecting rods and also for fitting pistons to the pins.

Reaming Main Bearings

When new main bearings have to be put into a crankcase, the fixture and tools shown in Fig. 4 are used to align-ream the bearings after assembling. To the rear end of the crankcase is bolted a plate *A* which has a hole through the center to receive the end of the boring bar. The plate *B* on the front of the crankcase is located by plugs *C* and *D* which fit into the camshaft bearing hole and starter stud hole as shown. When the plugs are in position, the plate is fastened to the gear case cover cap holes by means of capscrews. The bearings are first bored out, using the bar *E* which is shown in position in the crankcase and then they are reamed, using the reamer lying on top of the crankcase. To bore the first bearing, which is the one in the plate *B*, the boring bar is reversed and operated from the back end of the crankcase. After the first bearing has been bored, one of the two steel bushings shown on top of the crankcase is placed in position, and the next bearing is bored. Both steel bushings are then brought into use to support the bar and keep the hole straight. The same procedure is used with the reamer bar. A crankcase can be bored and reamed complete in three hours with this outfit.

A fixture and tools for reaming connecting rods are shown in Fig. 5. The connecting rod is put into the

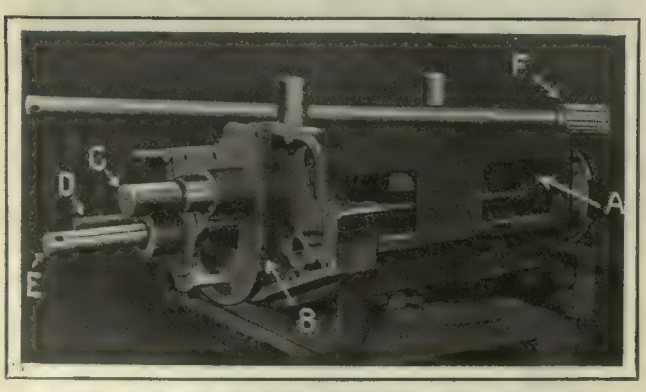


FIG. 4—MAIN BEARING REAMING FIXTURE

fixture in the position shown, with the hole in the small end of the rod resting over a locating pin, and with the large end of the rod in the fixture. The piece *A* is then inserted into the fixture to centralize the hole in the large end of the rod. The upper part of the piece *A* is ground to a sliding fit in the hole in the fixture and the lower end is hollowed out and slotted as shown so that it can be adjusted to slide far enough into the holes in the large end of the rods to centralize them, even though the hole in the rods may vary somewhat. The head of the bolt shown protruding from the

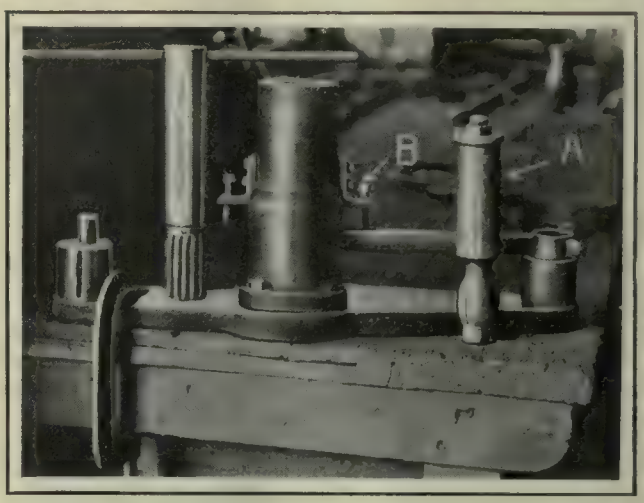


FIG. 5—CONNECTING ROD REAMING TOOL

top of the piece is recessed on the under side so that when the nut on the upper end of the bolt is tightened, the lower end of the piece will be compressed to the desired diameter. When the rod is located in the proper position, the screw *B* is tightened against the rod to hold it in position while the reaming is done. Another boss with a locating pin for the small end of the rod is shown at the left side of the fixture. This is to take care of a rod of a different length.

A home-made tool for riveting the lining to clutch



FIG. 6—RIVETING LINING TO CLUTCH PLATE

plates is shown in Fig. 6. The principal part of the tool consists of a C-clamp to which is riveted a section of hexagon steel bar to provide a means of holding the tool in the vise. That part of the clamp which was threaded for the setscrew has been bored out to

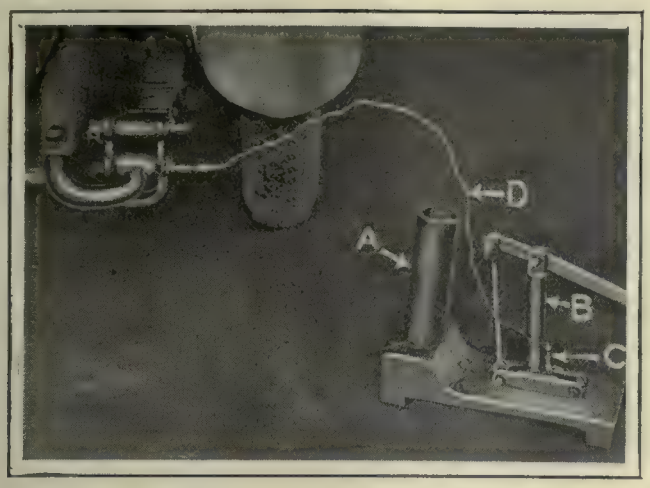


FIG. 7—GREASE PUMP FOR SPRING BOLT

receive a coil spring as shown. A hexagon piece with a hole through it for the plunger has been threaded and screwed into the under side of this hole to serve as a seat for the spring. The lower end of the plunger has been hollowed out to produce the desired head on the rivets, and as the lever is long enough so that plenty of purchase is obtained, a very good job can be done.

The apparatus shown in Fig. 7 is a pump for forcing grease into spring bolts. It sometimes happens that

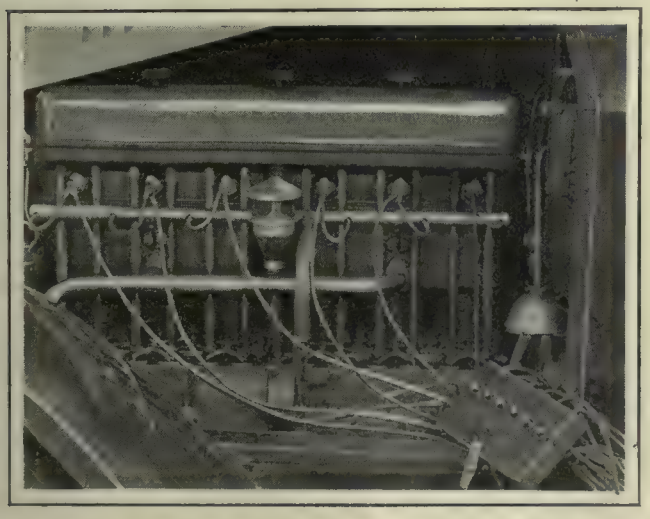


FIG. 8—CYLINDER CUT-OUT WEARING BLOCK

the grease hole in a spring bolt becomes so clogged with dirt that it is impossible to get grease into it by the usual methods. Usually, the only alternative is to remove the bolt from the car and place it in the vise where the hole can be opened. The device consists of a wood base carrying an oil-reservoir *A* which consists of a section of 2½-in. brass tube 8 in. high and closed at the bottom. The piece *B* is a steel sleeve with a vertical ¼-in. hole in it to receive a section of steel rod which acts as a plunger. The plunger hole is connected with the piece *A* by a section of tubing on the under side of the base. A check valve in this section of tubing allows oil to be drawn from the reservoir *A* when the plunger is raised but closes immediately when the plunger is started downward and prevents the oil returning to the reservoir, thus making it necessary for it to enter the tube *D*, which is ⅛-in. copper tubing. An ordinary pipe connection is soldered to the end of this tubing so that it can be attached to the spring bolt, as shown. It is said that enough pressure can be applied to the oil with this device to split open the tubing, and that practically any spring bolt oil-hole can be opened with it.

It sometimes happens that a "knock" can be heard in the motor, but which is hard to locate. By using the apparatus shown in Fig. 8, the mechanic can drive the car and at the same time cut out one cylinder at a time, until the knock is discovered. The apparatus consists of a wooden block, in which are located six push-button switches, each switch being connected with a wire which can be attached to the spark plug of a cylinder, as

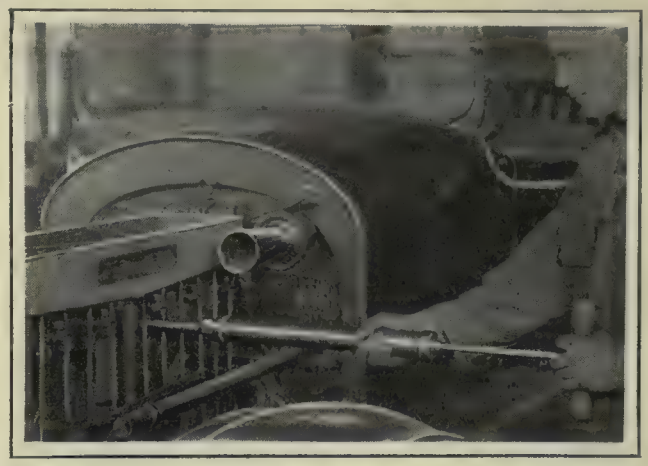


FIG. 9—SUCTION PUMP FOR LOCATING KNOCKS

shown, and all six switches being attached to a seventh wire which is grounded on the motor. By pressing one of these buttons the spark plug with which it is connected is connected to the ground wire, the plug will not fire, and if that particular cylinder is the one in which the knock is located, it will be discovered by its absence. This is a very handy apparatus, as sometimes knocks can be heard while the car is in operation on the road which cannot be located when the car is standing in the service station, as would be expected.



FIG. 10—BURNING CARBON OUT OF CYLINDERS

Another tool for locating knocks, and a very handy one, is shown in Fig. 9. This is a pump made of a section of 2-in. brass tubing 12 in. long with a flange on each end. To one end is attached a pipe nipple which is threaded on the outer end so that it will fit the thread in the spark-plug hole, and the plunger, of course, operates in the other end. The plunger consists of a section of steel rod with a round leather piece on the end which fits tightly in the tubing. As each cylinder is practically an airtight chamber, when the nipple of this pump is screwed into the spark-plug hole and the plunger of the pump is withdrawn, a vacuum is created which lifts the piston. By pulling and pushing the pump plunger back and forth, if there is any looseness in the piston or connecting-rod bearings, it can usually be detected.

The outfit for burning the carbon out of cylinders, shown in Fig. 10, is one with which practically all service men are familiar. The interesting feature of this particular outfit is, however, that no matches are needed to ignite the gas. A storage battery is fastened to the platform of the truck which carries the gas tank, one of the wires from the storage battery being attached to the rear end of the gas torch, the other one being grounded on the motor. A push-button switch is located just back of the torch handle, so that when the button is held down and the end of the torch is touched to the cylinder, a complete circuit is formed. By inserting the end of the torch in the spark-plug hole and rubbing it on the edges of the hole, sparks can be made to fly, and if the gas is turned on at the same time it can easily be ignited. This saves a lot of time and trouble, and experience would indicate that it is absolutely safe.

Methods of Testing Materials

The committee of the American Society of Testing Materials on the methods of testing, reported to the 26th annual meeting, held at Atlantic City, June 25 to 29, 1923, along the following lines: It is believed that the policy of studying methods from a broad viewpoint will lead to the organization of permanent subcommittees to consider tests of a certain type, such as tension, compression, distillation, etc. Several committees have carefully reviewed methods submitted a year ago, and a number of new methods representing considerable study and effort, are being brought forward. Discussions during the year have shown that consideration of methods of tests will be greatly facilitated if original test data that served as a basis in the formulation of the methods, are made available. The Committee suggests the desirability of requiring that standing committees include in their reports, the principal data upon which methods of tests have been based.

Defining Stress and Strain

As a result of criticisms and suggestions, some changes have been made, principally in the definition of "stress" and "strain," on which there seems to have been some misunderstanding. Textbooks on physics and some European textbooks on mechanics of materials, give a definition substantially the same as the Committee now recommends, which is "The intensity per unit area of internal force which, in the presence of forces causing a change in the form of a body, tends to hold the particles in their original relation and to preserve the integrity of the body." American textbooks on engineering mechanics define stress as a *force*, measured in pounds, and they call the intensity of force "unit stress" or "fiber stress."

In view of the fact that even in engineering textbooks the term "stress" is often used to denote intensity of force per unit of area, and in view of the fact that the physicists' definition involves somewhat simpler terms, the latter has been followed by the committee. In a similar way, strain has been defined as "The change per unit of length in the linear dimensions of a body, which change accompanies a given stress." Here again, the physicists' point of view has been followed as distinguished from the usual definition in engineering textbooks in which "strain" is used in the sense of total deformation.

The proposed tentative definition of terms relating to methods of testing, and which are published primarily for the purpose of eliciting criticism and suggestions are:

Tension—The condition which exists in a body subjected to forces which tend to pull the body apart.

Compression—The condition which exists in a body subjected to forces which tend to bring closer together the particles of the body.

Shear—The condition which exists in a body subjected to forces which tend to cause two contiguous parts to slide relatively to each other in a direction parallel to their plane of contact.

Flexure—The condition which exists in a body subjected to forces which tend to change the curvature of the axis of the body.

Torsion—The condition which exists in a body subjected to forces which tend to cause rotation about the axis of the body of a cross-section with reference to a contiguous cross-section.

Stress—The intensity per unit area of the internal force, which, in the presence of forces causing a change in the form of a body, tends to hold the particles in their original relation and to preserve the integrity of the body. Stress is measured in pounds per square inch (kilograms per square millimeter).

Strain—The change per unit of length in the linear dimension of a body, which change accompanies a given stress. It is measured in inches per inch of length (millimeters per millimeter).

A Stress-Strain Diagram—A diagram plotted with values of stress as ordinates and values of strain as abscissas.

Elastic Limit—The greatest stress which a material can withstand without deformation which remains upon release of the load.

Yield Point—The stress in a material at which there occurs a marked increase in strain without an increase in stress.

Tensile Strength or *Ultimate Tensile Strength*—The maximum stress carried by a test specimen in a tension test to rupture.

Modulus of Elasticity—The ratio, within the elastic limit of a material, of stress to corresponding strain.

Mechanical Analysis of Foundry Sand

A mechanical analysis was recently made, using the air analyzer of the Bureau of Standards, of a sample of foundry sand which contained coal particles and coal dust. This sand had been sent with a request for some method of removing the coal so that the sand could be used again in the foundry. The results of the mechanical analysis indicated that the coal could not be effectively cleaned out of the sand by means of air separation. It is probable that in cases of this kind some method of washing must be used.

It Pays to Replace—

How a Shop Saved by Replacing Old Shop Equipment with New Equipment

By MALCOLM H. AMES
Tool Designer, Saco-Lowell Shops, Lowell, Mass.

This article won a $10 prize

IT IS often hard to get old equipment replaced as long as the finish on parts produced is satisfactory and the production sufficient. It is rather a common occurrence to be told, "We have only eighty pieces a day to get out and we can do that easily." That is a comfortable feeling to have, as long as you do not count the cost, and things often slide along unnoticed on that basis. However, when an assembly floor is held up for parts, something has to be done, and the results are likely to show that the old tools are eating up enough money to pay for the new equipment.

The tools described here are some of those used for machining the roll stand for a worsted spinning frame, shown in Fig. 1. The foot *A* of the roll stand is fastened to the beam of the frame. Directly over the foot is a bronze half bearing *B* that carries the front rolls. Behind the bearing is an ear *C* to which is fastened the horn *H*. The horn curves up over the bearing and serves to guide the tension rolls. Behind the foot and in line with the ear is a surface *D* that serves to line up the intermediate tension guides. Back from the ear, at an angle of thirty-six degrees with the foot, is a surface *E*, having a tongue slot through the middle, on which slide the carrier stands and back-roll stands. This surface has graduation marks 1 in. apart along the whole length, which is about 20 in. On the underside is a cast rack, by means of which the carrier stand *G* may be adjusted in or out, simultaneously, the whole length of the frame. The underside *F*, on the extreme end, is finished for bolting to the creel stand. In order to minimize fitting at assembly, these milled surfaces are held in close relation to each other. The old design called for fitting the bearing to the roll stand. By finishing the bearing separately and finishing the seat for it, interchangeability is secured with little difference in cost. The roll stand is of cast iron and is very light in section, so that care had to be taken in designing fixtures that would not spring it in clamping and would, at the same time, support it well under the cut.

The first operation is to mill the slide for the carrier stands. On the old equipment, four stands were held in a fixture on a special, four-spindle, vertical miller. The graduations were put in on the same machine by means of an extra cross-rail carrying a single-point tool, and an index device on the feed hand wheel. The old machine was too light and the fixture was slow to load, sprung the work, and did not support it properly. The feed had to be slow. The operator of this machine hammered in the bronze bearings while the milling was done, and the other operations on the bearing were done in place on the stand. Obviously this method was a disadvantage when the time came for replacement of bearings in the mills.

The new fixture, Fig. 3, is used with a Cincinnati index base, on a No. 2 Cincinnati vertical miller with

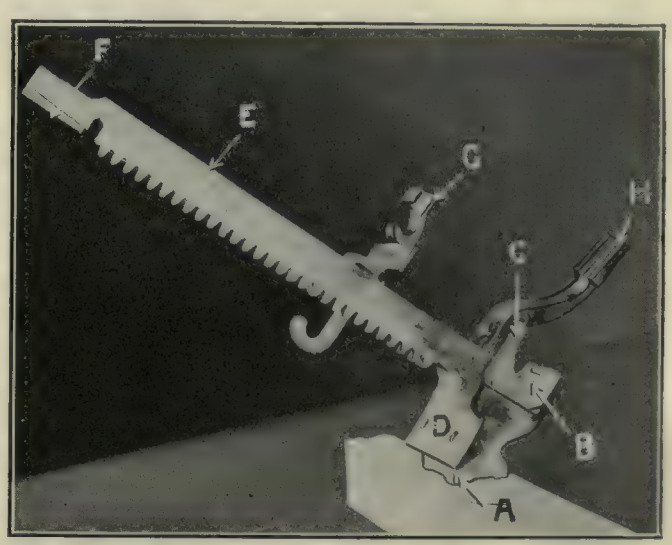


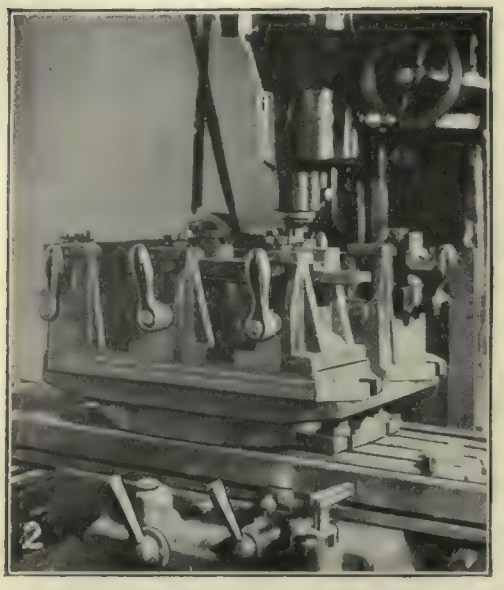
FIG. 1—THE ROLL STAND ON WHICH TIME FOR MACHINING OPERATIONS WAS CUT MORE THAN ONE-HALF

power rapid traverse. One piece is milled while the other is being loaded. The feed is much faster than the old machine would stand. The slight spring under the cut, which is unavoidable, is taken out by grinding at a later operation. The graduations are put in, after the grinding, by one stroke of a lever in a special marking device or fixture of our own design.

The second operation, milling the slot, was done on an old style vertical miller in a rather slow loading fixture. The new machine is another No. 2 Cincinnati vertical miller like the first and two fixtures are mounted on the index base as shown in Fig. 2. The work is loaded more easily and supported better. The old machine was run at such a rate that the slot could not be kept to size and had to be filed. We have cut down the rate so that we have eliminated the filing and we still beat the time of the old machine.

The third operation is to mill the foot and surface for the intermediate tension-guide support. The work

In the contest, which closed July 5, nine prizes were given for articles telling how a shop saved by replacing old shop equipments with new equipment. Additional articles will be printed in forthcoming issues.



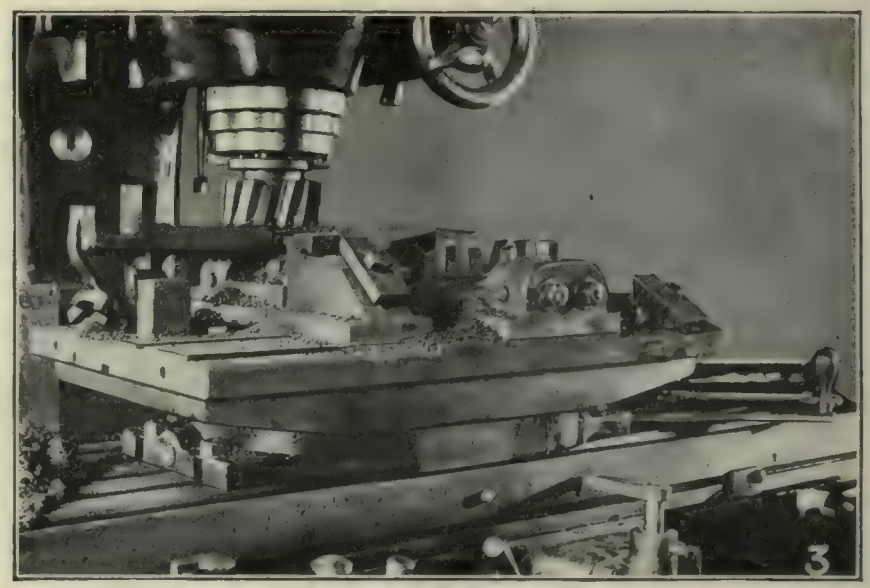


FIG. 2—OPERATION 2: MILLING SLOT. FIG. 3—OPERATION 1: MILLING TOP

in both the old and new fixtures is located on the surface and slot already milled. The old fixture carried six pieces, strung one behind the other. The set-up time was excessive as the whole six had to be set up and wedges were then driven between them. Even then the feed was very slow. In the new fixture one piece is done at a time. The work is clamped down on a tongued plate and is located lengthwise by bringing the ear against a stop. Plate, clamp and stop are on a gibbed slide, the Vs of which are perpendicular to the tongue on the plate. This arrangement allows the part to be brought to an equalizer on the solid jaw of the fixture and insures the surfaces being square with the tongue. A belt through to a strap on the front clamps the work and keeps the operator's hands away from the cutters. The part is held rigidly and with only two clamping points. The machine used is a No. 3 high-power Cincinnati miller with rapid traverse.

The fourth operation is to mill the tail. It was done by strapping the part to the milling machine table, doing one at a time. At present we clamp two pieces down on the table, clamping one while the other is being milled. In this way the cut is practically continuous. We intend later to provide a fixture for this operation. It will make handling easier and, by supporting the job better, will enable us to increase the feed. The machine is a No. 2 Cincinnati vertical miller with power rapid traverse.

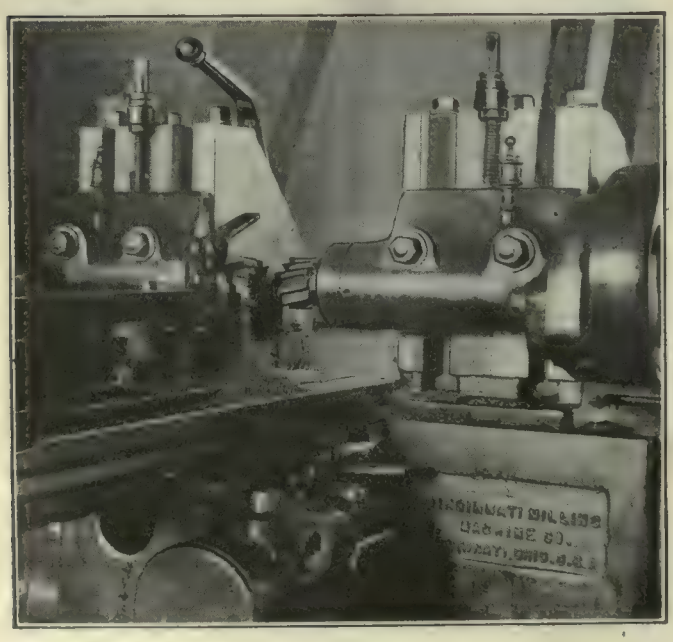


FIG. 4—OPERATION 5: MILLING END OF SLOT FOR BEARING

The fifth operation on the old design of part was to mill the ends of the bronze bearing. It was done by a large pair of straddle mills. The part was held by two straps on the same locating points that were used in the third operation. The present design of part has the ends of the slot for the bearing milled at this operation on the 24-in. Cincinnati duplex miller, as shown in Fig. 4. The part is centered by the tongue slot and is clamped to the foot and tail finishes by a single cam clamp. The fixture loads more rapidly and a heavier cut can be taken. We still run through some of the old-style roll stands, and one of them is shown in the illustration. The fixture is used for either style of stand.

Placing the Work Below the Cutter

The sixth, and last milling operation, is to finish the ear for the horn and the slot for the bearing. On the old design the ear only was finished and this was done on the string fixture used for milling the foot. The table was raised until the work was *above* the cutter. This was radically wrong as the tendency was to pull work, table, and saddle off their proper seats. The feed had to be very slow. In our new fixture the part is located by the foot and tail finishes and is clamped on the finished end of the slot. It is cam-operated, rigid and fast. The machine is a 48-in. Cincinnati automatic miller.

The top is next ground, as before mentioned, on a 14-in. Pratt & Whitney vertical grinder. Needless to say, this gives a superior finish in less time than filing. The grinder operator also takes care of the graduating while his machine is running.

The old milling machines were of the cone-driven type. The new ones are all high power Cincinnati millers and all are equipped with power rapid traverse.

The accompanying table shows the speeds and feeds used and total time per piece for each operation.

From the table, and considering a production of 20,000 pieces a year, the saving in wages alone can easily be figured. In addition it must be noted that we can produce in six months what we could not do before in a year and we have the machines available for other work. There are often cases where the saving would be as great but as the production is not as large they escape attention or are passed up because other work seems more pressing. It serves to show, however, what can be done by carefully going over and analyzing the work and the conditions under which it is done. Sometimes a new fixture will do the work. At other times it is necessary to replace an old machine with one designed for heavier cuts, to get the best results.

COMPARISON OF TIMES, OLD AND NEW EQUIPMENT

Old Tools				New Tools			
Operation	Cutting Speed, Ft.-Min.	Feed, In.-Min.	Total Time	Operation	Cutting Speed, Ft.-Min.	Feed, In.-Min.	Total Time
Mill top and graduate...	39	1½	7.7	Mill top.....	75	7¾	2.85
Mill slot.....	60	16	3.96	Mill slot.....	60	6¾	3
Mill foot.....	104	4	583	Mill foot.....	75	9	2
Mill tail.....	125	6¼	1.65	Mill tail.....	75	6⅞	1.3
Mill ends of bronze bearing.....	220	4	3.77	Mill ends of slot for bearing....	75	9¾	0.9
Mill ear for horn.....	102	1.35	3.17	Mill ear and slot for bearing....	75	7¾	1.2
File top and slot.....	...	....	12	Grind top and graduate...	..	..	5
Grand total.....			38.08	Grand total.....			16.25

These articles won honorable mention

By J. E. Dykstra

Superintendent, Foos Gas Engine Co., Springfield, Ohio

THE purchase of new equipment is always a very simple matter in a plant where quantity production prevails. In cases of this sort it is only necessary to submit blueprints to a machine tool manufacturer and have him furnish guaranteed operating estimates. The saving to be obtained is readily calculated from a comparison with manufacturing cost prevailing with the old equipment, and it does not require a far sighted executive to determine whether or not a machine ought to be purchased.

In smaller shops where the production varies greatly in sizes and quantities and where a quantity of 50 pieces is an exception, it is much more difficult to determine the advisability of the purchase of new equipment. The case of which the writer speaks was one in which, it was felt in general, that the equipment was quite obsolete in the milling machine department, its best machine being a No. 3 machine of a certain well known make, more than 12 years old. A salesman was invited to come down with a representative of a milling machine company to point out the possible saving that might be effected with a modern machine tool, with the result that an armful of blueprints together with a letter stating the quantity of parts to be machined during the period of one year and a complete description of the fixtures available were sent to the milling machine company. It was agreed by all that on account of the cost of the available fixtures and the small quantities machined in a year's time, it would be impossible to replace the available fixtures, as the savings would not justify the cost. After a period of waiting, an inquiry to the agent brought the response that the matter had been dropped by the milling machine company, because the fixtures on hand would not be suitable to the capacity of the machine. The writer himself, however, was well convinced that a sufficient saving would justify the purchase of a new machine, but since the milling machine company despaired of figuring the saving possible, his position was somewhat difficult.

Not deterred, however, the purchasing department was instructed to comb the market for a used machine, and a No. 5 high-power machine, manufactured by the Cincinnati Milling Machine Co. three years previously, was located. This machine had been used very little, and was purchased at a very reasonable figure on the writer's recommendation that a net saving of $745 annually could be effected, after allowing 15 per cent for interest, taxes and depreciation.

As soon as the machine was installed, the cost department was instructed to make a weekly report on the savings effected by the machine. The results were so gratifying that a No. 4 machine of the same make was purchased inside of 18 months after the first machine was installed.

By H. K. Griggs

Foreman Machine Shop, The Portland Co., Portland, Me.

THE MOST striking example in my experience of saving by replacing old shop equipment was the scrapping of an old 96-in. lathe that had been blocked up to swing 11 ft., and installing a 12-ft. Betts vertical boring mill in its place.

One of the jobs frequently done on the lathe was boring and facing wood-chipper disks for pulp mills. The disks were made of steel and were 8 ft. in diameter and 3 in. thick, having a hub on one side.

A disk was bolted to the face plate of the lathe and the hole bored and the hub faced. It was then removed and put on an arbor, turned on the outside diameter and faced on the working side.

As the lathe was not stiff enough for heavy cuts and was further handicapped by being blocked up, it took a long time to do the work. The time for both operations was from 200 to 300 hours.

After the lathe work had been done, the disk was taken to a large planer, mounted on an angle plate and keyseated. This required from 25 to 30 hr. more.

The boring mill is equipped with a slotting attachment and the disks can now be turned, bored, faced and keyseated in one setting, a second setting being required for facing the hub. The time for all the work is from 60 to 80 hours.

Another job done on the old lathe was turning rails for rotary incinerators. These rails are the same as used on railroads, but are bent to a 10-ft. circle and turned on the outside. The lathe time was about 100 hr. but we now do them on the boring mill in as little as 3 hours.

On special jobs at day rates, an extra charge is made for the use of large tools and the boring mill earned 15 per cent of its cost in the first year on such charges alone.

I consider this boring mill a good investment.

Foreman Training

By Edward Bard

PRESENT DAY economic conditions have led many industrial plants to institute some form of training course for their foremen, and the efforts along these lines have met with remarkable success in some places, while in others the results have not been as good as were anticipated by the management.

As with any branch of educational endeavor, the real success of a foreman training course is measured by the practical use to which the information given is put. The acquisition of the subject matter of the course is not an end in itself, but is simply the opening gun in a campaign to increase the efficiency of the individual foreman and his ability to work in harmony with the rest of the organization.

In order to put precepts into practice, it is quite necessary to have clearly in mind what real groundwork has been placed, upon which to build. Such a study should not be tempered with too much enthusiasm. It is also to be remembered that little success can be expected if the foremen are left to put their new ideas into practice by themselves and in their own way.

What concrete things can, therefore, be expected from the foreman who has completed a course of study along the usual lines?

Benefits Derived from Training

First and foremost, a spirit of co-operation and a real desire to team up with the rest of the organization. This is a result not only from the teachings of the course, but also from the opportunities that have arisen to become better acquainted with the other foremen. Second, increased ability to look at a problem from more than one angle and, in many cases, a keen wish to look at it from the other fellow's side as a basis for better judgment. Third, a spirit of loyalty to the plant; but this depends wholly on conditions and, by no means, on the fact that he has been taught to be loyal in his course of study.

In addition to the above characteristics, the men will, of course, have a multitude of rather muddled ideas about how to handle various types of men, how to keep machinery operating efficiently, how to cut down waste, how to chart production and organization, and so forth. The main advantage from such teaching is simply mental development gained from thinking along these lines.

The Foremen's Club

In some plants foremen's clubs have been organized at the end of the study period, and these have functioned with success in some cases. One such club, organized without a well-defined program, started in to discuss plant problems of detailed character with the result that all advantages derived from the course, along the lines of co-operation and team work, were immediately lost through endless argument and bickerings among the various members. It is evident, from a study of various instances, that a club of this type should be kept as much as possible upon an educational plane, for it is a trait of human nature that we are most interested in those things from which we expect to derive some benefit.

Granting, then, that the foremen's club should simply supplement the educational work of the training course, we are still confronted with the problem of deriving the benefits for plant and men from the work that has been done.

A good way to conserve a spirit of co-operation is through proper organization. A proper organization outlines the responsibilities of each member and delegates authority in proportion. A loose organization, which permits shifting of responsibilitiy or overlapping authority, provides poor ground in which to sow the seed of co-operation. A foreman who knows his own authority and responsibility and also knows, or can find, the authority and responsibility of his colleagues, is in a good position to co-operate with them for the best interests of all concerned. In most cases the desire to team up with other departments is there. It is necessary only to show what is needed and how far he shall go before overstepping his own bounds. This seems to combat the oft-repeated statement that a man should lose no opportunity to be familiar with the whole plant and its workings, but such familiarity should not, by its own virtue, allow him to overstep his authority or shoulder responsibilities other than his own.

Broader Outlook and Judgment

The second characteristic, which may be expected in a foreman who has finished a training course, is a broader outlook on his own problems, and a greater ability to acquire a more seasoned judgment. This is a very valuable asset to any plant organization, not only in the matter of the duties that the foreman has, but in the development of better methods and practices. A man will begin to show marked individuality and originality as his viewpoint broadens and, if possible, he should be made to feel that his suggestions and criticisms are welcomed by the management. This is a difficult thing to do, as is shown by the ineffectual attempts of many managers to get suggestions from the men through suggestion boxes and other means. Instead of making the system for betterment ideas a grab-bag, into which the men are invited to throw anything, and from which the management hopes to draw something of value, the better way is to first outline betterments that are desired and then interview those whose advice is sought.

Loyalty in an organization is something which every industrial plant needs and which all managements desire. If the training course teaches a foreman that a certain principle governs a certain line of procedure, and he sees that principle violated continually in the plant in which he works, there is every reason to expect that his loyalty will waver and that the morale of the men under his direction will immediately suffer. The manager who considers a training course for his foremen should first be entirely sold on the proposition himself, and ready to apply the principles which are to be taught to them. Otherwise failure will most certainly result and conditions will be worse than before.

From the above considerations it would seem that the main advantages to be derived from foreman training courses are to be found in mental development, a better spirit of co-operation, a broader viewpoint and sounder judgment and, under proper conditions, an increase in loyalty and morale. A plant which undertakes foreman training with these expectations and with a desire to conserve those characteristics which result will almost surely meet with a considerable measure of success.



Assembly Bay, Grinder Department



Tool Room

Where Machines and Tools Are Made

Charles H. Besly and Company

Founded 1875

Battery of Thread Millers, Tap Shop



View in Grinder Department



Hardening Room, Tap Shop



Flute Grinding Department, Tap Shop







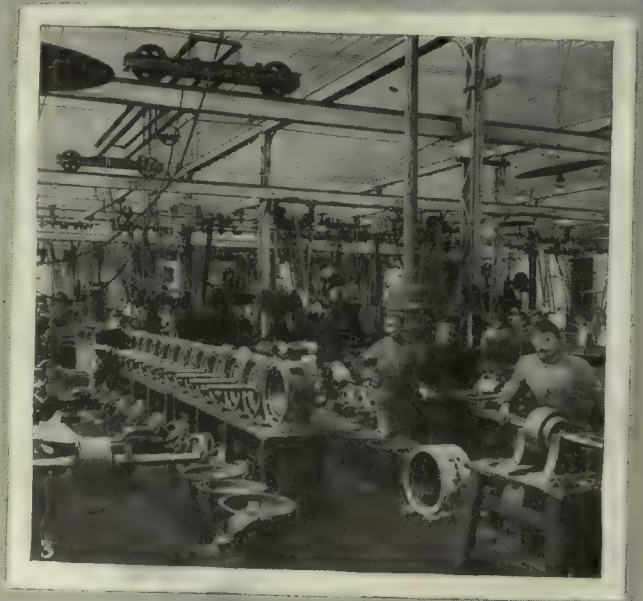
AN ITALIAN MACHINE PLANT

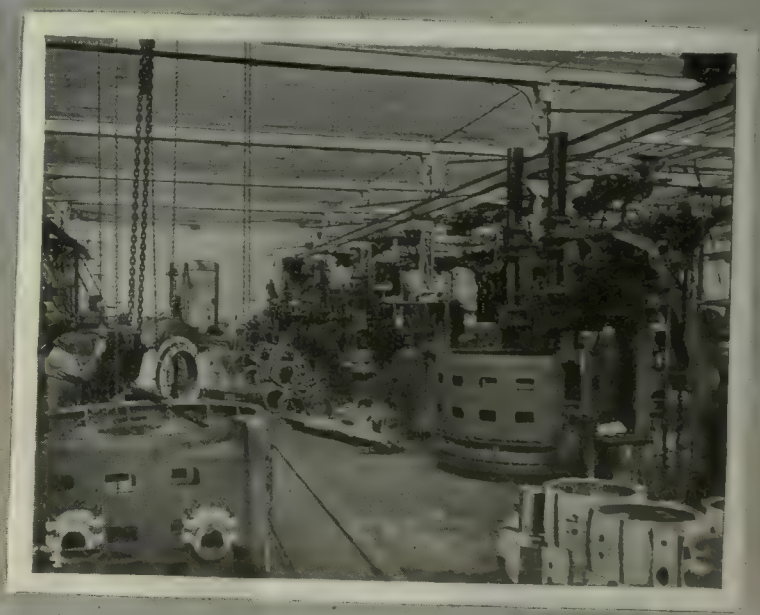
Ercole Marelli & C. Società Anonima Milan

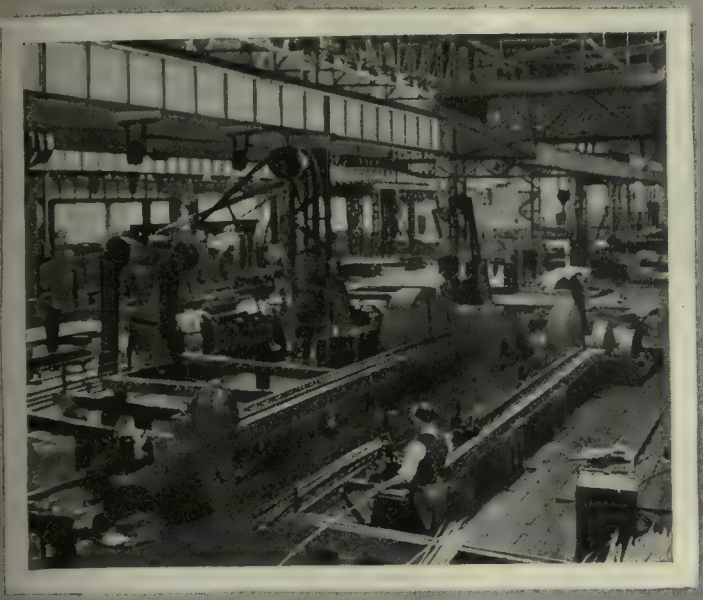
1
Fan Body
Division
2
Testing
Room



3
Motors up
to 100 hp.
4
100 hp to
1000 hp motors









VIEWS IN AN AUSTRIAN STEEL MILL

Böhler Bros. & Co. Kapfenberg

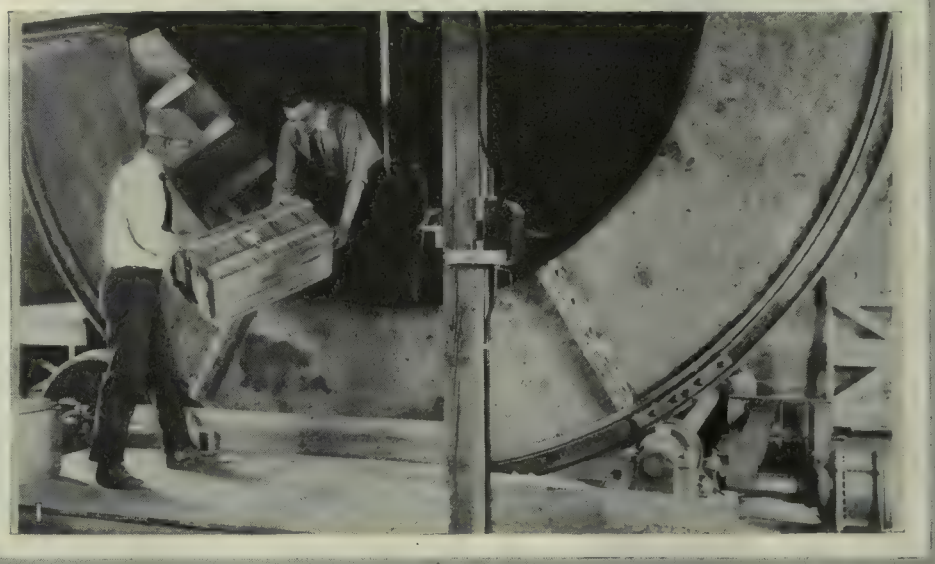
1
Draw benches and straightening machines
2
The Steel Foundry~



3
Crucible furnaces
4
Drop Forging Plant
5
Plate Mill







PACKING FOR SHIPMENT

(Photos from the Forest Products Laboratories, Madison, Wis.)

1

Revolving hexagonal 14-ft. drum used to test containers It is lined with baffles, knobs and hazards to stimulate handling in transit

2

Two wire bound boxes after equal punishment in the drum. Box 1 made from ⅜-in. box 2, from ¼-in. material; nails and staples in box 1 at 4-in. intervals, nails in box 2, 3-in. apart, staples 2-in. apart

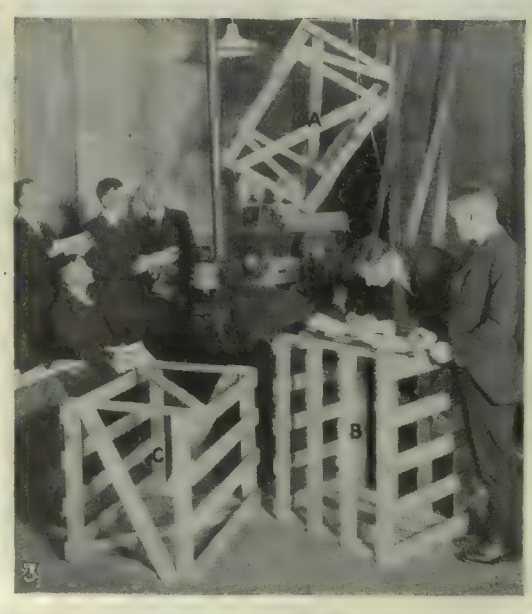


3

Crate "A" withstands double the diagonal compression that crate "B" will withstand. Bracing on crate "B" offers little resistance to weaving and skewing. Design in crate C useful only in packing contents which need protection on sides but are rigid enough to endure stresses diagonally

4

The fibre container with scores taped showed twice the durability of the one with scores unprotected





Building the Large Navy Dirigible ZR-1

By F. E. SCHMIDT

An outline of the problem in designing and building the huge airship — Special machine for drilling holes spaced within two thousandths of an inch—Machining duralumin

IN UNDERTAKING to build its first rigid airship, the ZR-1, the U. S. Navy Department confronted a complex mass of new problems. They were essentially problems of structural design and fabrication, and were closely related to those which have been worked out by gradual practical development in the related field of steel structural work for building and bridge construction.

The ZR-1 is a huge structural framework of latticed struts braced by wire ties. Though precisely similar to any structural steel frame in its principles of arrangement, it is made radically different from such a frame by three characteristics: (1) The metal is duralumin, a light alloy of aluminum and copper; (2) the material is in sheet metal thicknesses; (3) the members, with few exceptions, are of triangular cross-section, so that the joints become special problems of great complication. The peculiarities of the duralumin, the problems of fabricating and assembling the sheet metal members, and the difficulties presented by the joints and of connections constituted the outstanding elements of the fabrication problem.

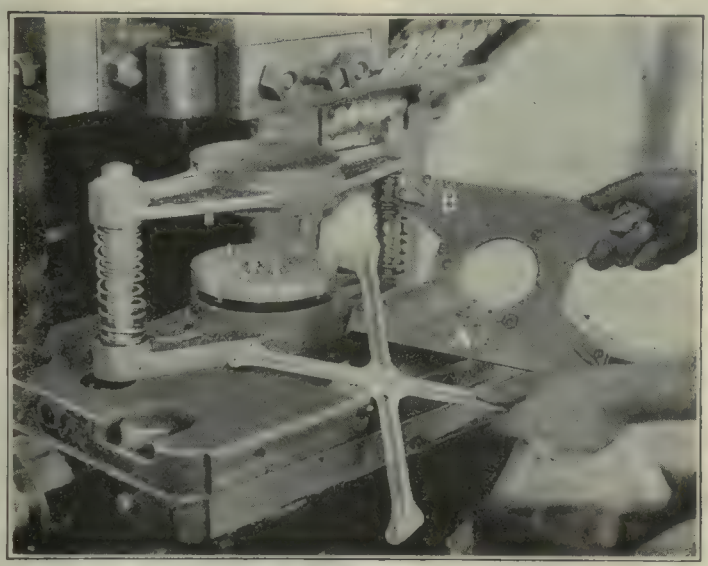


FIG. 1—DIE FOR ASSEMBLING STRUTS

For a general understanding of the construction problem it is necessary to outline a few essential facts concerning the structure of the ship and the material used. The frame of the ship, a cigar-shaped body of circular cross-sections, 680 ft. long and 79 ft. (24 m.) in diameter in the mid-section, is made up of frame rings spaced 32.8 ft. apart, connected by thirteen longitudinals and made rigid by diagonal wire bracing in the transverse planes of the frames and in the rectangular panels formed by frame members and longitudinals. Halfway between the main frames are intermediate frames, of lighter section and without transverse wire bracing; similarly, halfway between the main longitudinals are intermediate longitudinals, this secondary system being braced by a system of secondary wire diagonals in the outer surface. The entire hull frame weighs only about 15 tons; as there are about 3,000 struts in the frame, this is less than 10 lb. weight per average strut. Duralumin, the material used, has a specific gravity of 2.8 (slightly more than one-third that of steel), an ultimate strength of about 55,000 lb. per square inch and a minimum yield point of about 35,000 lb. The frame members are essentially struts or columns, and stiffness against buckling required that they be of large transverse dimensions and hence of very small metal thickness. For weight economy they were made of triangular cross-section.

Metallurgical difficulties in the production, rolling and handling of duralumin have been largely overcome. The metal may be annealed to a soft state by heating for one-half to one hour at 350 deg. C., and either quenching or slow cooling; or it may be brought to a tempered condition by heating to 490 deg. C. and cooling. Immediately after the tempering treatment it is soft, and remains so for one or two hours, slowly assuming the hard condition. The hard condition is wanted in the finished structural members, but work must be done in the soft condition. The processes of manufacture must therefore be arranged to utilize the short-time soft state immediately following the tempering treatment, unless later tempering is practicable.

Aside from the difficulties introduced by the nature of the material, there were perplexing difficulties of fabrication, chiefly due to the very light thicknesses of the shapes used. These may be readily appreciated by comparing with ordinary structural steel. As in any structural framework, it was vital that the individual members should be straight and that the structure should be assembled firmly and true to form, with bracing of uniform tension. Duralumin rolled channels of special section for the main members of the strut and stamped and punched lattice bars were furnished from the mill of the Aluminum Co. of America. The channels were in random lengths, to be cut to length at the factory as required. The lattice bars, cut and formed by die stamping from an annealed rolled strip and punched for the end and center connection rivets, were received ready for assembly.

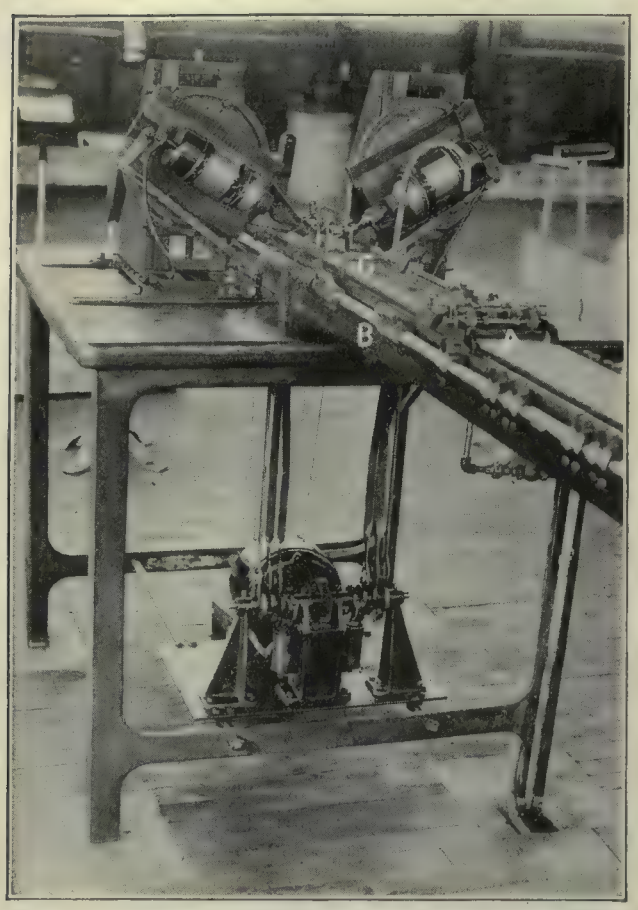


FIG. 2—SPECIAL MACHINE FOR DRILLING CHANNELS

Fabrication of the parts of the airship was allocated to the League Island Navy Yard, Philadelphia, and erection of the airship to the newly built naval air station at Lakehurst, N. J., where an airship shed 264x803 ft. was built three years ago for constructing and housing dirigible balloons. The work was put in charge of Commander R. D. Weyerbacher, U. S. N., who organized the fabrication at League Island and later took up the erection work at Lakehurst. In both parts of the work it was necessary to develop methods, tools and machines from the ground up, and work out in succession the problems met in the work. In spite of the assistance of English and German airship experts, the work remained essentially a pioneer undertaking.

The lattice bars were blanked from unannealed duralumin, varying in thickness from 0.015 to 0.026 in. After that they were heat treated and the ribs formed and pierced. For quick and accurate assembly of the struts the lattice bars were first riveted together in pairs to form crosses. The necessary high precision was obtained by use of a two-piece fixture shown in Fig. 1. A rectangular plate *A*, with corner dowels *B*, receives the two lattice bars and positions them. When laid over a central die plate having three dowels registering with holes in the rectangular plate, the four central rivet holes are brought directly over rivet dies on the die plate, and all four rivets are headed up in one stroke of the press in which the die plate is mounted. The punching of the lattice bars is initially checked up by their fit on the dowels of the frame plate; lack of distortion in riveting is checked by noting the absence of binding when the riveted cross is removed from and replaced on the plate.

The channels which form the longitudinal members of the struts are first cut to length by hand hack saws, allowing 2-in. over-run at each end. The rivet holes are then drilled in the automatic spacing machine shown in Fig. 2.

The triangular struts, which form the entire framework except for a few rectangular struts in minor positions, are of two shapes, equilateral and isosceles, the latter having a long side equal to twice the short side. Two forms of channel were provided, differing in the angle between the flanges. Both sections are 1.18 in. wide on the back and 0.459 in. wide on the flange, with the outer edge of the flange slightly turned in to stiffen it; they are 0.59 in. deep. Their thickness ranges from 0.031 to 0.079 in. The angle between flanges is 60 deg. for the channels used in the equilateral sections and the base channels of the isosceles section, and about 45 deg. for the channel used at the peak of the isosceles struts.

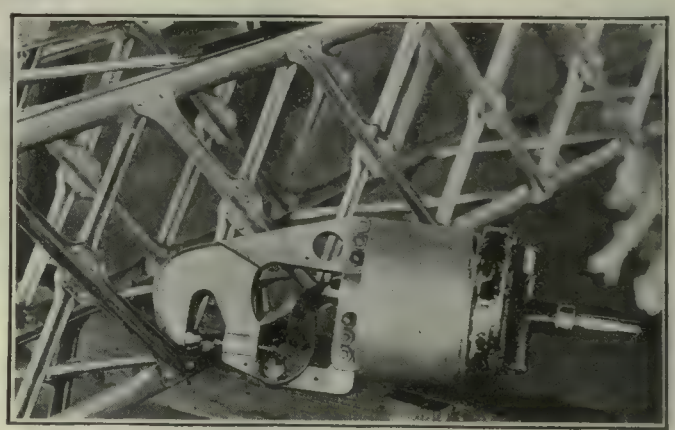


FIG. 4—RIVETER FOR STRUTS

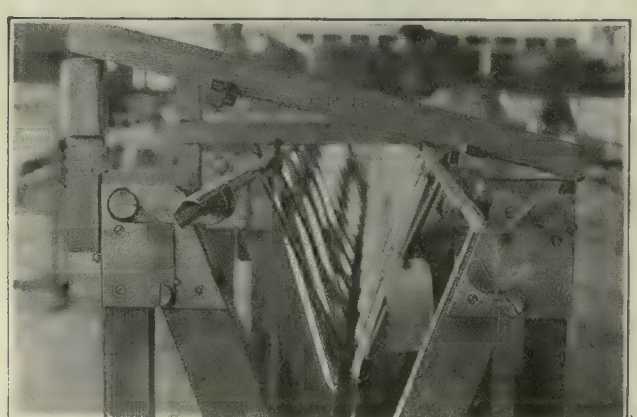


FIG. 3—ASSEMBLING STRUT SECTION

In foreign practice, the struts have been built up complete in box-like forms, in which the channels and lattice bars were held firmly in position and then drilled and riveted in place. The builders of the ZR-1 decided upon pre-fabrication as being more rapid and accurate, believing that precision in locating the rivet holes would assure straightness and truth of the struts. Laying out and individual drilling of the holes were out of the question from this standpoint, and the development of an automatic mechanical spacing machine was undertaken, with entire success.

One end of the channel to be drilled is attached to a light carriage pulled along the table of this machine by a weight. Dogs along the sides of the table as at *B* bring the carriage *A*, to a stop at the proper position

for the rivet hole. As the table strikes the dog, it trips a clutch which actuates a cam shaft (on a stand on the floor beneath the machine) by means of which four control motions are initiated in succession. The first presses a hold-down pad on the channel at the point of drilling, the second closes the drill circuit, the third feeds and returns the drill, and the fourth throws out the dog holding the carriage and sets the following one.

The channel slides over block *C*, which supports it while being drilled and the drill is guided by the bushing shown.

A high degree of precision is required in the work. An accumulated error of 0.006 in. on the 18-ft. length of a strut gives the finished strut a wind of $\frac{3}{4}$ in. in a 5-m. length. It was therefore considered necessary to limit the overall error in rivet holes in one channel to 0.002 in. To assure this degree of precision the stops

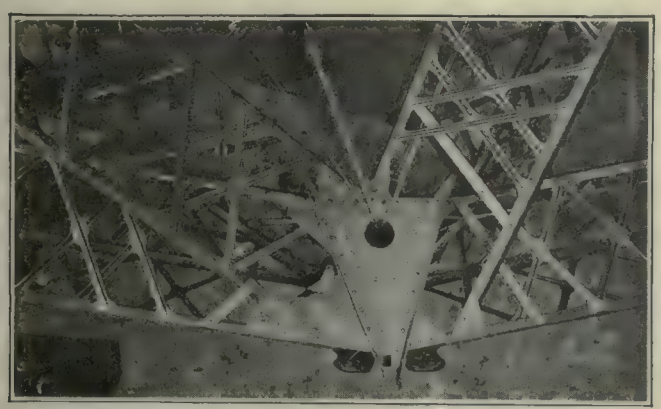


FIG. 5—WIRING AT MAIN FRAME JOINT

on the machine were set up by the use of fixed end-gages corresponding to the various rivet spacings required.

With the channels drilled thus accurately and the lattice crosses assembled precisely by help of the fixture previously described, it is possible to assemble a strut in the open and obtain entirely satisfactory results. Quicker work can be done, however, by assembling it in a form. Such forms, as shown in Fig. 3, have therefore been used for most of the work. Before the parts of the strut are placed in the form, the peak channel is clamped, back down, on a base strip and the lattices of both sides are bolted to it, with bolts in half the total number of holes; the bolts are set up tight by a screwdriver. Similarly the two base channels are bolted to the bottom lattice, on a flat support. The two parts then go into the form, where the strut is assembled peak down and clamped. The empty holes are riveted and then the bolts are successively replaced by rivets.

Rivets are driven cold. The air-operated toggle riveting press, Fig. 4, is also one of the tools designed for the job. It has a 3-in. air cylinder, and with 85 lb. air exerts a pressure of about 3,000 lb. It is necessary to adjust the grip of this press (gap at full stroke) to the grip of the rivet to be driven, as greater closure would be likely to deform or cut the metal of the channel; this adjustment is made by changing the dies, various dies of suitable length being provided. The strut shown in Fig. 4 happens to be of square section, though the main framing of the dirigible consists of triangular struts.

Doubled latticing (successive lattice crosses half spaced) is provided at the ends and load points of those struts which have to carry transverse load, as occurs in a number of members in the keel section, and also

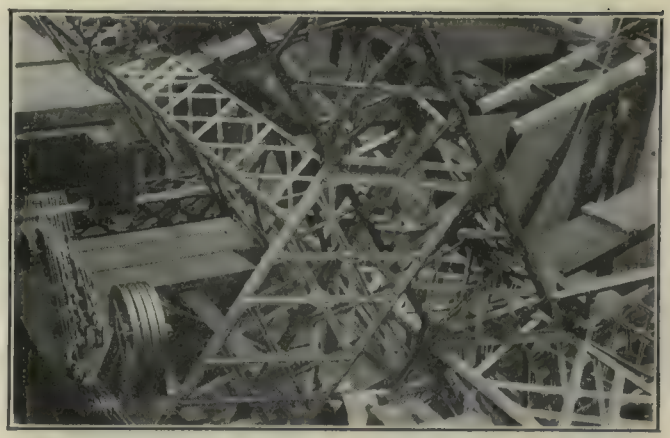


FIG. 6—FRAME JOINT AND CONTROL WIRES

in general where strength of joint is important. For the necessary inside attachment of the additional lattice members the in-turned edge of the channel flange must be straightened. This "lipping out" is done by a small press, or in individual cases by a hand tool shaped like broad flat-nosed pliers. Lipping out tends to curve a channel concave toward its inner edge, but the operator can neutralize this tendency by bending the channel out during the operation.

Three sizes of rivets are used in the structure, 0.0965 in. for the center connections of the lattice bars, 0.115 in. for the girder-lattice connections, and 0.154 in. for the joints. They are tempered before driving and must be driven within an hour following this treatment. In fabrication as well as erection the system was followed of collecting all undriven rivets at one-hour intervals and distributing freshly treated rivets.

Details of typical connections were worked out on the drawing board in the course of the original design, but much of the detailing was left to the shop, to be worked out in actual set-up. No attempt was made to develop templets or shape the connection parts from the drawings, but all these data were worked out by shop set-ups or, as they were called, "mockups." Where a large number of duplicate joints was involved, all or part of the mockup was built with waste members or ends of members, and the details worked out with them thereafter were used as templets for laying out the total number of connection pieces required. Where only one connection of a given kind was to be made, it was usually worked out on the members themselves.

How the Joints Were Fitted

If the complexity of the joints involved in the airship structure is considered, it may be realized that the detailing of the joints was a very tedious and extensive item of the whole work. A number of joints may be seen among Figs. 5, 6, 7 and 8.

A special method of working out the joints was applied to the circumferential frames, which constitute the major part of the ship framing. A large floor jig was built for fitting up these frames at League Island, as shown in Fig. 9.

A floor jig like that used at League Island but somewhat simpler in construction was built at Lakehurst for final assembly of the ring frames, as shown in Fig. 9. Here they were riveted and the diametral and chord wiring which holds the ring to shape was inserted and drawn up to proper tension. With some care in handling, the completed frame could be picked up without serious distortion and handled by hoist lines suspended

from the roof, over to the erection trestles, along one side of the big hangar, where it was set and blocked up, being lined up transversely and longitudinally by transit to true position.

The system of erection differed from that used in



FIG. 7—A JOINT IN "MOCKUP" ASSEMBLY

England, where it has been customary to set and brace permanently a pair of frames, then skip a panel and erect and brace the next pair of frames, later filling in the empty panels. For the Lakehurst work it was decided that continuous working would be better, starting from a rigid mid-section to be first set and braced. Accordingly the middle six frames were set, the longitudinals put in place, beginning at the bottom, first in the middle panel and then in the panels to either side, etc., and finally the wire bracing between frames and longitudinals was put in in similar sequence. In this process the farthest advanced portion, at the middle, was at all times more rigid than the portions to either side, and disturbance or distortion was minimized by carrying on the work symmetrically toward either end of the group of frames. It was thus possible without great difficulty to maintain the framework true and thus finally produce a mid-section fully braced and true to form, with uniform tensions in the bracing wires. In this initial operation only the main frames and longitudinals were placed, and the secondary system with its secondary bracing followed as a second operation.

Once the rigid central section was complete, work could progress toward either end independently without any tendency to distortion, greatly facilitating the work.

The wire bracing throughout the ship consists of hard-drawn steel wire from No. 9 to No. 11 wire gage, with No. 12 and No. 13 used in some minor services. Turnbuckles are not used, but instead the wire is drawn up and end loops formed and safe-ended, with the use of a tensioning device which permits the application of precisely the tension wanted. The tensioning device consists of a small winding frame comprising a cable drum or spindle attached to a gear, and a crank handle attached to a pinion meshing with the gear; a pawl on the housing of the device engages a ratchet wheel on the pinion shaft. A vise-like clamp is connected by a link to the winding-gear housing, and a similar one is attached to the outer end of a length of tiller rope which is wound on the drum of the winding gear. When a wire diagonal is to be put in, one end of the wire is passed through one of the eyes which it is to connect, a loop is bent, served with wire wrapping and soldered; then the other end of the wire is passed through its eye, and one of the clamps of the pulling device is attached to this free end, while the other clamp is attached to the standing part of the wire near the opposite eye. By

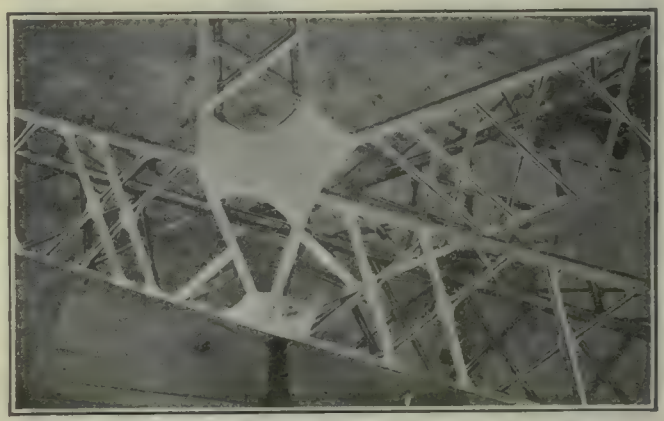


FIG. 8—FRAME JOINT WITH DOUBLE LATTICE

means of the ratchet gear the connecting rope is wound up on the drum and the free end of the wire thereby pulled up to any desired tension. The tension in the standing part of the wire is measured with a Larson wire-tension gage while the pulling goes on, and when



FIG. 9—ASSEMBLING A SMALL RING FRAME

it reaches 300-lb. tension, the desired amount in the diagonals of this airship, the free end of the wire is clamped to the standing part, served and soldered. The serving is done with No. 30 annealed steel wire, put on in about 100 turns with a small space left every fifth turn. Without releasing the clamp, the serving is then filled with a flux of stearic acid and resin, and soldered and wiped.

Gas Bags Have Automatic Valves

Each longitudinal element of the ship between main frames (10 m. long) is occupied by a separate gas bag. Each bag has a manually operated escape valve at the top and an automatic release valve at the bottom, vented upward through a tube passing through the bag. To resist the bulging tendency of the bags in the openings between the frame members, the entire inner surface of the frame is covered with a tightly stretched network of crossed diagonal wires (No. 13) spaced about 18 in., which are fastened to the inner channels of the longitudinals and ring frames. Inside of these is a smaller netting of knotted ramie cord about 9 in. mesh.

A skin of impregnated fabric covers the outside of the ship. It is put on in wide longitudinal strips, which are laced to the frame members around their edges. The spaces between the sections of fabric are covered with strips cemented on, and the entire skin is brush-coated with cellulose acetate.

The various problems encountered in the equipment of the ship cannot be gone into here. One of them may be noted, however, to illustrate the original experimentation required in their solution.

The aluminum gasoline distributing piping in the ship is connected by fittings of sand cast "lynite," an aluminum alloy. These fittings proved to be very porous; practically the entire lot leaked gasoline under a pressure test. The problem was to make them tight. Extensive experiments were carried out. Finally, success was attained by impregnating the castings with silicate of soda (water glass) under pressure. In the method finally used a lot of the castings are first subjected to a vacuum (25½ in. mercury was obtained), after which the water glass solution is admitted. The tank full of castings immersed in the solution is then subjected to a pressure of 300 lb. per square inch, which is left on for an hour. When taken out of the solution the castings are dried in the sun or at a gentle heat. The treatment makes them tight against gasoline in tests at 110 lb. pressure, which is several times as great as the highest service pressure.

Provision for Expansion

It may be added that expansion is provided for in the longitudinal piping as well as in the wire and wire-rope lines of the control system, which operates valves of gas bags, ballast tanks, and the like, engine telegraphs, rudders and other necessary controls throughout the ship from the control car under the forward portion of the keel. The expansion provision in the pipes consists of goosenecks, while the wire and cable lines have mechanical take-up, also operated from the control car.

The general design of the Fleet Airship ZR-1 was started under the direction of Commander J. C. Hunsaker, Construction Corps, U. S. Navy. The design of airships was under the cognizance of the Bureau of Construction and Repair. As chief of the bureau of construction and repair, Rear Admiral D. W. Taylor always displayed great interest in airships and due to his energy the work never lagged. Upon formation of the Bureau of Aeronautics, under Rear Admiral W. A. Moffett, the design of the ZR-1 was completed under the direction of Commander Hunsaker. The detailed design, fabrication of parts of the structure and power plant installation were performed at the Naval Aircraft Factory, Navy Yard, Philadelphia, Pa., under the direction of Commander G. C. Westervelt, Construction Corps, U. S. Navy, its manager. The development of plant facilities, methods and processes of erection and tests of the ZR-1 were performed under the direction of Commander R. D. Weyerbacher, Construction Corps, U. S. Navy, manager, Naval Air Station, Lakehurst, New Jersey.

Selling Machine Tools in Unusual Places —Discussion

By F. P. Terry
Belfast, Ireland

Happening to visit a little out-of-the-way town in northern Ireland, I dropped into a small machine shop to pass away the time, and I was forcibly reminded of the editorial on page 672, Vol. 58, of the *American Machinist*, under the title given above.

In this shop I found a collection of relics, consisting of old lathes (two with wooden beds), an old planer held together with many bolts and plates, and a sort of home-made shaping machine. In addition, there was one other machine, the pride of the old proprietor. There was not (according to the owner's opinion) anything like it within fifty miles. I had no difficulty in recognizing one of the most-up-to-date American lathes made by a firm advertising regularly in the *American Machinist*, and how it got there was the next thing that I wanted to know. The old fellow informed me quite seriously that his son got it for an "old song," in other words, next to nothing. This I found was practically true, the said son being an engineer in the British Navy during the war. One day his boat intercepted a ship load of these lathes and other machinery, destined for a port in Germany, which it never reached, being brought into a British port as a prize and the cargo sold. But from what I gathered from this old man of his son's wonderful cleverness as a sailor and engineer, I doubt very much if this lathe ever saw the sale and the mere song price was an exaggeration of the real paid price.

"It's a bonnie lathe and does wonderful good work, and is admired by everyone who sees it, and I could have sold it dozens of times, but it has one bad fault, there's plenty of change wheels but we can not cut a thread." Looking into the matter I found it was somewhat out of the ordinary, the wheels all being multiples of twelve up to ninety-six, consequently the old man's reckoning of five was all useless. With a little explanation from me as to how they do things in Germany and a sheet of paper, I was able to leave him a list of wheels necessary to cut most of the threads he would require, also full particulars of metric threads, which he was pleased to have.

He was more than pleased at the information I gave and I promised to send him—which I have done—a page from the *American Machinist* containing the maker's advertisement and the London agent's address.

Liability of Buyer

When failure of buyer of machinery to give notice of defects may create liability for payment of price in full

By Leslie Childs

WHERE machinery is sold, under a contract that gives the buyer a certain time in which to test its sufficiency, it is usual to insert a stipulation which obligates such buyer to give notice of any defects within a named period. Stipulations of this kind vary in their terms, but, as they are inserted for the protection of the seller, they commonly recite that failure of the buyer to give notice of defects, within the time stipulated, will render the latter liable for the purchase price of the machinery in full.

Needless to say, under such a contract, the question of the liability of the buyer, in case he fails to give notice of defects within the time specified, becomes one of considerable importance. And, while this subject has been the starting point of much litigation, it cannot be answered by the statement of a hard and fast rule, for the reason that each case of this kind has necessarily been decided in the light of the particular facts involved.

However, generally speaking, a clear violation of a stipulation requiring notice of defects by the buyer within a certain time will render the latter liable for the price of the machinery. Especially is this true where by his silence and failure to give notice the buyer has prejudiced the rights of the seller to make good any defects that developed in the machinery on the trial. The application of this rule of law is illustrated in an interesting and instructive manner in the recent Washington case of the Gruendler Patent Crusher & Pulverizer Co., vs. the Preston Grain & Milling Co., 215 Pac. 60, which arose under the following facts.

A Case in Point

The defendant purchased certain machinery from the plaintiff under a written contract. This contract, among other things, provided for a test by the defendant, and notice within 30 days of any defect that might develop, and further that the failure of the defendant to give such notice should render it liable for the purchase price in full. That part of the contract dealing with this phase of the transaction providing as follows:

"By acceptance of this proposition you agree to install machinery and put same to work . . . immediately upon arrival of same, and if within 30 days after date of receiving machinery same does not come up to our representations, we reserve the right to have you notify us at once to send our engineer to investigate the trouble, to remedy same if possible. However, should the mill thereafter not come up to our guarantee, you to place the machinery on board cars f.o.b., your station, . . . and we will refund all money paid us.

"If your option to return above machinery is not availed of according to the above terms, and within the above 30 days, the machinery must be paid for in full. . . ."

The machinery in question was, it appears, delivered in February, 1921, and operated by the defendant from Feb. 8 until about March 19, during which time the defendant made no complaint of defects in the equipment. On the last-named date, however, the defendant notified the plaintiff by letter that the machinery was unsatisfactory, and pointed out certain defects and deficiencies.

Now, at this point, it may be noted that this letter was not written within the 30 days required by the contract for any notification of defects. The plaintiff appears to have ignored this letter; at any rate sometime thereafter the instant action was brought in an attempt by it to recover the purchase price of the machinery.

Upon the trial of the cause the trial court held that the notice of defects given by the defendant was too late, as it was not given within the 30 days stipulated in the contract, and rendered judgment in favor of the plaintiff for the value of the machinery. From this judgment the defendant prosecuted an appeal to the Supreme Court of Washington where in upholding this judgment it was, in part, said:

Defendant Held Liable for Purchase Price

"The parties here fixed their several rights and obligations by a written contract, which provided for a 30-day test in order to develop any inherent defects or want of capacity, with the right in the seller, if defects were developed, to send his engineer to investigate and remedy the same, and not having timely notice it was deprived of its right to remedy the want of capacity and other defects, if any, and by the terms of the contract the buyer became liable for the payment of the purchase price in full. . . .

"The theory of the trial court was the correct one. The evidence fully sustains its findings as to the failure to give notice within the time provided, and the judgment must be affirmed. . . ."

The foregoing case was well reasoned, and in view of the facts and the terms of the contract involved, it illustrates the application of the rule of law under discussion in an admirable manner. And too, while the case was of course decided in the light of these facts and the terms of the contract, the reasoning of the court is sound, is applied quite generally in situations of this kind, and is supported by much authority.

It is then obvious that, where machinery is purchased under a contract that provides for a trial and notice of any defects that may develop within a certain time, the giving of such notice, within the time named, may become of the greatest importance to the buyer. For, as in the case reviewed, if the buyer neglects to give the notice required within the time agreed upon, he may thereby waive valuable rights under the contract. Truly the point involved in the case reviewed is one of vital importance to buyers and sellers of machinery.

Position of the Machine Building Industry

By J. Bainter

It should be easy to be proud of membership in the machine building industry after reviewing even only slightly its history and noting its present scope. As for the history, articles now running in the *American Machinist* give some of the romance of the story. One needs but look about to observe the scope, as practically our entire civilization has been made possible by our machinery. Truly, we can consider ours the key industry.

The Elements of Production Grinding

By ELLSWORTH SHELDON
New England Editor, *American Machinist*

The fifth article—Cause and remedy of chattering—Proper support of work is essential — The use of steadyrests — Importance of preparatory work

ONE OF the annoying difficulties most commonly experienced by the operators of grinding machines is that of "chattering," resulting in a rough corrugated appearance of the ground surface or in very fine parallel lines showing upon an otherwise smoothly finished part, according to the magnitude of the fault. It is almost certain to be due to vibration somewhere about the machine or work, and the cause is sometimes very difficult to trace.

Extreme cases of chattering, when the ridges left by the grinding wheel can easily be felt with the fingers, are not likely to occur, or, if they do, the cause may be quite obvious—as a wheel that is noticeably out of round, or a piece of work so springy that the vibrations may be seen. On the other hand, chattering is only too apt to appear when the operator is trying to secure an extra fine finish upon the surface of the work.

In the latter case the chattering appears as closely spaced, delicate lines of light and shade, very apparent to the eye because of the light refraction, but impossible to feel or to detect with measuring instruments. Unless the work in hand be of a very exacting nature, such chatter marks will do no harm, as the extreme height of the ridges—if they may be so called—is far less than the thickness of any oil film that would necessarily be interposed if the part were a journal.

Owing, probably, to the regular spacing of the marks it is a common fallacy to attribute them to the presence of toothed gearing somewhere about the machine, but that such a theory is untenable is amply proved by the fact that they are quite as likely to appear upon work ground in a machine that has no gears whatsoever in its construction as in a machine with a gear driven headstock.

Whatever the degree in which the chatter may appear, the operator will be safe in assuming that it is caused by vibration, and a careful search or process of elimination will, in nine cases out of ten, reveal the fault to be in the work itself rather than in the machine. Strange to say, a large and heavy piece of work is quite as likely to give trouble as a lighter and more springy piece, and the average operator will experience more difficulty in overcoming it for the reason that he does not suspect the true source.

No piece of work, however, heavy, is absolutely rigid. It will possess a "period of oscillation" governed by its size and weight, and may easily be caused to vibrate by any succession of small impulses that synchronize with it. Rhythmic vibration may also be caused by the steady but sustained impulse of the wheel in passing over the work, exactly as the string of a violin will vibrate in response to the bow.

When trouble is experienced from chatter, the first place to look for it is, therefore, in the work itself or in the manner of its support. If the machine be a cylindrical grinder, examine the condition of the head and footstock spindles to see that there is no looseness. See that the center points are true and of the correct angle, and that the center holes in the work are equally true and match the angle of the points.

Do not try to grind work of any length on the cylindrical grinder without intermediate supports, and do not be afraid to use too many steadyrests—it cannot be done. The proper distance apart to space steadyrests is determined by the room that the individual rest takes up; put them as close together as they will go.

Steadyrests are of various kinds and are of both the solid and the spring-supported type. Excellent results may be accomplished with either type when the principles upon which they are based are thoroughly understood. For comparatively light work which is subjected only to light cuts, the spring-supported rests are more convenient, as they will to a certain extent adapt themselves to the constantly lessening diameter of the work. On large pieces, especially under heavy cuts, the solid rests furnish a rigid support to resist the wheel pressure.

Several styles of rests are shown in Fig. 24. The one farthest from the observer in the cut is designed to inclose the work at some point that is not required to pass the wheel, as on long-shouldered shafts, where the rest acts as a bearing and causes adjacent parts to be ground concentric with the part supported by it.

The middle one shown in the cut is a solid rest with

> ONE of the most frequently occurring and persistent troubles experienced by the operator of grinding machines is that of "chattering" of the work, resulting in a wavy appearance of the ground surface that is always objectionable to the eye and that may or may not be detrimental to the work, according to its magnitude and the service to which the ground part is to be put. Careful balancing and truing of wheels and the proper support of the work by means of steadyrests will generally reduce if not entirely eliminate the greater part of such trouble.

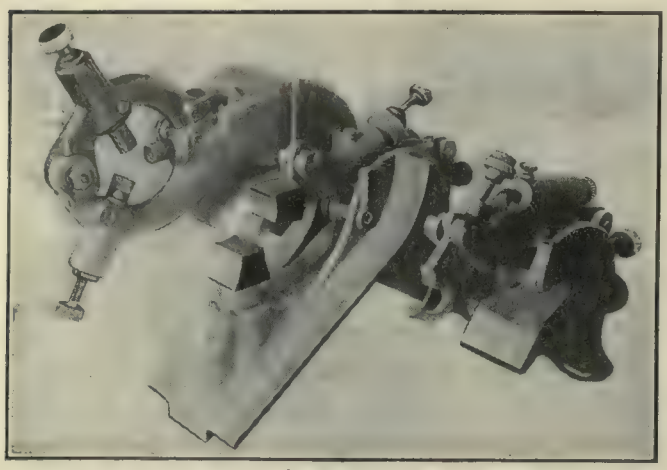


FIG. 24—DIFFERENT TYPES OF STEADYREST

adjusting screws conveniently located for the operator to follow the diminishing diameter of the work with either or both shoes and keep them at all times in contact. The third rest shown is of the spring-supported type and is designed to follow any irregularities of the work while at the same time supporting it against deflection.

The original conception of a steadyrest was that of a device for absorbing rather than preventing vibration and to a certain extent it had that effect, but the real office of a steadyrest is to *prevent* vibration by supporting the work so solidly that it cannot be made to vibrate. The absorption principle is most effective in the case of rhythmic vibration, where the work responds to the action of the wheel as a bell to the stroke of a hammer. Even the slight pressure of a spring finger will in some cases damp the vibration to an extent sufficient to eliminate the trouble.

The point in relation to the circumference of the

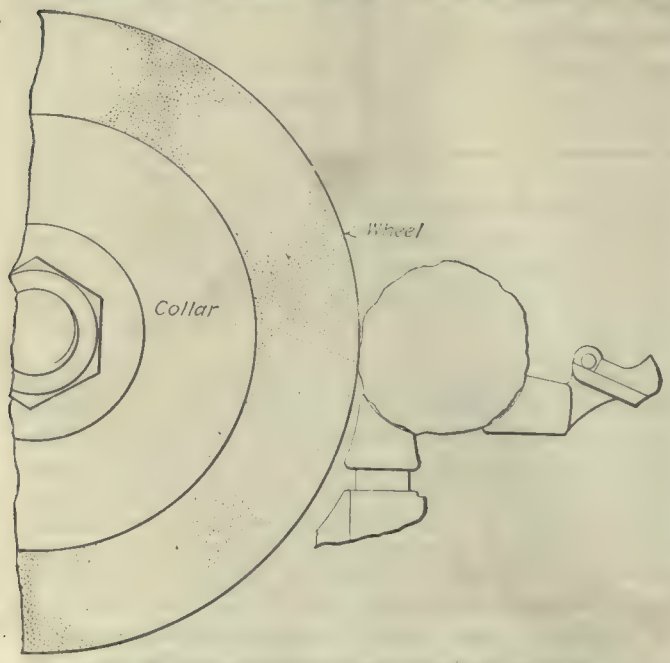


FIG. 25—POSITION OF STEADYREST SHOES

work and position of the wheel at which the shoes of a steadyrest should bear is of importance. A single shoe directly opposite the wheel will not prevent the work from vibrating—indeed, it will often aggravate it. The shoe should not be placed directly under the work.

Each rest should have two shoes bearing upon the work approximately 90 deg. apart. One shoe should be on the side of the work toward the wheel and well up to the point of contact between wheel and work. The other shoe should bear at a point about midway between the ends of the horizontal and vertical diameters. Fig. 25 is a diagrammatic representation of the position that should be occupied by the shoes. In this position any movement of the work due to its irregularity will be in a direction that does not seriously affect its diameter.

For a variety of work, when the number of pieces of a kind or diameter is small, the shoes may be of bronze or wood, but for long-continued service upon identical pieces, as is the usual condition in production grinding, the proper material to use for this purpose is hardened steel. Bronze or wood would not of itself abrade the work, but either material will soon become loaded with abrasive grains and will then act as a

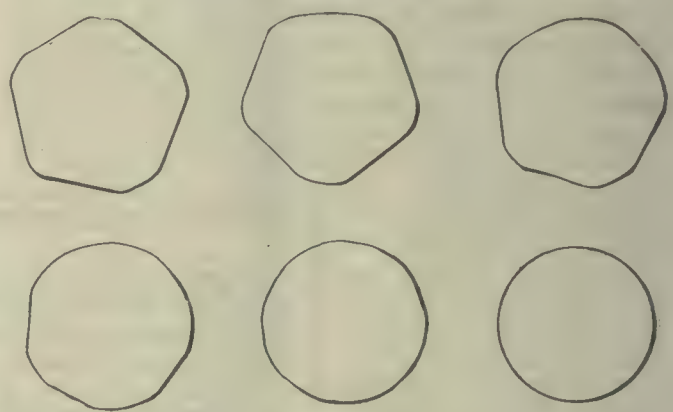


FIG. 26—A "SERIES OF PROGRESSIVE APPROXIMATIONS"

lap. The hardened steel shoes will not load and are not likely, therefore, to cause abrasion.

The shape of the steadyrest shoes where they bear upon the work is of importance; they should be ground to the exact radius of the finished piece they are to support. Before the grinding starts, the shoes will naturally bear upon the work at only two points (the ends of the included arcs) but as the diameter of the work decreases under the action of the grinding wheel the bearing will approach nearer and nearer to the full arc until, when the finish size is reached, the work will have a full and true bearing in each shoe.

The process of grinding a piece of work by the use of a steadyrest has aptly been called a "series of progressive approximations." Take, for instance, the grinding of a rough pentagonal bar as illustrated in Fig. 26 (which represents the result of an actual experiment conducted by a leading manufacturer of grinding machines and is not a hypothesis of the writer's) from approximately 2 in. to a truly round bar of $1\frac{3}{4}$ in. diameter.

Such a piece, supported by a rigid steadyrest and revolved before a grinding wheel, would at first have a very erratic movement because of the five "high spots" passing successively over the two-point bearing provided by the shoes. The bar rapidly changes its shape as it diminishes in size, the high spots changing position and appearing closer together as the work progresses, until the radius approaches that of the hardened-steel shoe of the steadyrest. By the time the radii of the work and shoe coincide, the former has

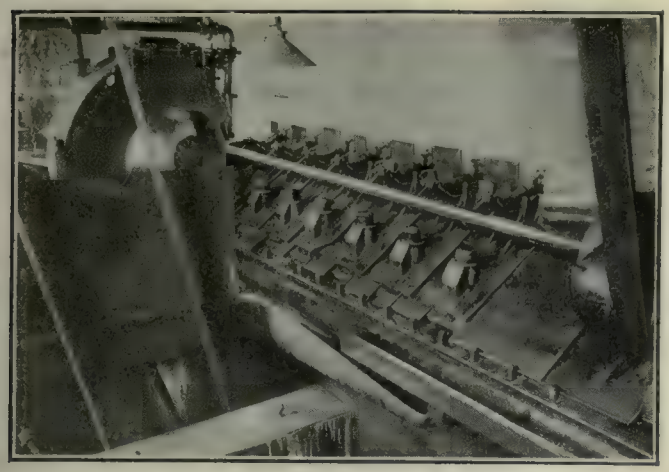


FIG. 27—A REGULAR PRODUCTION JOB

been reduced to a truly round bar of corresponding diameter.

The piece of work shown in the grinding machine in Fig. 27 is the lead screw of a well-known toolroom lathe and the job is one of regular production, 50 or 100 pieces being ground in a single lot. It will be noted here that the operator believes in the use of plenty of steadyrests and has placed them as closely together as they will go and still allow room for the water guards between them.

Though careful and considered application of steadyrests will almost always eliminate chatter that is caused by vibration of the work—and this, as has been said, is the principal cause—the rests cannot be expected to cure a disease that exists in some other part of the machine and after the operator has become convinced that neither the work itself nor its supports are at fault, it is time to look elsewhere for the cause of the trouble.

Next to springy and imperfectly supported work as

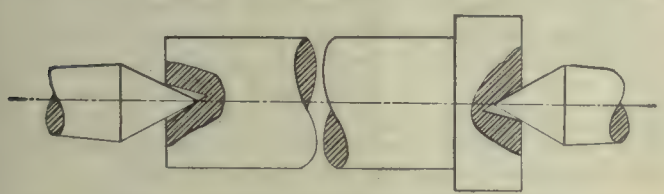


FIG. 28—CENTERS NOT IN ALIGNMENT

a cause of chatter, the greatest offender is probably an unbalanced wheel and it should be remembered that because it shows a proper condition of static balance while on the balancing ways, it does not follow that a wheel is not out of balance when it is running in the machine. There are other reasons for a lack of balance and the wheel itself may not be at fault.

Chattering *can* be caused by loose bearings on the wheel spindle, but while these bearings are often blamed, the fact is that they are about the least likely of any part of the machine to be the source of such trouble. If the bearings are loose they should certainly be adjusted to correct running conditions, but when once so adjusted and properly lubricated, further tightening will serve only to absorb unnecessary power, cause undue heating and perhaps destroy the bearings but it will never cure a case of chattering.

A spindle that is sprung will cause a true wheel to run out of balance and the operator of a grinding machine should make certain that this condition does not exist in his machine, by testing the spindle with an indicator. If the hole in the bushing is appreciably larger than the spindle upon which it goes, a true wheel may run out of balance because of being set eccentrically. If this is the case it should be packed true with paper or metal shims until it is concentric with the spindle. Truing it with a diamond while in the eccentric position will not help matters much, for the wheel will then have a heavy and a light side—it will no longer be a true wheel.

Chatter may be caused by a loose or improperly fitting wheel slide, and if a thorough examination into the above possible causes proves that the trouble is neither in the wheel nor its mounting, this bearing should be looked after. The wheel slide should move freely but without shake, and should always be kept well lubricated. If it is too tight it will move in a succession of minute steps instead of with a continuous movement, and it will be practically impossible to size the work with any degree of accuracy.

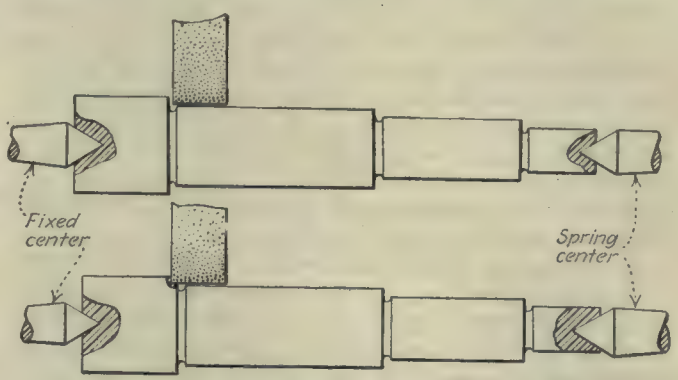


FIG. 29—CENTERS NOT THE SAME SIZE

Many little difficulties and annoyances are experienced in cylindrical grinding as a result of careless or imperfect preparation of the work. In such preparation at least one preliminary operation is necessary, whether any lathe work is to be done upon the piece or not, and that is the centering. If the pieces are rough turned upon the lathe it is not enough to assume that the centers upon which the work was turned are good enough for the finishing operations on the grinding machine.

The first requisite to good centers is a properly made center reamer. This tool must be true as to angle and with a correct amount of clearance upon each of its cutting lips, else the result will be an imperfect center hole. It is much easier with the average center reamer to make a hole that is not round than to make one that is and good grinding cannot be done when the work is supported upon centers that are not round.

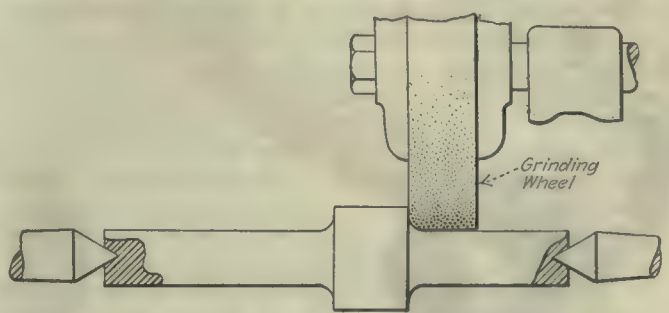


FIG. 30—GRINDING FILLETED SHOULDERS

Another thing that can cause a lot of trouble is to center the work upon a machine the spindles of which are not in line. This contingency is not likely to occur if a proper centering machine is used but, unfortunately, a great deal of centering is done upon sensitive drill presses, and with this equipment it is easier to make the center holes out of line than otherwise. Fig. 28 shows the effect of misaligned center holes when the work is on the center points of the grinding machine. A piece so supported will usually chatter badly in despite of perfect conditions in other respects.

Making the Work Round

Nor can a piece so supported be made round, parallel, or accurately to size without a deal of trouble. When several pieces of a lot are in this condition, especially if the degree of misalignment varies and the grinding machine warns its operator that something is wrong by refusing to size properly, the trouble is difficult to locate unless the operator has had previous similar experiences to direct his suspicion to the center holes.

Centered work that goes directly from the hardening department to the grinding room should have the center holes lapped true, both as to roundness and alignment. For this work the end of a three-cornered file and a piece of abrasive cloth is too often the only equipment, whereas properly formed laps and suitable abrasives should be used, and these only in a machine that will insure correct alignment.

It goes without saying that center holes should be deep enough, and, though there may be little likelihood of error in this respect, there is another consideration involved in the depth of the centers that is too often overlooked, and that is: the length of the pieces of any given lot should be alike when measured between the angular faces of the center holes, exactly as they *are* measured by the center points of the grinding machine. This point is of importance on any work and especially on shouldered work.

Further; if there *must* be variation in this respect, the variation should all be at the small end of the piece, for in nine cases out of ten the large end of the work is toward the fixed center of the work head of the grinding machine and a variation in depth of center hole at this end, as shown in Fig. 29, will cause a corresponding variation in the position of the shoulders with respect to the point of reversal at which the table of the machine is set.

Proper Location of Shoulders

In rough turning shouldered work, the lathe operator will invariably locate the shoulders from the small end of the work piece, and when, by reason of improperly made center holes, these shoulders do not all come the same distance from the large end, the grinding wheel is going to bang into the first "long" shoulder that comes along and there is bound to be fireworks, if not broken wheels.

If center holes are drilled with separate drill and reamer instead of a combination tool, make sure that the drill holes are deep enough. A small amount of time may be wasted in drilling them a little deeper than is necessary, but it is small indeed when compared with the time that will be wasted by the grinding-machine operator before he discovers that the trouble he is having in sizing his work is caused by the work revolving upon the point of the centers instead of upon their angular faces.

In roughing out shouldered work, ample clearances should be left, if possible, under each shoulder. Many grinding-machine operators believe that their machines will reverse to a line but they will not. On most small work a clearance of $\frac{1}{16}$ in. may be tolerated and the operator should never allow less than this amount of leeway when setting his machine. A clearance of $\frac{1}{8}$ in. is safer if the nature of the work will permit.

The operator of a grinding machine does not have much to say about the design of the pieces he grinds; he must take the work as he finds it. Nevertheless, in the interests of good design it should be said that generous fillets under the shoulders make for greater strength than undercuts. When grinding up to a filleted shoulder, as shown in Fig. 30, the corner of the wheel should be rounded to the same radius. In this case the table of the machine should be set to reverse while the wheel is at least $\frac{1}{8}$ in. away from the shoulder and upon the final cuts the table traversing should be done by means of the handwheel. The grinding wheel can then be made to finish the shoulder to any desired length.

Rough Turning Preparatory to Grinding

When rough-turning work that is to be finished to size in the grinding machine, every attention should be paid to the cutting lip of the lathe tool and none at all to the point upon which the "finish" usually depends. The tool should be calculated to get under and shear off the maximum chip at the highest rate of speed and feed that the machine and tool will permit. The rougher the finish left, to the better advantage will the grinding wheel remove the remaining stock.

The amount of metal left to be removed by the grinding wheel depends somewhat upon the size and nature of the work pieces. Long pieces with several shoulders should be left from $\frac{1}{32}$ to $\frac{1}{16}$ in. oversize because of the tendency of such pieces to "run out." For short pieces a grinding allowance of $\frac{1}{64}$ in. should be ample.

If the work is to be carbonized or hardened before grinding, the finish allowance must be kept as low as possible in order that the thickness of the carbonized shell may not be unduly reduced. An oversize from 0.008 to 0.010 in. is common practice, increasing or decreasing slightly in accordance with the nature of the work and its tendency to warp in hardening.

Effect of Cold-Rolling on the Hardness of Metals

The work to determine the effect of cold-rolling on the hardness of metals is being continued by the Bureau of Standards. The general character of the results obtained show that the change in hardness resulting from cold working is represented by the V-curve, the abscissas of which show the degree of cold working, and the ordinates, the softness of the metal. The only possible exception found so far is aluminum of very high purity. The results obtained for a specimen of this material indicated a progressive hardening upon increasing deformation.

Tin, on the other hand, gave the usual V-curve. Additional tests are being made with the "soft" metals, aluminum and tin, care being taken that the metals are tested immediately after rolling so that the chance for self-annealing is eliminated. It is also intended to make density determinations of several typical metals after various degrees of cold deformation.

Industrial Cost Accounting for Executives

By PAUL M. ATKINS

Twenty-first article—Direct labor charge and hour methods of allocating burden — Determining the rate — The time element in burden application—Limitations of these methods

WE HAVE seen that the problem of apportioning the expenses incurred in the operation of a business to the product should be divided into two steps—the first of which consists of allocating to the several direct manufacturing departments the expenses of the other departments whose work has aided production, in proportion to the services rendered. In this way departmental burdens are built up which are summarized in a controlling manufacturing burden account. The second step is the one which is to be discussed in part in this article—the distribution of the burden to the product. In the preceding article it was also seen that not all of the burden should be assigned to the products but only that portion of it which measures the value of the service rendered to the goods in the course of their fabrication. Our present task, therefore, is to consider means by which the earned burden may be allocated in a satisfactory manner to the work as it progresses through the factory.

THE USE of direct wages as a means of apportioning the burden is correct in so far as the direct wages serve as a measure of time.

It is not satisfactory to apply the burden without taking into consideration the differences among the several departments in which it is incurred nor is it correct to apply all the burden, for the earned and unearned must be separated and only the earned apportioned to the work in process.

If conditions are such that it is appropriate to use the direct labor charges as a basis, there is no method which is simpler, easier or which requires less clerical labor for its operation.

There are a number of methods which may be utilized for the purpose and successfully used if the conditions are appropriate. In this article two variations of the same method will be discussed, and in the following article, two variations of another method will be investigated. The means of burden application which are here treated are probably the simplest, the most used and the most frequently condemned by progressive cost-accountants and hence it is worth while spending some little time finding out what is the real truth of the matter concerning them.

It may be said at the start that the way these methods are commonly used, a flat rate being developed without regard to departmental variations or fluctuations in the volume of business and hence of the incidence of the burden, cannot be too heartily condemned. There is no sound theory back of such procedure and in practice incorrect costs and misinformation can be the only result. In condemning these faults, writers on cost-accounting have been entirely correct. Unfortunately, they have not always perceived that many of the limitations might be avoided and that the advantages which the simplicity of such methods gives might well be retained.

The theory underlying the direct labor charge and hour methods of burden distribution is quite simple. A ratio is established in some way between the burden to be absorbed by the product and the amount of the direct labor hours. When the ratio has been established it can be applied to the various orders as they go through the department in proportion to the amount of direct labor charged to them or the number of hours which was worked upon them.

The first problem which we have to consider is the development of the ratio, assuming for the moment that the conditions are such as to make it possible to use these methods. After the departmental burden has been accumulated, the first step is to determine the number of hours or the amount of the direct labor charge which may be expected in the several departments if the volume of business is normal. The departmental burden is then divided by the labor charge or hours to find the rate, which is applied, as has been pointed out above, to the orders as they go through the department.

Essentially, what has been done is to determine a charge for the use of the services provided by the department; the longer the product enjoys such services, the greater must be the cost to it. At the same time, the rate at which the burden is allocated to the product does not vary with the volume of business, for the cost of the service rendered does not increase with the decrease in output.

It is important that the time element in burden application be kept constantly in mind for if it is not so held much of the significance of burden will be lost. It is only under exceptional circumstances that the time element does not have a part in the matter.

It is quite evident when it is remembered that expenses are almost invariably dependent on the time factor also and burden is simply expense looked at from another point of view. It may occur to some one

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to inquire how it is that wages can be used as a basis for burden application under such conditions. It is only because the time factor has played an important part in the determination of the wage charge that it can be employed for this purpose, and, as is seen later, under many conditions direct wages are not satisfactory because other factors enter in so extensively to the composition of the labor charge.

It should be quite clear that the development of a rate based simply on the total departmental burden for a period and the labor charge or number of hours worked in the department will not be correct for in this fashion the entire burden—unearned as well as earned—will be apportioned to the product and this, as we have already seen is incorrect. It is because of the custom of so doing that the method has not found favor among the cost-accountants who require accuracy in the records which they are keeping.

So far the assumption has been tacitly made that departmental burdens shall be built up before any effort is made to apportion the overhead to the product. It is true that such procedure should be followed but in the great majority of cases it is not, and hence we find ourselves confronted with another of the errors which have attached themselves to the method under consideration. It is common practice to establish a fixed rate to be applied either on the direct labor charge or hours, but without any regard to the variation of the incidence of the burden through the different direct manufacturing departments.

The establishment of a fixed rate approximates the idea of a normal burden rate, though rarely is any conception of the existence of normal burden rate or its meaning present in the mind of the man who sets the rate in this fashion. In so far, however, as the rate approaches a normal burden rate the development of the rate in this manner is correct. It is highly incorrect in disregarding the differences which exist among the several direct manufacturing departments, and so this reason is justly condemned as undesirable and misleading.

One Limitation on these Methods

If we consider simply the assembly department and the machine shop department of a metal working concern and the departmental expenses involved, it is evident that the rate of burden application is almost certainly different in the two. In the assembly department most of the work must necessarily be by hand, and little machinery will be employed. Hence there will be no large maintenance charges such as are necessary in the machine shop, no power costs and a much smaller expenditure for supplies. If the entire burden or expenses of the factory are to be lumped and spread by a flat rate over all the product without regard to the department in which the work is done, it is evident that the expenses of the above mentioned departments will bcome mixed and that if the rate is to be the same for both it will be too small in the machine shop and too large in the assembly department and incorrect costs are the inevitable result.

Of course, if the product is of only one variety and passes through the same processes in each department, then the final unit cost will be substantially correct. It must be remembered, however, that the departmental and process costs will be incorrect and under such circumstances, process costs are likely to be far more important to the management in the control of the business than are unit costs. If the company is turning out a variety of product then all the costs—aside from the direct costs—will be incorrect and the value of the cost accounts will be almost nil. In any event it is not worth while trying to apportion the burden and the time, and the labor employed in so doing is simply thrown away. It should be evident to any thinking person why the use of the method in such manner is condemned by all constructive cost-accountants.

It can easily be deduced from what has already been said that it is not worth while to apportion all the burden to the product regardless of the departments in which it is incurred by means of a rate on the direct labor charge or hours. To sum up then, we may say that it is not satisfactory to apply the burden without taking into consideration the differences among the several departments in which it is incurred, nor is it correct to apply all the departmental burden, for the earned and unearned must be separated and only the earned apportioned to the work in process. It is only when departmental burden rates are worked out in the way which was described some paragraphs above that the percentage on direct labor charges or hours can be properly used.

Limitations Within a Department

Our analysis of the problem is not yet ended, however, for further investigation shows that there are still other limitations on the use of the method. We have already seen that consideration must be given to the differences which exist among departments and have used the illustration of the assembly and machine shop departments. It must not be forgotten that the incidence of the burden varies within departments also. It must always be kept in mind that in the application of burden to the product the effort should be made to allocate it in proportion to the services rendered so far as that is possible.

Let us consider the machine shop department a little more in detail and see how the problem presents itself there. Having ascertained the normal departmental burden and the normal number of direct labor hours or total direct payroll, it would be quite easy to fix a burden rate. But would the rate so found by simple division be a correct one in the light of what has just been said about services rendered? Should the same rate be charged for an hour's service of a large size planer as for a small size drill press? Obviously the cost for the service is not the same. The planer, for example, may use more power in an hour than the drill press does in a week; it probably occupies ten times as much floor space; the depreciation taxes and insurance on it all are far larger than on the drill press; and without much question the cost of its maintenance is much more.

If a flat rate per hour is set, however, part of the cost of operation of the planer will find its way against the product which is being worked on at the drill press, since the burden is being considered departmentally and not from the point of view of the machine or production center. It is obvious, therefore, that where there are marked differences among the costs of operating the several production centers of a department this method of burden application is not satisfactory even though all the other requirements are met.

In such a department as the assembly department, on the other hand, where the only equipment consists of benches all nearly alike, and where any differences are not such as are likely to cause any variation in cost of

operation, this method is most acceptable and gives very satisfactory results. It is not at all necessary that there shall be no machinery in the department or that it shall be all alike from the mechanical point of view; it is only essential that the cost of their operation shall be the same.

Limitations of Direct Wages Basis

It is now time, perhaps, to consider certain limitations which affect the development of a rate on a basis of the direct labor charges. The use of the direct wages as a means for the apportioning of the burden is correct only in so far as the direct wages serve as a measure of time, since burden depends directly on time. Hence whenever wages are paid on a piece rate basis the direct labor charges are useless as a means of distributing the earned burden since they do not represent fundamentally a measure of time.

Variations in the wage rates within a department are another limitation on the use of this basis. It often happens that the man who is paid a high rate does only bench-work, hand-fitting, or repair work, which requires little use of machinery, while a man who receives a much lower rate may be engaged in running a large turret lathe whose expense of operation is considerable. When such conditions as these exist it is evident that the direct wages will not serve satisfactorily as a measure of time, and hence as a means of apportioning the earned burden. It becomes necessary, therefore, whenever there is a marked difference in the wages paid the workers to use the direct labor hours instead of the charges.

In the illustration used above, of course, neither basis would be correct because of the variation in the cost of operating the two production centers. It not infrequently happens in an assembly department, however, that there is a wide variation in wage scale—some of the jobs requiring much more skill than others, and some workers having been on the payroll much longer than others—yet the actual burden per hour is about the same for all. If anything, the lower paid workers receive more supervision and their work has to be more carefully inspected than is the case for the more highly paid and presumably more skilful workers, but if the burden is allocated on the basis of wages, the work which should receive the smaller share of the burden actually receives the greater.

The Advantages

It might appear from all which has been said about the many and varied limitations on this method of burden application that it would probably have few advantages and be seldom usable. It does have certain very distinct good points, however, which deserve mention. If conditions are such that it is appropriate to use the direct labor charges as a basis, there is no method which is simpler, easier, or which requires less clerical labor for its operation. It is almost without exception necessary to accumulate the direct labor charges against the several orders or processes, and when this has been done, the application of the burden is the work of but a moment. If it is possible to use the direct labor charges, it is usually very simple to collect the direct labor hours, and though a little additional work is needed in the cost department for this, it is not usually a serious burden and except for this added detail the method is as simple as before and often distinctly more accurate.

It is not at all necessary that the same method be used for the application of burden in all departments and so it frequently happens that in one or more of the direct manufacturing departments it is possible to use either the direct labor hour or charge method and so obtain the benefits of its simplicity even though it may be essential to employ a complicated means of allocating the burden in other departments. It often happens that this method in one or the other of its principal variations can be applied rightly where some modification of the general plan is now utilized wrongly if only the fundamentals of sound burden application are kept clearly in mind.

The details of the practical use of the method are simple. The number of hours worked or the total of the direct wages in each department in which work is done on an order are summarized from the time tickets. The totals are then entered on the order cost card, extended by the appropriate rate, and the result also entered on the card. The entry represents the earned burden for the order.

Controlling Account Entries

The controlling account entries are equally simple. If a percentage on direct labor cost is used, the total direct wages in each department can be obtained from the payroll summary. The direct wages multiplied by the departmental rate gives the earned burden for the department. The total of the departmental earned burden gives the total earned which should be prepared as a general journal entry—a credit to the manufacturing burden account and a debit to the several "in process" accounts.

If a rate per hour is employed it is well to arrange the payroll book in such a way that the total direct hours worked in the several departments can be obtained therefrom. From this point much the same procedure as that just described should be followed.

The sum of the earned burden charges to the several orders for the month in question should, of course, agree with the controlling account entries prepared in some such fashion as that just described. If a reconciliation cannot be made to within less than one per cent of the total involved, all the entries should be checked to find the error.

Within their limitations the direct labor charge and hour methods of burden allocation are very useful means of dealing with the problem involved. It must always be remembered that they have limits and that when complex situations are met, more highly developed means of dealing with the question must be used. One of these more complex methods is the subject of the next article.

Cast Iron for Enameling Purposes

The Bureau of Standards has received a number of specimens of typical enameling castings, and these are now being enameled with several commercial cast iron enamels. The chemical analysis of the castings has been made, and the Bureau also plans to make up typical bodies of cast iron in its metallurgical division. The specimens thus obtained will also be analyzed chemically and enameled. An attempt will be made to correlate the blistering of the enamel and the chemical composition of the cast iron, with the object of obtaining a good commercial cast iron which will not produce blisters.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

A Quick Method of Pointing Pins—Discussion

By George R. Bott

On page 149, Vol. 59, of the *American Machinist*, there was published an article under the above title by R. H. Kasper. Mr. Kasper's method is all right on small stock but would be very slow on stock of one-half inch or larger.

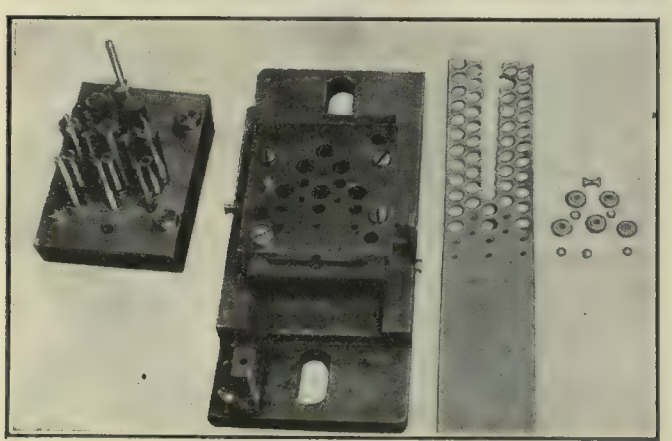
A few years ago while working where a cofferdam was being built, an order came to the shop for 3,000 drift pins, 12 in. long, to be made of ¾-in. round stock and pointed at one end. This job was accomplished in four days of eight hours each by means of a bolt-threading machine. A worn-out set of dies was ground to the required angle of the point, placed in the die-head and closed until they were tight together. The stock was then fed into these dies at high speed, using lard oil. A sharp, smooth and concentric point resulted from this method.

A Set of Washer Tools

By William Denton

The illustration shows a set of washer tools for making the small embossed washers of fiber, used in large quantities for insulating purposes in the manufacture of electrical devices. Five washers are made at each stroke of the press after the fourth, and the scrap is cut in two strips.

On the first stroke of the press three holes are pierced



PROGRESSIVE WASHER TOOLS

in the stock. On the second stroke the embossing, in the form of a depression around the holes, is done. The third stroke cuts out three washers and pierces two more holes. The fourth stroke embosses the two holes last pierced, and upon the fifth stroke the tools are in full action.

The final punch with the long pilot comes into action on the sixth stroke and divides the strip of scrap into two parts. This punch is round only for convenience in making it. The shape of the piece it cuts out may be seen to the right, and is scrap. The long pilot is the stop against which the strip is located at each movement of the stock. A progressive stop, the position of which is changed at each stroke, may be seen at the left of the die. Its duty is to locate the strip for the first four positions, after which it is drawn out and laid aside.

Saving Money on Piston Rods and Packing

By I. B. Rich

A piston rod isn't very different from any other shaft of the same size and length except for the fit in the piston and in the crosshead. And the method of fitting has changed very little in the past 50 years. For the most part we still cut a big slot through the tapered end of the rod and drive a taper key through it, to hold it in the crosshead. Why more of them don't break through the slot is a mystery to me.

The turning and finishing of the rod has seen some changes from the days when we had wrought iron rods with more or less seams running lengthwise. Then we turned them as best we could, at about 20 ft. a minute, and filed them smooth in the lathe. Sometimes we polished them with emery-cloth. In the days of low steam pressure and hemp packing, it didn't make so much difference as to the rods being either round or of uniform diameter. But the metallic packing made us pay more attention to the rod work. I have seen new engines come on the road with the piston rods turned so roughly that we used to call them "rat tail files for wearing out the packing."

Then we began to pay more attention to getting the rods round and smooth. We learned that filing in a lathe never made anything round, so we stuck to turning them as smoothly as we could. Then some bright individual began to finish piston rods and a lot of other work with a roller tool and we all followed suit. Most of us are still doing it.

A few shops have a grinding machine which will swing a piston and piston rod but these shops are few and far between. Some shops have attempted piston rod grinding with a heavy tool post grinder, but this is a makeshift and production cannot be gotten in this way.

With a piston rod grinding machine and some one with the nerve to set a few standards for "undersizes," just as the automobile men do for oversizes of pistons and piston pins, a lot of money could be saved in a big shop. By having a few standard sizes to grind piston rods down to, the metallic packing could be cast in a metal mold to these sizes and used without machining of any kind, or it could be finished with a reamer if desired. There would be no boring to fit, as at present. This is one of the many ways in which railroads could save money on repair work.

Designing and Cutting Sawtooth Clutches

By Archie C. Smith

The writer had occasion to make use of several quick-acting clutches and, as the quickest acting and most positive is the "sawtooth" variety, this form was selected.

The handbooks present a formula for the cutting of such clutches based on the angle of the milling cutter

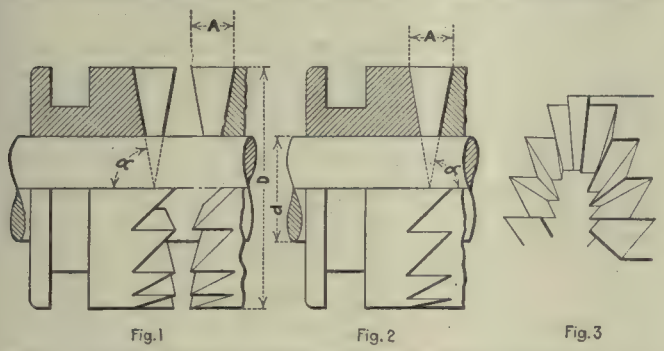


FIG. 1—CLUTCH WITH TEETH CUT BY HANDBOOK FORMULA (TEETH DISENGAGED). FIG. 2—SAME CLUTCH WITH TEETH ENGAGED. FIG. 3—APPEARANCE OF TEETH CUT BY HANDBOOK FORMULA

used and the number of teeth to be cut. While the teeth of clutch members cut according to the formula given will mesh perfectly, they are not as strong as they might be made.

This condition will be appreciated upon an inspection of Fig. 1 in which the two members of a sawtooth clutch are shown separated. Fig. 2 shows the same members engaged. It will be noted that while they fit perfectly when in mesh, the action at the commencement of engagement or when the teeth just touch, is anything but ideal. This action becomes worse as the speed is increased.

The formula presented in the handbooks for obtaining the angle for setting the index head of the milling machine to cut the teeth is as follows:

$$\text{cosin } a = \frac{\sin\left(\frac{360}{N}\right) \times \text{cotan of cutter angle}}{1 + \text{cosin}\left(\frac{360}{N}\right)}$$

From which A, Figs. 1 and 2, $= D$ cotan a

a is the angle for setting up the milling machine, N

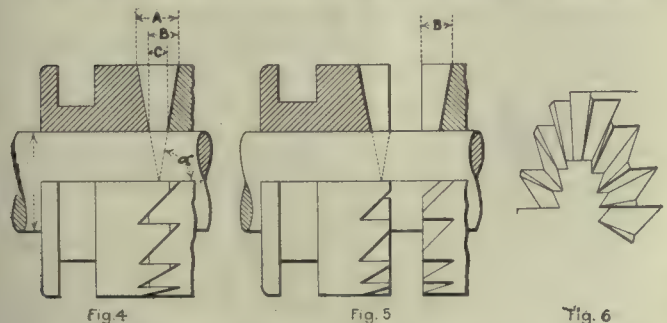


FIG. 4—CLUTCH WITH TEETH CUT BY MODIFIED FORMULA (TEETH ENGAGED). FIG. 5—SAME CLUTCH WITH TEETH DISENGAGED. FIG. 6—APPEARANCE OF TEETH CUT BY MODIFIED FORMULA

the number of teeth to be cut, A the depth of cut at the outside and D the diameter of the blank.

The appearance of the finished teeth will be as shown in Fig. 3.

An improvement over this method and one which the writer has found to eliminate the faults of the above formula is shown in Fig. 4. An inspection of this sketch will show that instead of engagement being effected by a series of delicate points clashing together there is, on the contrary, a line contact, the length of which equals the length of the teeth.

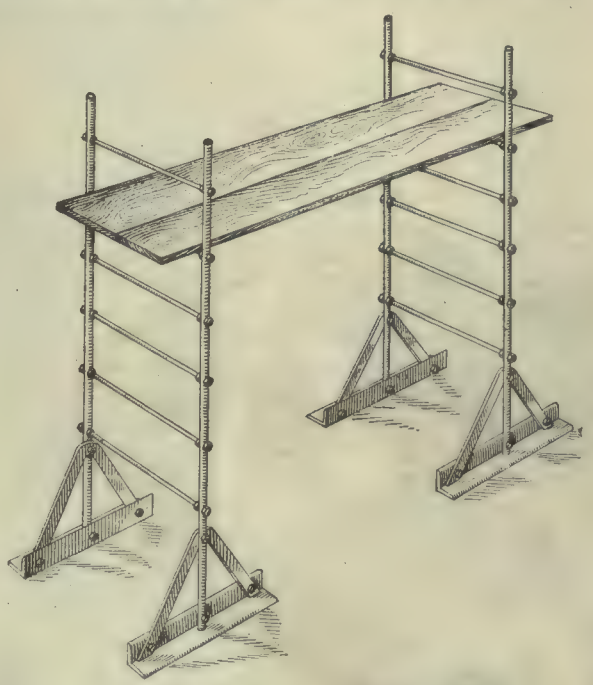
In selecting suitable proportions for the teeth it is necessary, first, to decide upon their number and the angle made with the shaft centerline, and then to obtain angle a by the handbook formula. Distance C is dependent upon the depth at the bore and equals d cotan a and is the amount of overlap of the teeth. $B = \frac{A+C}{2}$ and is the depth of cut at the outside. Fig. 5 shows the members out of engagement.

The appearance of the finished teeth will be as in Fig. 6. It will be at once apparent that the top faces of the teeth will not be cut away but will remain at right angles with the shaft. This construction produces a flat topped tooth which does not detract in any way from an instant engagement but on the other hand has the advantage of great strength.

Scaffolding for Use in Erecting Machinery

By L. M. Francis

The illustration shows a very convenient and substantial scaffolding for use around the shop where locomotives or other large machines are to be erected, or



SHOP HORSES MADE OF IRON PIPE

for overhead work. The standards are light, take up less room than the usual wooden horses and have a greater range of usefulness.

The standards are made of wrought-iron pipe of 2 in. or $2\frac{1}{2}$ in. diameter, and the bases of structural-steel angles. Holes are drilled through the pipes at intervals of about 12 in. and through these holes are passed 1-in. round bars, threaded at both ends and with two nuts at each end, one inside and one outside the uprights.

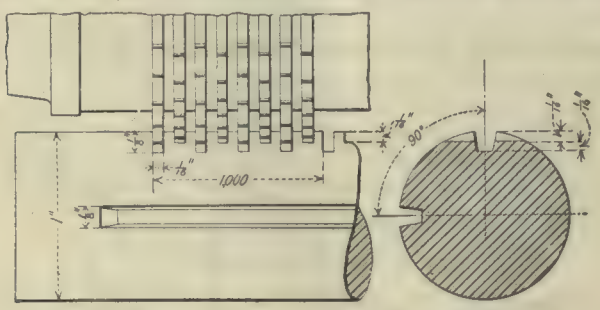
Suitable planks laid across the horizontal bars make a convenient platform at whatever height may be desired.

Unusual Methods of Making Graduated Rods

By Donald A. Hampson

A New England shop manufactures a special machine on which is used a 1-in. rod graduated for 84 in. and a similar rod graduated for 66 in. The graduations are made by milling cutters $\frac{1}{16}$ in. wide that cut across the high part of the round and the rods are further machined by cutting two keyways that run the full length. This statement immediately pictures to mechanical men the crooked shapes assumed by the rods and the long, uncertain job of straightening them.

Having been through the usual experimental processes and settled on a method that appears extremely simple, judging by the ease with which the men turn out the parts, the process will be of interest to others who have to straighten bowed shafts to a nice degree of accuracy. In use, the rods are traversed by light iron castings having spring-actuated index, or locating blades that engage the slots milled across the rods. The slots serve both as visible indicators and as accurate spacers for



UNUSUAL GRADUATING METHOD

the castings, which are really movable gages. A total error of $\frac{1}{64}$ in. in the length of the rods is permissable.

Figures are stamped on the rods at every inch and the milled slots are made $\frac{1}{8}$ in. deep for the quarters and $\frac{1}{16}$ for the eighths, measured at the high part of the rod.

A gang of cutters is used that will mill one inch at a time and the work is done with a rack-cutting attachment on a No. 2 Kempsmith milling machine. After each inch is cut, the table is moved 1.000 in. by the dial on the hand-feed screw. For some time the shop used a pilot piece and checked each setting with a special gage, but it was discovered that graduations fully as accurate could be made by depending upon the dial alone—and at considerable saving in time. Some of the machines are exported to France and for the rods used in them, a gang of cutters is provided that will produce graduations to suit French measurements.

The rods are graduated for a length of about 2 ft. by table movements of 1 in. Then the table is run back, the work unclamped and moved along, and the cutters lined up with the cut previously made, before proceeding again.

The two keyways are V-shaped, $\frac{1}{8}$ in. wide at the top. One of them runs through the center of the graduated part and the other one is quartered. The keyways are cut before the graduations.

A cast-iron fixture is used on the milling machine, the same one answering for both the graduating cuts and the ones for the keyways. The fixture encircles three-fourths of the rod—the top being the open part—and clamps the rod by having one side a loose piece.

The cuts are localized on less than one-third of the rod's surface and the total bow from the cuts amounts to an inch, but the rod never shows that much, as straightening operations are performed between cuts. Selected stock is used but even that has to be gone over and some straightening done. After cutting the keyways, the rods go through another straightening, which must remove a nearly uniform bend from the entire length. And following the graduating, the third and most particular straightening takes place. The bend this time is in nearly the same place as before but does not run clear to the ends, which are blank for several inches.

The first straightening job is performed in a 16-in. lathe having an extra long bed and purchased to take in these rods. Centers must be put in the ends of the rods and shoulders turned, so it has been found quicker to look over the blanks for kinks while in the lathe than to shift them to the straightening press. A short bar of square steel, laid across a piece clamped in the toolpost and having a copper protected end, is used for the work. Subsequent straightening operations are performed on a Geier screw-press having sliding centers attached. These centers are placed so conveniently that the workman does not have to move away from his position during the entire straightening. The open front, screw type of press is especially handy and adapted to this class of work. By means of a dial, the amount of pressure applied each time may be noted, which is a great aid when more pressure must be applied in the same spot or when the pressure has bent the rod too much.

In straightening cold-drawn and other finished pieces, the surface is too often badly bruised and these rods must be turned out without any evidence of mishandling, even though they get severe treatment in the straightening. To cushion the ram, a steel sleeve 2 in. long and bell mounted at both ends is slipped over the rod to serve as a pressing piece. By use of this sleeve and fiber lining in the V-blocks, no injury results.

Automobile Piston Clearances—Discussion

By James McIntosh

I had not intended to notice the letter on Automobile Piston Clearances by D. P. Muirhead, published on page 344, Vol. 58, of the *American Machinist*, for the reason that such figures as he gives are of no value in that they fail to account for so many factors entering into the problem of controlling piston conditions.

The capacity of the cylinder walls to absorb heat is a factor, as is also (and to even greater extent) that of the piston, and the design of both is, therefore, a controlling influence. Compression is also an important factor. Lubrication by the splash system will, to some extent, cool a piston that might otherwise retain sufficient heat to cause trouble.

Otto M. Burkhardt, writing upon the same subject on page 65, Vol. 59, refers to a piston temperature of 800 deg. F. and assumes a piston of that temperature operating in a cylinder, the walls of which are but 200 deg. F., with ring temperatures of 500, 400 and 300 deg. F. respectively. These figures indicate a rate of heat absorption or transmission that tends to upset any empirical rule and even to seriously modify scientific analysis.

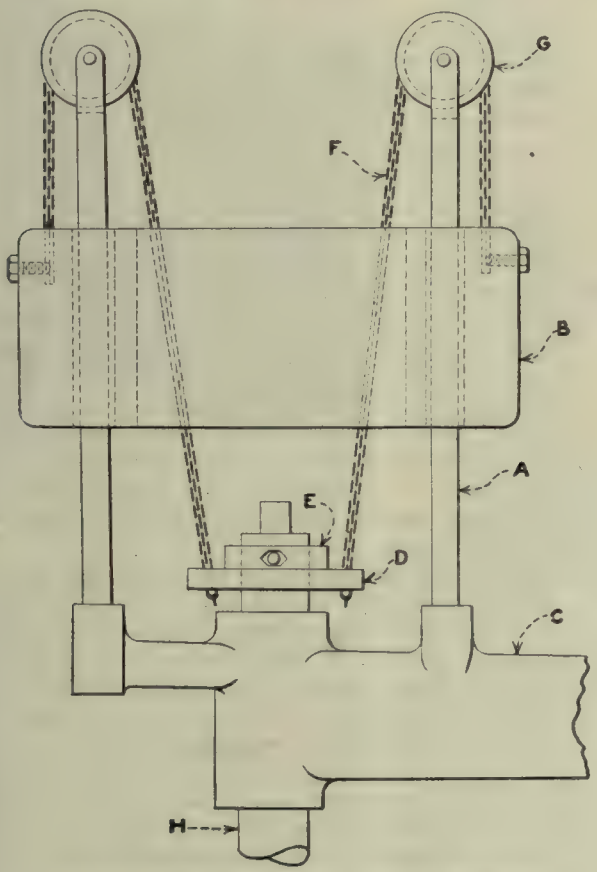
Volume of metal in the head of a piston is, up to a certain point, of value in transferring heat to the skirt. Beyond this point a thick piston head is a detriment.

There is but one safe method to employ in designing a piston to determine its correct size at any point over its entire length, and it is this: Fit a piston and rings to a cylinder with a reasonable amount of clearance based upon experience, run them in, and operate the engine under its own power. The condition of the parts when disassembled may then be observed and deductions drawn that will serve as a basis for future calculations.

A Return for a Drilling-Machine Spindle

By W. Burr Bennett

Recently the writer looked over an old plant that several years ago was a machine shop engaged in making platform scales, and in fact it still makes them from time to time as the occasion requires. Many of the machines are very old and have some curious arrangements for operating them. The writer's attention was attracted to an old drilling machine without any name



ARRANGEMENT OF THE RETURN WEIGHT

on it that had a very novel device for lifting the spindle or quill. This was in the form of a weight mounted over the axis as shown in the accompanying sketch. Fastened in the top arm of the machine frame *C* were two round steel posts *A* and on the top of these posts were located two sheaves *G*. On the top of the quill *H* was arranged a plate *D*, retained on the quill by means of a collar *E*. Two chains *F* run over the sheaves, being fastened at one end to the plate *D* and on the other to the weight *B*.

While the idea should have been to have the weight just about equal to the weight of the spindle assembly, the writer noticed that upon feeding the spindle down and then releasing it, the weight returned with a violent jerk. Is it possible that it took so much force to withdraw the drills in the good old days or was allowance made for lack of lubrication? Another thing noticed was the topheavy feature of the arrangement. The machine was lagged to a wooden floor so that any pulling or strain made the top of it sway like a mast in a storm.

Use and Abuse of Milling Cutters

By H. S. Steele

One of the most useful tools in any machine shop is the milling cutter. There is not the least doubt that it is one of the most essential tools being used today, yet if we should go into almost any shop we would find it abused in one way or another. Abused because the man who uses it knows little or nothing about either its constructions or its proper duty, except that it is there to cut with.

It is true that much has been written upon milling cutters and their duties but these writings are rarely read by the men who use cutters in their daily work, not only because they have no time to read during working hours, but because they have not enough interest in the job to read them in their homes. I do not mean that every man who uses a cutter should know all there is to know about it, but I really believe that he should know more than the majority of cutter users know at the present time.

What good is a perfectly designed, hardened and ground cutter if the man on the job knows nothing about it, except to cut with it? Most catalogs on cutters have tables of the different feeds and speeds at which they should be run and some even go so far as to publish notes on the proper clearance and lubricant to use, but the men on the job rarely have this information. They usually use their experience which is not always correct. The boss on the job may have a catalog, but he is not running all the milling machines.

Data on milling cutters are just as essential as decimal equivalents and drill speeds, both of which are made up on small compact little cards or circulars that fit into the vest pocket.

I would like to make a suggestion, and that is, that some cutter manufacturer get up a card folder containing cutter data that the man in the shop could have in his possession at all times, and before long I really believe that we would find men in the shop who would take pride in knowing the proper speeds and feeds at which to run cutters.

The folder or card that I would suggest should contain the following information:

Use high-speed steel cutters for production, as they stand up better under heavy cutting.

Use carbon steel cutters for all grades of work where fine finish is desired.

Do not burn cutters when grinding, this makes the cutting edge soft.

Grind proper clearance as follows:

For steel, 3 to 5 deg. For cast iron, 5 to 7 deg. For brass, 10 to 12 deg.

See that cutters have plenty of coolant or lubricant.

Do not use dull cutters.

Do not grind a drag or hook tooth on cutters that should be ground radially.

Do not use a fine tooth cutter where a coarse tooth cutter should be used.

Do not blame all the chatter on the cutter. Look over the machine.

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KENNETH H. CONDIT AND FRED H. COLVIN
Editors
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The Machine Tool Builder and the Service Problem

THE MACHINE TOOL builder, like the rest of us, has many problems to face but the one that is usually uppermost in his mind is how to meet the unreasonable demands of his customers for free service. So serious has the situation become that one big builder who is bringing out a new machine of radically different design is planning to abandon the direct sales method of distribution in favor of the rental plan employed by such companies as the United Shoe Machinery Corporation.

It seems rather idle to try to fix the blame for the existing conditions on either one of the parties involved. Both are at fault, the builder because his fear of his competitors has prevented him from adopting a policy of insisting upon payment for repairs or adjustments made necessary by the ignorance or carelessness of the customer's operators, the user through his failure to make provision for the maintenance of the equipment with which he carries on his business.

The question may be raised as to why the user should maintain his own tool equipment if the builder will do it for him. The answer is not far to seek. It may take two or three days or even a week or more for the builder's service man to arrive in answer to the most urgent summons. In the meantime the idle machine is down and is no longer making money for its owner. If it happens to be a "key" machine in his production chain its inaction may mean that a number of other machines must be shut down until it is fixed and the production of the whole plant slows down. Under such circumstances wouldn't it be a good investment on the part of the user to have a supply of the parts most likely to fail, and one man in his plant who had studied the machine in question so that he could attend to all but the most unlikely accidents?

Perhaps the principal reason for the continuance of the bad service situation is the conviction on the part of the short-sighted customer that the machine-tool builder is footing the bills. It may be that the builder does if he is equally short-sighted. If so, his altruism generally does not last long for his business career is soon terminated by the sheriff and then the customer is left with an orphan tool on his hands for which nobody will provide any free service. If, on the other hand, the builder knows his costs and understands where the free service will-o'-the-wisp will lead him, he will add to his price the estimated cost of the free service and the customer will pay for it in spite of himself. The injustice of this solution to the fair-minded user who pays for service as he gets it is obvious, but how is it possible to distinguish between customers when quoting a selling price? It would be entirely right to favor the man who was known to pay his way but the establishment of such a practice would be akin to patting nitroglycerine with a hammer.

What the final solution of the free service problem will be we are not prepared to say, but the establishment among machine-tool builders of an unvarying rule demanding payment for service where payment is justified would go a long way toward it.

New Equipment an Investment Not an Expense

ACCORDING to the somewhat humorous definitions of a keen observer, the difference between expense and investment depends on whether you put the money in your own business or in someone's else. If you buy new machinery or equipment for your own shop you charge it to expense. But if you let someone else use it to equip his plant or develop his business, you call it an investment.

This is unfortunately too true in many cases. Men frequently refuse to replace old and obsolete machinery with newer and more productive equipment because of the expense, and yet put the same money into stock of other companies of which they know nothing, and call it an investment. And the chances are that in most cases the same money invested in the purchase of new machines in their own business would be more truly an investment and pay higher dividends, than in any other way it could be used.

Unless your own shop already has the latest and best equipment, it should afford the best field for investment you can find. It is a business which you know far better than any other and it is where you can keep your eye on it. If it is worth continuing at all, it is worth keeping up to date by reducing production costs with the very best machinery and methods to be obtained. You cannot afford to let it fall behind because of inadequate equipment.

Consider all new machinery as an investment on the basis of what dividends it will pay in reduced costs. Remember that a $5,000 machine need save you only $800 a year to pay 6 per cent dividend and allow for a ten per cent depreciation. This is less than a saving of $3 per working day and it is a poor machine investment if it will not save more than that.

Production managers and those who keep an eagle eye on the check book, must learn that money spent for new, production-increasing machines, is not an expense but a real investment of the highest character. The best way to show faith in the stability of your own business and in your management, is to invest in the best machine equipment that can be had to handle your work. It is usually far more of an expense to put money into enterprises over which you have no control than to put it into your own plant where it can be made a paying investment. Replacing obsolete machinery with the most modern is always a good investment for any going concern.

In checking up on the savings of a new machine do not make the mistake of figuring only on direct labor. Production per square foot of floor space, keeping a supply of parts going to assembly and other factors also count in the net savings to be secured.

Shop Equipment News

Societe Genevoise Locating and Jig-Boring Machines

A series of precision machines for locating and boring jigs, manufactured by the Societe Genevoise, has recently been placed on the market by the R. Y. Fermer Co., 1410 H St., N.W., Washington, D. C. The design incorporates features based upon the experience of the builders in the construction of linear and circular dividing machines.



FIG. 1—SOCIETE GENEVOISE NO. 2 LOCATING AND JIG-BORING MACHINE

There are four sizes of the machines, of which the No. 2 and No. 5 are illustrated in Figs. 1 and 2, respectively. In all four machines a carriage, on which the work is mounted, is moved by a precision screw along accurate ways. A cross slide, also operated by a precision screw, moves at right angles to the direction or motion of the carriage. This slide carries a spindle in which may be mounted an automatic center-punch for layout of centers, a drilling tool for the preliminary drilling of holes, or a boring tool or finishing end mill for cutting holes accurately to size. A microscope may also be used to check positions on the jig or, by means of a standard scale, to check the accuracy of compensation of the screws.

The device for compensation of the screw errors is an essential feature of the machine, the correction being automatically applied to the micrometer heads. A curved template, shown in Fig. 1 attached to the front of the carriage, is cut in accordance with microscope observations to correspond to the errors of the screw, and a steel finger at the end of a lever system follows the contour of the template. The action of the finger shifts the vernier index of the head back and forth in accordance with the errors of the screw. As the screw wears new templates can be made from microscope readings on the standard scale, supplied with the machine.

It is possible to lay out and bore several holes accurately in a jig without moving the work, on account of these compensating features. On one of the larger machines, it is claimed, seven $\frac{7}{8}$-in. holes, through an $1\frac{1}{8}$-in. medium-hard steel plate, were laid out, drilled and finished in 35 min. These holes, it is stated, were accurate in diam. within 0.00016 in. and the greatest error in position of holes was 0.0006 inch.

The No. 1 machine is designed for watchmakers, has a 3-in. movement of both slides, and is provided with a work table 4 x 8 in. Machine No. 2, illustrated in Fig. 1, is designed for jigs for small machine parts, has an 8-in. movement of the slides and a 10 x 12-in work table. The lead screws have a pitch of 10 threads per in. with micrometer heads graduated to 0.0005 in. and verniers permitting readings to 0.0001 in. The tool holders have a vertical travel of 2.4 in. and three microscopes are provided, one for locating points, one for calibrating the screws, and

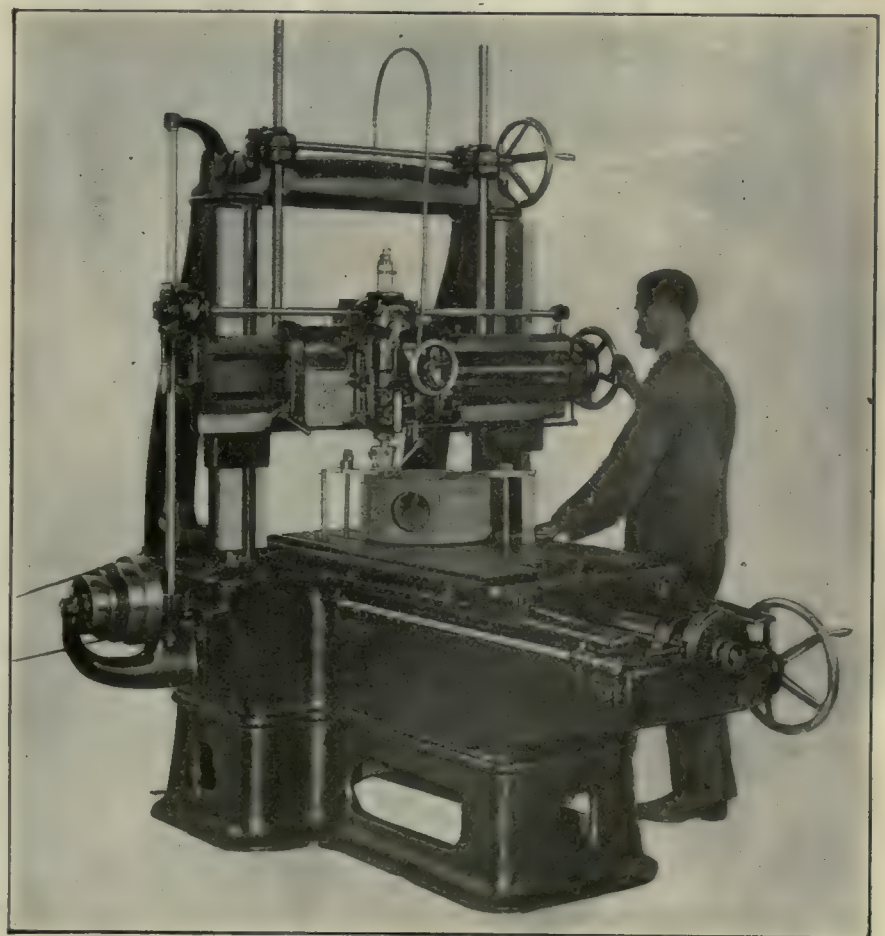


FIG. 2—SOCIETE GENEVOISE NO. 5 MACHINE

a goniometric instrument for measuring angles.

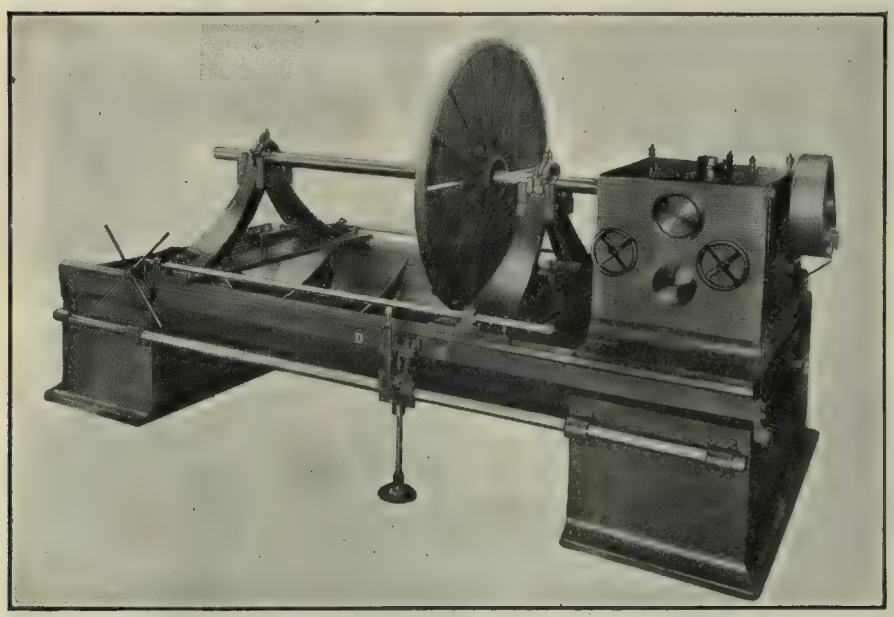
The drilling and boring attachment has a tempered spindle mounted in adjustable bearings and rotating in a carefully finished sleeve. The spindle is driven through gears by a flexible shaft at speeds from 420 to 2,000 r.p.m. Two sizes of circular tables are also provided.

The larger machines are provided with the same precision features as the smaller machines. The No. 5 machine, illustrated in Fig. 2, has a work table 40 x 24 in., and the clearance between supports is 31 in. The longitudinal travel of the table is 32 in. and the cross-travel of the tool holder is 24 in. The spindle has a No. 3 Morse taper socket and has an automatic feed with four speeds from 0.003 to 0.012 in. per rev. of spindle.

The net weight of the No. 4 machine is 2,100 lb. and of the larger, No. 5, 3,000 lb. Motors of 2 and 3 hp., respectively, are required.

Olsen-Carwen Static-Dynamic Balancing Machines

The Olsen-Carwen static-dynamic balancing machines are now being marketed by the Tinius Olsen Testing Machine Co., 500 North Twelfth St., Philadelphia, Pa., in sizes which will balance rotors up to 100,000 lb. in weight or greater, depending on the design of the part to be balanced. Features of design have been added to these machines so that they will not only indicate the amount of unbalance statically and dynamically, differentiating between the two, but will also indicate the existence of a dynamic couple and the location of the static unbalance along the length of the rotor, all without stopping the machine.



OLSEN-CARWEN BALANCING MACHINE

As shown in the accompanying illustration, the part to be balanced is mounted in plain bearings, as it is said to be unsatisfactory and inaccurate to balance rotating parts in roller or ball bearings. The bearings are bolted to a vibrating bed which is mounted on springs, and the part to be balanced is connected to the driving head which revolves it at a critical speed.

The critical speed depends upon the mass to be balanced and the spring suspension, so that if the part is balanced under this speed, it will be in balance at any speed. The amount of static and dynamic unbalance is determined in ounce-inches.

The handwheel at the right end of the driving head operates the balance weights in the machine, and an unbalance is created in the head which may be either static or dynamic, depending on the spring suspension. The static is indicated on an outer and the dynamic on an inner dial on the head. The angle or plane of unbalance is adjusted by the handwheel at the left so that the unbalance in the head is equal in amount, and opposite in angle, to the unbalance of the part being tested.

After determining the static unbalance and its angle the lever at the side of the bed is shifted from position *S* to position *D*. This changes the spring suspension of the bed so that the presence of a dynamic couple may be detected. Without changing the angle of unbalance in the head, the amount is regulated, and if the bed can be placed at rest by this means, no dynamic couple exists. The relation between the first and second readings will then determine the location of the static unbalance along the bed, and the introduction of a dynamic couple may be prevented.

When a dynamic couple is present the static unbalance is temporarily corrected on the machine, by means of a graduated disk on the front end of the spindle, until the dynamic unbalance is determined and the entire amount of unbalance corrected on the part to be balanced. The amount of metal to be added or removed from the part, and its position, are indicated by the machine.

The vibration of the bed is detected by means of the small indicator at the upper right hand corner of the driving-head housing. The spindle is of a flexible type so that no undue stresses will be placed upon the part to be balanced.

"Tuec" Truck Cleaner

A heavy service vacuum cleaner, mounted on a suitable hand truck, is now being marketed by the United Electric Co., Canton, Ohio.

The machine is for use in buildings which are not piped for vacuum service and as auxiliary equipment to the installed type. It is claimed



"TUEC" TRUCK CLEANER

that this cleaner will give as good cleaning service as the stationary plant, and it is recommended for use in factories and shops as well as office buildings and places of like nature.

The ¾-hp. motor is mounted at the top so that the fan and the armature are suspended in ball thrust bearings. A dust drawer is provided at the bottom of the separating tank and the dust bags are at the rear of the tank.

The net weight of the apparatus is 280 lb. and its height is 48 in. It is 36 in. long and 30 in. wide. The truck mounting consists of a suitable handle and 30-in. pressed steel wheels with 1-in. rubber tires.

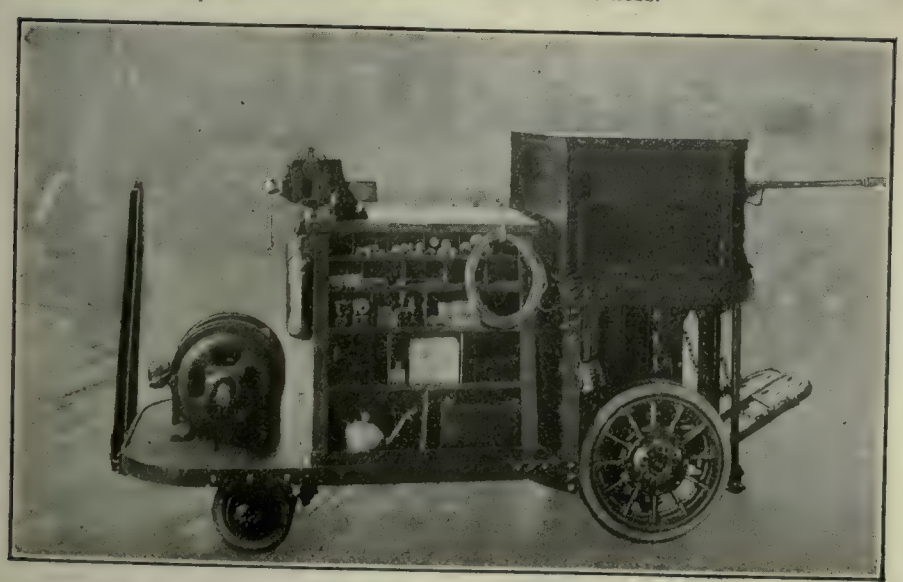
Elwell-Parker Electric Maintenance Truck

An electric truck which will be of interest to the maintenance and repair departments of large plants has recently been placed on the market by the Elwell-Parker Electric Co., Cleveland, Ohio.

As will be noted from the illustration, a steel and wood case occupies about two-thirds of the platform of a standard Elwell-Parker truck, the balance being reserved for a motor and tool kit, with room for one or two repair men to ride. A pipe vise is mounted on the rack, which accommodates the usual emergency equipment.

The truck is equipped in this way to provide a quickly portable breakdown service, so that when the maintenance men arrive on the job, they will have sufficient tools and material for the ordinary repairs.

The truck has rubber-tired wheels and all four wheels steer. It is said that the simplicity of control allows anyone to operate the truck and it is, therefore, quickly available at all times.



ELWELL-PARKER ELECTRIC MAINTENANCE TRUCK

Japan Will Be Market for Machinery

Like the rest of the world, Japan has been suffering from the general unrest following the war, according to an article in *Commerce Reports* published by the Department of Commerce. In the year 1922 imports exceeded exports; the invisible exports diminished to such an extent that the Government had to dispose of specie to the amount of 330,000,000 yen; and wages and costs still clung to their high level, while prices had dropped but slightly. These conditions led to a constant outflow of money from the country, with no corresponding influx, and caused heavy retrenchment in Japan. Many of the new industries that sprang up during the boom years and purchased machinery and supplies from the United States have found it unprofitable to operate under present conditions and have either failed entirely or closed down until things brighten in their field. This process of elimination has been rather costly and, moreover, has thrown on the Japanese market a certain amount of fairly new, used machinery, which must be disposed of before fresh imports are sought.

Notwithstanding all these factors, it must be recognized that the value of Japan's machinery business will probably never drop to the level of the average for the five years from 1909 to 1914, inclusive—12,940,357 yen. The trade in 1921 alone was 82,762,000 yen, while the total value of the trade for the five years from 1909 to 1914 amounted to only 64,701,787 yen.

Japanese industry is experiencing "growing pains," and even if these are not affecting it just at the moment, they will undoubtedly recur from time to time with reasonable frequency, and it is well for American machinery manufacturers to be prepared to alleviate these "pains" by furnishing the equipment desired for the development of business.

Belgian Steel Trade Thriving

The Belgian iron and steel business maintains unusual activity although the volume of orders is limited by the fact that smelters and mills are booked to November and are accepting no commitments beyond that date, according to *Commerce Reports* published by the Department of Commerce. The market was influenced by the low offers made by Lorraine mills, by sacrificing the rebate for export granted by the Societe des Consommateurs de Coke des Hauts-Forneaux. This situation is but temporary, however, as the rebate will shortly be discontinued.

Stocks of pig iron are low and prices are rising. Production has increased considerably in July, 39 blast furnaces being in operation. The pig-iron output for July was reported as 187,340 metric tons, compared with 171,970 in June, or nearly 50 per cent over that for the corresponding month of 1922. Heavy commitments entered into by converters prevent placing any considerable contracts in semi-finished steels. The production of raw steel in July amounted to 176,000 tons, which, although it is over 55 per cent more than the output for July of last year, is somewhat under the June total of 182,000 tons. Toward the end of July prices in finished steels, which had shown some tendency to stabilize, were again pushed upward by the decline of the franc. Quotations in sterling, which are becoming extremely common, were unchanged. The output of rough castings, 5,500 tons, and that of finished steel, 144,600 tons, were both slightly under the June figures.

Pig-iron prices are generally up 10 francs per ton. Foundry No. 3 now being quoted at 475 francs and basic pig at 480 francs, the latter being in heavy demand.

More Costly but Fewer Autos Exported

Although the total value of automobile products exported during June decreased slightly from that of May, the proportion of motor cars and trucks exported remained at slightly over 8 per cent of production, states *Commerce Reports*, published by the Department of Commerce. The value of automotive exports for June amounted to $15,977,441, as compared with $17,092,041 for May—a decrease of about 6 per cent.

One of the conspicuous features of the month's figures is the increase of about 5 per cent in the value of passenger cars exported, in spite of a slight falling off in the number. While the value of trucks exported declined slightly, this decrease is much less noticeable than that of the number exported. The number of cars exported from Canada, however, increased approximately 35 per cent, and the value increased only 14 per cent. The increase in number and value of truck exports from Canada was approximately 42 and 44 per cent, respectively. The large increases in Canadian exports are explained by the fact that shipments to Australia, Great Britain, and New Zealand—markets that take principally Canadian-made cars—have shown the greatest increase.

News Section

Railway Tool Foremen Hold Convention in Chicago

Considering that the eleventh convention of American Railway Tool Foremen's Association held at Hotel Sherman, Chicago, Aug. 29, 30 and 31, was the first convention held in three years, the results obtained were very satisfactory. The convention opened on Wednesday morning with an invocation after which an address of welcome was made by Leonard J. Grossman, assistant Corporation Counsel of Chicago who was representing the Mayor. An address was also made by H. T. Bentley general superintendent of motive power of the Chicago and Northwestern R.R.

A number of papers were read and considerable discussion of great benefit was indulged in. The subjects were: forming and combination punches and dies, general tool grinding and the use of jigs on grinders, forging machine dies, jigs and devices for locomotive and car shops, general reclamation of shop tools, and shop equipment.

A theater party for foremen was enjoyed Wednesday evening and the annual banquet and entertainment was held Thursday evening. An automobile ride for the ladies was held Thursday afternoon.

Officers Elected

Seventy-six tool foremen were registered and there were forty-three exhibits of tools and devices. The election of officers took place Friday afternoon. G. W. Smith of the Chesapeake and Ohio R.R. was elected president, Charles Helm of the Chicago, Milwaukee and St. Paul R.R., first vice-president, George Tothill of the Buffalo, Rochester and Pittsburgh Ry., second vice-president, E. A. Hildegrand of the Big Four, third vice-president, C. C. Kuyper of the Illinois Central R.R., chairman of the Executive Committee, W. C. Stephenson, Atlantic Coast Line, secretary and treasurer. The next convention will be held at the Hotel Sherman again. No date has been set.

That the railroad shops are advancing rapidly along the line of modern shop practice was indicated by a paper read by R. D. Fletcher, secretary and treasurer of the association.

Mr. Fletcher's paper emphasized the importance of supervision of speeds, feeds and cuts on various classes of work. He said "the average machine foreman is kept busy routing the work and endeavoring to keep up with the erecting shop and many times while doing this overlooks the individual operator and fails to notice whether proper speed or feed is used so as to complete each job in the required length of time."

It is the opinion of Mr. Fletcher that each large shop should have a demonstrator for machine tools, should regulate shape and size of tool, also cut feed and speed on each individual job. To accomplish this a standardization of tools would be required similar to method in use in large manufacturing plants. All tools should be delivered to tool room and one or more men assigned to grind them and keep them always in good condition and ready for service. The man in charge of grinding should be furnished with a complete set of models and blue prints giving proper degree of rake, side slope, and clearance required for various kinds of work that each tool is supposed to do. Mr. Fletcher gave figures on the angles for tool grinding and the speed at which said tools should cut on various kinds of materials. He also discussed grouping of machines to expedite work by eliminating handling back and forth across shop.

Another Record Week of Car Loading

Car loadings for the week ended Aug. 18 were 1,035,741, the largest for any week in August in the history of the railroads, and with the exception of the 1,041,044 for July 28 of this year, the largest for all time. These reports brought the total figures for the first thirty-three weeks of this year up to 30,999,244, exceeding by 5,195,251 cars the corresponding period of last year.

Compared with the corresponding week last year the loadings showed an increase of 189,475 cars, or 22.4 per cent. In the Eastern district the freight loadings increased 26.3 per cent over the same week of last year, when the strikes of both the shopmen and the miners were in progress. Loadings in the Southern district increased 22 per cent, while the Western district reported an increase of but 17.7 per cent.

Date Set for Annual S.A.E. Meeting

Announcement was made last Spring that the next annual meeting of the Society of Automotive Engineers would be held in Detroit. The dates were not set at that time, but they have now been chosen definitely as Jan. 22 to 25, to co-incide with the Automobile show week in Detroit. This arrangement will enable those who attend the meeting to inspect passenger cars and trucks of the latest design many of which will come direct from the New York show to be exhibited by the Detroit Automobile Dealers' Association. The advantage of holding the S.A.E. meeting simultaneously with a representative exhibit of motor vehicles will thus be preserved.

It is expected that the 1924 meeting of the S.A.E. will be the largest in its history because of its location near the production center of the automobile industry. Engineering papers are being received at this early date and the technical meetings are expected to include the names of many experts. The meetings will be held in the General Motors Building which is becoming a convention and meeting center for the automobile industry.

Business Better in Philadelphia

A favorable business outlook throughout the Philadelphia district is reflected in the report of steel production. The mills in Pennsylvania booked more orders in July and August than they have for some time, according to figures compiled by the Federal Reserve Bank.

General manufacturing plants and railroads are buying, and automobile factories, locomotive builders and other industries have placed orders for steel castings. Sales to canners have been large, but orders for textile industries and paper mills have not been so great.

Steel rail requirements for the Pennsylvania R.R. for 1924 are estimated at 135,000 tons, which at the prevailing prices will mean an expenditure of $1,400,000. Officials are now compiling the estimated needs for the system, receiving reports and recommendations from all divisions.

Under the present plans, officials say but little new road building is in contemplation. The estimated requirements are for replacements. One new construction will be a twenty-five mile freight line from Rochester, Pa., to a point in Ohio.

The company is completing a new freight line between Allegheny and a junction with the main line near Johnstown, Pa. A new round house, costing approximately $1,000,000, will be built for the division, with sixteen stalls.

About 5,000,000 lb. of fabricated steel, used in the construction of the Broad St. train sheds at Philadelphia, have been removed. Fire recently destroyed the sheds and the steel is being removed. It will be sold for scrap at about $15 a ton. Thirty years ago when the steel was constructed, the cost was $30 a ton.

Hoover Honored by Czechoslovaks

Herbert Hoover has been elected to honorary membership in the Czechoslovak Engineers and Architects Association, it is announced by the Federated American Engineering Societies. The honor was conferred at the Annual Conference of the Association held recently at Kosice in recognition of "merit in engineering science and practice and good rendered to our people." Mr. Hoover was chairman of the Committee on Elimination of Waste in Industry, whose report has been translated by the Government of Czechoslovakia and distributed to the industries and educational institutions of that country.

Better Business Is Reported from Indianapolis

With the coming of Fall, the machinery situation has taken on a much more optimistic tone than a month ago in Indiana. Most companies in the city have about all the business they can attend to with inquiries coming in from sources that were least expected. One of the executives of one of the larger companies said the volume of inquiry for special machinery and tools was sufficient to lead to the prediction that the present Fall business will be a near record.

One of the chief sources for machinery trade now is coming from the furniture trade. For a time this Summer business was rather dull in these lines, but the last month has seen increases of from 40 to 50 per cent over business done in the Summer on woodworking machinery alone. One dull spot in the trade is the automobile industry. A month ago, business for Fall was promising, but recently there has been practically no demand from this source. The inclination most local factories are showing toward closed body jobs is making some sales for specialized machinery for this work. Unlike Detroit manufacturers, the Indianapolis automobile trade believes in making its own bodies. One well known plant that went into the hands of a receiver some months ago, is reported to have received a taxicab order for New York City that will keep the plant going for months at full capacity.

No Slump Yet

Indications are that public utility and railroad repair work will fall off during the early Winter, but there is no abatement at the present time. To the contrary there is an apparent effort to speed up the rehabilitation programs as were promised at the Spring meeting of the American Railway Association. The drastic decrease in the price of crude oil and gasoline in Indiana has virtually stopped oil developments in the fields in the Southern part of the state. Machinery men say inquiries for special drilling machinery have almost ceased.

Conditions Quiet in Cincinnati

Many of the manufacturers and dealers in machinery, in Cincinnati, have been rather surprised at the business conditions here last week. When other trades are experiencing a pleasant volume of trade, the machinists thought that their business ought also to be brisk, but such was not the case with many of them. The railroads do not seem to be interested buyers, but the automotive men are placing a fair number of orders, especially those concerns which are replacing some of their equipment. Although several of the large electrical equipment manufacturers are placing some good orders, the steel concerns are not buying much.

In the machine tool field a few of the larger electric appliance manufacturers are good buyers. Although some of the plants are making replacements with used machinery, those buyers who buy with the view of greater efficiency in their purchases, are buying maximum service planers from one of the large planer manufacturers of the city. The production of lathes is going along well in the hope that some of the orders from the electric companies will materialize. One of the men in one of the large machine tool factories in the city remarked that a preference was shown among buyers of large lathes for oil well lathes. This house, he said, was sending some 24-, 27-, and 30-in. oil lathes to California and that they were exporting a 30-in. lathe. Several small lathes, 14,- 16-, and 18-in., are being shipped to the West.

The American Tool Works made several good purchases last week including grinding machines, milling machines, radial drills and other equipment.

Manufacturers of metal specialties and steel products are enjoying a revival of trade, following the quiet period during July. The pig iron market is showing gradual improvement and prices remain firm. Production in the blast furnaces is being curtailed, with a strengthening effect on the market. Orders now being placed are for immediate shipment.

Trade Slows Down in the South

While there has been some improvement the last two weeks in machinery and machine tool sales over the Southeast, such improvement as there has been was comparatively slight, and the volume of business is still considerably less than the manufacturers and jobbers had expected. Five or six months ago there was every promise that the present year would prove one of the best the industry had ever enjoyed in the South, for sales at that time were materially better in the district than they had been in some years; since April, however, business has been dropping off considerably, with July and August the two lowest months of the year in point of sales volume. August was slightly better than July.

While Atlanta manufacturers and jobbers report they have made some fairly good sales of machinery, tools and equipment to the larger industries of the district, principally textile, as a whole the best business has been with the smaller shops and companies. If other business was in the same proportion to this there would be little cause for complaint, for the smaller shops have been doing much more buying this year than usual, principally of lathes and drilling machines. Sales of smaller and miscellaneous machine tools to the smaller shops also have been very good.

Many Inquiries

There has been considerable shopping with the trade receiving many more inquiries than usual, but with these inquiries producing comparatively little business.

The trade regards the outlook as fair for the rest of the year, much depending on the outcome of cotton. There is promise of a 12,000,000 bale crop, which is about normal, selling at an average of 25 cents per pound. If this promise materializes into a reality it is virtually certain that machinery and machine tool sales over the Southeast will improve the last three months of the year, and compare favorably with the big volume enjoyed from January to April.

New York Business Has Quiet Week

Business in the New York district took a drop during the latter part of August thereby bringing the total business for the month down below the estimates of the dealers who predicted that the month would show up favorably as compared with March and April of this year. During the past week a lull settled over the buying and it was also reported that the number of inquiries received was less than usual for the same period.

Railroads and Coal

Railroad buying has been poor during the week and many causes are given for this. Some are of the opinion that it is merely a quiet period before the heavier buying commences. Others see the coal fields problem as a factor and think that disturbances in this industry are reflected in the cautious attitude of the roads. It is enough to say, however, that railroads in the East with the exception of single purchases of absolutely necessary equipment, did not buy during the past week.

In the automotive field some selling was accomplished. Good sized orders were completed with a manufacture of a popular priced car on Long Island. Other deals were about to be closed in factories around New York making automobile accessories.

Practically no business was reported from the textile mills of New England but this was to be expected as Summer is the dull months in this industry and buying in most unusual in this quarter in August.

General industrials did some purchasing, it is reported, and there have been inquiries from these sources.

The future, however, is generally regarded as unusually bright and every dealer seems confident that the month of September will bring a return of excellent business.

North American Company Reports Gains

The North American Co. and its subsidiaries, for the twelve months ended July 31, reports gross earnings of $68,561,292, against $45,055,979 in the corresponding period of the last fiscal year. After payment of all operating expenses, and allowances for taxes, there was reported net income from operations of $24,822,534, against $15,364,310, while other income made total income of $25,203,380, against $15,787,841.

Gear Makers' Fall Meeting

The Fall meeting of the American Gear Manufacturers Association will be held Oct. 25, 26 and 27 at the Mountain House, Lake Mohonk, N. Y. Plans are being made to present many interesting papers and the list of speakers will include many prominent men.

Business Items

The Wright Machine Co. has been organized in Worcester, Mass. for the purpose of manufacturing screw machine products. George M. Wright, formerly president of the Wright Wire Co., is the president of the new company. The capitalization is for $1,000,000.

The quarters occupied by the Chicago Machinery Club, Clinton St. and West Washington Boulevard, have been enlarged by the renting of additional offices and the remodeling of the rooms.

The Logemann Brothers Co., Milwaukee, Wis., has purchased the business patents and good-will of the Chicago Baling Press Manufacturing Co., Chicago. The business will be conducted entirely through the main offices in Milwaukee and the district offices throughout the country.

The Oldsmar Automotive Accessory Corp., formed recently at Oldsmar, Fla., has taken over the large machine shop and foundry of the Oldsmar Manufacturing Co., and is converting the plant for the manufacture of several automobile accessories, according to an announcement by officials of the company.

The plant of the New Bern Iron Works, of New Bern, N. C., manufacturer of machinery and mill supplies, resumed operations Sept. 1 after an idleness of several weeks. The plant recently was sold at a receiver's sale, the various banks of New Bern purchasing the property. Eugene Williams, formerly of New Bern, heads the new company as general manager.

The Chicago & Northwestern R.R. has taken out a building permit at Madison, Wis., for new structures valued at $109,000 and other work estimated to cost $390,000, in the improvement of the Monona yards. The general contract has been let to the Charles W. Gindele Co., Chicago.

The Sullivan Machinery Co., Michigan City, Ind., that has built a new plant for the manufacture of mining and prospecting machinery, held its formal opening recently. Among the officials of the company in Michigan City for the affair were: F. K. Copeland, president; S. T. Nelson, general superintendent; A. D. Ferguson, assistant superintendent; A. E. Blackwood and H. T. Walsh, vice-presidents and Thomas W. Fry, secretary, the latter of Claremont, N. H., the home of the Eastern plant of the Sullivan company.

Federal incorporations have recently been granted in Canada to the Engineering & Inspection Co., Ltd., which is capitalized at $50,000 and whose headquarters will be in Toronto, and the Tidioute Refining Co., of Canada, Ltd., capitalized at $200,000, with headquarters at Montreal.

The Reproducto Manufacturing Co., Newport News, Va., has just erected a new plant for the manufacture of small metal parts.

The board of directors of the Van-Camp Hardware & Iron Co., Indianapolis, has elected Raymond P. Van-Camp president to take the place made vacant by the death of Cortland Van Camp. Several other changes in the personnel of the officers also were made.

The American Tool Works, Inc., Hartford, Conn., has obtained from the Vanderbeek estate the exclusive right to manufacture and sell the Vanderbeek ball and giant universal joints.

The Johnson Gas Appliance Co., Cedar Rapids, Iowa, has taken over the manufacture and sale of the Du-Moore self-cleaning rake formerly manufactured by the Moore Self-Cleaning Rake Co., Cedar Rapids, Iowa.

The general offices of the Consolidated Machine Tool Corp. of America have been removed from New York City to Rochester, N. Y. A branch sales office will be maintained in New York City.

Henry J. Bailey New President of Consolidated

Henry J. Bailey, formerly president of the Hilles & Jones Co., Wilmington, Del., has been elected president of the Consolidated Machine Tool Corp. of America to succeed the late Waldo H. Marshall, whose death occurred suddenly Aug. 23 at his Summer home, Barnstable, Mass.



HENRY J. BAILEY

Mr. Bailey has been with the Hilles & Jones Works for the past thirty-three years. He worked his way up through successive executive posts to the presidency and when this plant was combined with others in the Consolidated Machine Tool Corp. of America he was made vice-president in charge of the Hilles & Jones Works.

There is no other change in the organization. The following officers continue: Vice-presidents, H. W. Champion, formerly president of the Newton Machine and Tool Co.; H. W. Breckenridge, formerly president of the Colburn Machine Tool Co.; A. H. Ingle formerly president of the Betts Machine Co.; and J. J. Dale, formerly president of the Dale Machinery Co. O. D. Miller continues as secretary and treasurer.

Personals

F. A. WILSON-LAWRENSON has resigned from the United Carbide & Carbon Corp. and will travel in Europe for several months studying economic conditions. His resignation was due to his health which has been impaired by too close application to his duties as vice-president in charge of sales of the various subsidiaries of the company.

SHERIDAN TALBOT has been appointed secretary to the acting commercial attache at Havana, Cuba. Mr. Talbot was formerly with the International Harvester Co.

JAMES E. MILLER, Chicago, has been appointed trade commissioner of the Department of Commerce at Calcutta, India, according to announcements recently made by Secretary Hoover. Mr. Miller was formerly consulting engineer with the General Engineering & Management Corp., New York, and previous to this connection was with the Westinghouse Electric & Manufacturing Co., in United States, Canada, England, France, Russia and South America.

CHARLES A. HOWLAND, late of the Benham Engineering Co., of Kansas City, Mo., has been appointed to the technical staff of the Bureau of Municipal Research of Philadelphia. He formerly was connected with the New York State Departmet of Health.

MORRIS L. COOKE of Philadelphia has been named director of the Giant Power Survey Board of Pennsylvania by Governor Pinchot. The duties of the board are to conduct surveys of the state's natural resources for the conservation of energy and power. Mr. Cooke is a consulting engineer. He formerly held the position of Director of Public Works for the city of Philadelphia, and recently served on the Transit Advisory Board for a study of the city's subway requirements.

PERRY C. MARK, for ten years general superintendent of the Zanesville plant of the Steel & Wire Co. of America, recently acquired by the Youngstown Sheet & Tube Co., has resigned his position and will take up a new one with a construction firm at Los Angeles, Cal.

Obituary

CHARLES C. RUSSELL, aged 63 years, a pioneer in the manufacture of taps and dies in western Massachusetts, and an early inventor in the tap and die industry, died at his home in Greenfield, Mass., Aug. 27. Mr. Russell was born in Candia, N. H. His early years were mostly passed in Washington, D. C., and New York City. His first shop experience was with the John Russell Cutlery Co. In 1871 he went to Greenfield and became associated with Solon N. Wiley in the firm of Wiley & Russell, which developed a prosperous business, and merged some years ago in the Greenfield Tap & Die Corp. He retired from active business in 1912, at which time he was president and directing head of the Wiley & Russell Mfg. Co.

The Industrial Status of France

Despite the Ruhr Occupancy the country has gone ahead—Exports and imports during the past year—English building ships in French ports

By OUR PARIS CORRESPONDENT

UNQUESTIONABLY the stagnation which has settled down like a pall over France during the past three weeks is merely a manifestation of a Summer lethargy, and this in spite of the fact that the financial and economic situation, as brought about by the check in the Ruhr, is far from brilliant, indeed the price of the dollar and the pound sterling in francs are at this writing higher than ever before known.

Naturally no new obligations abroad are being assumed other than may be strictly necessary. This, however, effects merely foreign trade relations for, with the exception of the Ruhr imbroglio, there is nothing in the home situation which may be considered other than seasonable. Tax returns of the last half year are above the previous government estimates, only those items covering custom dues falling below. This again indicates the indisposition of the French trader to buy abroad at this time.

France is actually producing more coal per month than at any time since the war, during the first six months of 1923 having produced 100,000 metric tons more per month than in 1922. Iron and steel production have been on the increase for some months until these very last days when mills have been loath to book orders ahead at current rates expecting a rise in market prices due to the shutting down of the steel plants of the Ruhr and the Saar and a consequent rarefication of semi-raw materials and finished products in export markets.

On July 1 there were 106 blast furnaces alight as against 77 on April 1 in France proper and 71 as compared with 66 in Alsace-Lorraine. Pig iron production for June increased 53,585 tons over the month previous and steel bars and billets increased 39,151 tons, exceeding the production of last December, which was the largest monthly output since the war, by 12,803 tons metric.

Heavy Taxes

There is complaint on all hands of the high cost of rail transport and manufacturers of heavy lines are doubly taxed as well in obtaining their raw materials as in the distribution of the finished product. In spite of this, the railways show only normal fluctuations in freight receipts as compared with the same months of last year. There is, however, a notable curtailment of large lot shipments in the metal trades, but an increase of small fast freight shipments in contrast with a falling off of slow freight, this fact of itself accounting in some measure for the high cost of many items. This suggests that in many lines France is living on a hand-to-mouth basis as far as the final distributor is concerned. This is especially so with respect to all metal and machinery lines, the only encouraging aspect of the situation being that the wheat crop this year is sufficient to enable the country to avoid buying abroad as was necessary in 1921-1922.

A new phase of the metal industries has resulted from the occupation of the Ruhr, of which the secret has been well kept by the Interministerial Committee which was studying the results of dumping seized metallurgical products on the French or foreign markets. At the moment the problem concerns nearly six hundred thousand tons of metallurgical products of all kinds. Of this about two hundred thousand tons are highly finished products, merchant steel, profiles, wire rods, etc. The arrival of this upon the French market may well startle the French manufacturer. It is simply another situation like that of the liquidation of war stocks which in France was by no means handled with that successful facility with which such was turned back to the channels of trade in the United States. One single item alone, 25,000 tons of rails, if kept by the government and turned over to the Minister of Colonies for the laying of the Transsaharan Railway, as is proposed, will lift just that much business from French steel mills.

Export and Import Increases

France increased both exports and imports during the first six months of 1923 above the figures for the same period in 1922 by some four billion francs. Imports of manufactured articles increased 3,134,000,000 francs and exports increased by 1,361,000,000 francs. These figures are naturally misleading if compared with the normal valuation for similar articles in the years before the war, but export statistics by weight as well of French manufactured articles are in progression constantly.

It is a sign of the times that a number of minor English ship-building companies are building in France. Two causes may have led to this—the rate of exchange of practically eighty francs to the pound sterling as against a normal of twenty-five and the very obvious fact that there is scarcely more than twenty-five per cent difference between English and French output prices in certain categories of ship building, apart from fittings which are regarded as accessories which can be installed after the ship arrives at its home port. The Harfleur Works of the Chantiers et Ateliers de la Gironde has in hand two dredgers with heavy duty oil motors of 1,500 tons each for the James Dredging Co. of England. The Anglo-Saxon Petroleum Co., Ltd., has ordered a small tank steamer of 800 tons of the same company and the English Asiatic Petroleum Co. has given the Bordeaux Works of the same company an order for five oil reservoirs to be erected in Tunisian ports in competition with the Standard Oil reserves recently chased from Gibraltar by the onerous conditions imposed upon them in the transfer of fuel oil to ships in harbor. The Penhoët Works of Saint Nazaire, which built the France and the Paris for the Transatlantique line, has also just launched a dredge for the Tilbury Dredging Co. of London.

The French government Standardization Committee has, as a part of a more comprehensive program, recently issued specifications, the observance of which is obligatory on all government contracts, as well for the colonies as for mainland France. The items referred to in this latest list are:

Sheets, strips, tubes, bars and profiles of all alloyed metals of high resistance; platinum in all forms in combination with alloys or not; zinc in all forms; warps and bitts for ships; and cast deck fittings.

A clause provides that exceptions may be made in the case of the colonies where the strict following of specifications might lead to costly delays. The entire list of these specifications when completed will be the first co-ordinate effort towards a standardization program which has been made here.

It is perhaps worthy of remark that French exports to the United States of machinery, machine parts and tools during the first four months of 1923 amounted to the value of 7,824,000 francs, rather more than double the figure shipped the year before during the same period.

Chicago Prepares for Busy Fall

Machine tool sales during August were approximately in the same volume as during July. The Chicago market is inactive. The Chicago railroads are not doing any buying this week although it is understood that the Baltimore & Ohio R.R. is making inquiry for a large list. The Mobile & Ohio R.R. is reported to be in the market for a number of machine shop tools. The Sea Board Air Line Ry. is said to be preparing a rather large list of machine tools wanted. The Elgin, Joliet & Eastern made purchases last week of tools to the extent of about $85,000.

Steel producers in the Chicago district are reducing their order books for the first time in many months. While deliveries are still extended, consumers are now more certain of their shipments within a reasonable length of time than they have been at any period this year.

New business in steel was comparatively quiet during the last week, although rails and steel bars were in good demand. Despite the fact that new orders for steel are not equal to production, the outlook in the industry for the last quarter of the current year is bright. Automobile companies are still in the market for sizeable tonnages of steel, farm implement makers are fairly active and tank interests are taking fair tonnages. Automobile manufacturers are contracting for their steel up to the end of the year. One large farm implement manufacturer reports an increase in business, particularly for tractors. This maker has sufficient orders on his books for tractors to carry over to the end of the year at present capacity.

French Patents Granted in 1922

THE *Journal Official* of July 25 publishes the annual report of the French patent office which in view of the change of base brought about by the remaking of so many of the elements of the new map of Europe is exceedingly interesting.

The report refers to operations for 1922. The number of demands for patents (brevets d'invention — without guarantee of the government—S.G.D.G., as the French patent notice reads) and certificates of deposit of specifications fell, in the first classification, from 19,500 in 1921 to 17,719 in 1922 and for the two classifications together in 1922 were but 18,300.

It is stated that it must not be concluded from these figures that they indicate a diminution in industrial activity in France for during the 1921 period there were many hang-over demands from the war period which had not been disposed of. Actually the numbers of 1922 are in excess of those of 1913 by a thousand or more. The Ministry of Finance has recently increased the annual patent fees from 100 francs to 125 francs.

Of the total of 18,300 brevets and certificates delivered in 1922 those granted to French citizens were 10,879, which is a far larger proportion, as compared with those granted foreigners, than was the case in 1913, when the figures showed 9,164 delivered to foreigners and 7,562 to French citizens. Those granted to German subjects in 1922 were but 1,480 as compared with 3,967 in 1913. British subjects increased their figures in the records from 1,273 in 1913 to 1.514 in 1922. The classification "America" is represented by 2,005 grants in 1922, as compared with 1,849 in 1913, of which, states the report, "nearly all were of United States origin."

Behind in Printing

The "Office National de la Propriété Industrielle" is actually behind in the issuing of printed specifications of patents already deposited to the number of fifteen thousand odd, whereas the ordinary end of the year carry-over has seldom exceeded four thousand. A lack of appropriation funds is given as the cause, the present credit of 2,200,000 francs not permitting more than the caring for the normal annual output. Credits are requested immediately which shall permit the clearing of the decks. The former total fee of 1,500 francs, payable in annuities of 100 francs for fifteen years has, since 1921, been raised to 3,150 francs (which for the American who pays in dollars today makes his French patent cost him less than two-thirds of what it cost in the old days) which funds, in the form of annuities, are paid directly into the government treasury and not into the patent office coffers. The total receipts of 1922 were nearly ten million francs whereas in 1913 the sums so collected did not exceed five million francs.

Of the total demands for patents in 1922, approximately 13.5 per cent were held up for a year pending a final decision as to the granting thereof.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0337	$0 0337	$0.028
Cold finished shafting	per lb.	0.0433	0.0428	0 036
Brass rods	per lb.	0.1741	0.1825	0.1666
Solder (½ and ½)	per lb.	0.276	0.276	0.228
Cotton waste	per lb.	0.1231	0.1231	0.1458
Washers, cast iron (½ in.)	per 100 lb.	4.66	4.66	4.00
Emery, disks, cloth, No. 1, 6 in. dia	per 100	3.08	3.08	3.11
Lard cutting oil	per gal.	0.575	0.575	0.575
Machine oil	per gal.	0.349	0.349	0.36
Belting, leather, medium	off list	37%	37%	43½%
Machine bolts up to 1x30 in.	off list	44¼%	44¼%	53⅓%

Hendey Company Holds "Old Home Week"

The Hendey Machine Co. of Torrington, Conn., observed "old home week" Aug. 20, 21, 22 and 23, on which days salesmen from all over the country were assembled at the main plant and devoted their time to a renewal of acquaintanceship, the interchange of ideas and to a study of the products and methods of manufacture as applied to the Hendey line of machinery. The men were conducted about the factory by the company's engineers, who instructed them in the details of the several machines recently brought out and in course of development. Machines were partially taken down and reconstructed before them in order to give the men a more thorough knowledge of the various mechanisms and to put them in position to demonstrate to advantage for the benefit of their customers.

On the evening of Tuesday, Aug. 21, the party was tendered a dinner at the Waterbury Club, over which Charles H. Alvord, president of the company, presided. Mason Britton and Fred Weatherby of the *American Machinist* were present as guests.

Editors Will Broadcast From WJZ

Editors of the various papers published by the McGraw-Hill Co. are giving radio talks during September using WJZ as the broadcasting station. These talks are held on Wednesday evenings and last fifteen minutes. On Sept. 12, Kenneth H. Condit, editor of the *American Machinist* will speak on, "Automatic Machines and Their Effect on Men," on Sept. 19 a talk will be given by H. C. Parmalee, editor of *Chemical & Metallurgical Engineering* and on Sept. 26, E. J. Mehren, editor of the *Engineering News-Record* will speak on "What Engineering Is and What it Is Not." The talks start at 8:15 o'clock.

Slavs Study Methods Used in America

Close co-operation between the professional engineers of both Czechoslovakia and Poland and the Federated American Engineering Societies is being established, according to the president of the Federation, Dean Mortimer E. Cooley of the University of Michigan. Dr. Bedrich Stepanek, who recently resigned as Minister of Czechoslovakia to the United States, will spend six months in this country studying agricultural, educational, industrial and social conditions, principally in the South and West.

M. Lomchakoff of the professional staff of the Technical University of Prague is now in this country to study industrial problems, including power development, generation of gas, and the use of pulverized fuel and lignite. M. Lomchakoff is being aided in his task by officials of the Engineering Federation, the Federal Power Commission, and the U. S. Bureau of Mines. Actively interested also is J. W. Lieb of New York, past president of the American Institute of Electrical Engineers.

Engineers of Poland, it is announced by Dean Cooley, are mapping out a program of activities in which the Federated American Engineering Societies will cooperate. The Hoover assay of national waste, the investigation into the twelve-hour day in continuous industry and the study of coal storage now in progress are examples, Dean Cooley said, of engineering service in the public interest which are influencing engineers of other countries in an effort for the common good.

Pig Iron Production Breaks Record

Production of pig iron in the United States for the first half of 1923 aggregated 21,016,475 tons, according to figures compiled by the American Iron and Steel Institute. This compares with 15,028,893 tons produced in the second half of 1922 and 12,191,011 tons in the first half of that year.

The output for the first half of this year established a new high record for any similar period in the history of the country. Of the total, 20,874,240 tons were produced by the use of coke, 133,469 by charcoal and 8,766 by anthracite.

Sales Conference for Norton Men

During the week of Sept. 24 all the outside representatives of the Norton Co. will meet at Worcester, Mass., for a general sales conference. It is expected that over seventy field men will be present. The conference will be in charge of W. LaCoste Neilson, vice-president and general sales manager, assisted by H. W. Dunbar, assistant sales manager, W. T. Montague, machine sales manager, and Herbert Duckworth, wheel sales manager.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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BECAUSE some Greek banditti assassinated the members of an Italian mission in Albania, Mussolini has sent a very truculent ultimatum to Athens. But the latest advices indicate that the League of Nations will succeed in composing the threatened quarrel.

The Anglo-Franco-German squabble over the reparation question is therefore about the only really dark cloud remaining on the horizon. Those who have been made pessimistic by its shadow should read the news that was cabled from Ireland two years ago and compare it with the reports of the election held there last Tuesday. In 1921 the Irishmen seemed determined to keep on fighting each other until they had committed national suicide. Today the "Emerald Isle" is the most prosperous and peaceful part of the British Empire, and the Free State administration was given an overwhelming vote of confidence at one of the most tranquil elections ever held in Ireland or anywhere else.

By thus looking backward we shall probably be able to look forward more clearly, for despite the contradictory and confusing dispatches from Berlin, Paris and London it is plain that by economic pressure the three dissentient governments are being gradually brought together and that some sort of a settlement is only a question of time.

When a settlement is reached or definitely indicated a world-wide revival in trade and industry is as certain as anything in the future can be. The markets throughout the world are already showing a subconscious appreciation of the probabilities. The London Stock Exchange is almost buoyant despite the depressing stories of unemployment cabled from the industrial centers of Great Britain, and on the Paris Bourse there has been a substantial advance in the market for the best investment securities.

While this is in part due to the depression of the franc, it also reflects the essentially prosperous condition of the French people and the unlikelihood of war. In Germany values are hard to measure with marks selling at 8 cents a million, but my private advices are that the dollar is becoming the real medium of exchange and that as its use increases business is becoming more stable.

In the Western hemisphere, both in the United States and elsewhere an increased degree of tranquility is also to be noted. It is understood that the recognition of Obregon's administration in Mexico has been practically agreed upon at Washington, and a substantial advance in the milreis is thought to indicate that the Brazilian government has been able to improve its financial condition.

There is some political irritation in Cuba over the proposed nationalization of the railways, but the latest reports are that it is being allayed. At Washington President Coolidge seems determined to avoid doing or saying anything that will disturb business, to which end he has announced that the Cabinet meetings hitherto held will be abandoned and that every effort will be made to maintain the *status quo*.

On the New York Stock Exchange the tone of the market reflects the satisfaction that is always felt by business in the assurance of political quiescence. Stocks advance more easily than they decline, and bonds are gradually working upward. It is said that over $100,000,000 of new securities will be publicly offered after the Labor Day holidays and that the bankers are confident that these offerings will be rapidly absorbed.

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The shrewd bankers of Amsterdam are reported to be large buyers of American railway bonds and as the canny judgment of these Dutchmen is held in great respect their purchases have created a very favorable impression. Railway earnings are excellent and car loadings continue to exceed past records. Railroad securities are therefore higher, but the advancing tendency in this department of the market has been held in check by the fear that the brotherhoods may demand an advance in wages.

Governor Pinchot has probably succeeded in averting the threatened anthracite coal strike by a compromise which involves a 10 per cent increase in the miners' wages. The exact facts are not known at this writing and it is possible that public disapproval of the advance in wages suggested may make a settlement impossible.

If this shall prove to be the case the result will be an increased consumption of bituminous coal and fuel oil in the Middle Atlantic States and New England, which will probably be a blessing in disguise, for with the improvements in the methods of combustion that have been lately devised it is a question whether anthracite coal is any longer worth the premium that is demanded for it.

It is also probable that a settlement of the oil war is approaching, for the latest advices indicate a slight reduction in the output and it is rumored that the bigger companies have succeeded in securing the production that they coveted and that some of the smaller producers have been compelled to shut down. Meantime it is worth noting that the consumption of both oil and gasoline has been enormously increased by the decline in prices. A logical consequence would be an advance in the prices of petroleum and its products, in anticipation of which it may be wise for those who have empty tanks to fill them.

An improvement in the steel industry is also to be noted. It is attributed to the buying of the railways and the automobile manufacturers who are turning out an unusually large number of cars for this season of the year. Zinc is also higher, reflecting what is said to be a world wide scarcity of the metal. Copper is the only metal of importance that has declined. It has sold at 13⅝ cents on a statement showing a sensational decrease in exports.

Wheat is firmer and there are many good judges who believe that it will sell higher as the fear of a somewhat mythical surplus passes. Corn, hogs and hog products are also in improved demand, and less is being heard of the distress of the farmer. What is called an equalization of wages in the building trades is reported from many sections and a resumption of constructive activity in the East is to be noted, one effect of which is to be discerned in the announcement that 200,000,000 bricks will shortly be brought to New York from Holland.

Sugar and coffee have both been steady at prices which justify buying for legitimate consumption without being cheap enough to invite speculative purchases.

But cotton holds the center of the speculative stage. A Government report putting the condition at 54.1 and estimating the crop at 10,788,000 bales was a great surprise to the trade. It was followed by a sensational advance in futures and the indications favor a high price level throughout the season. Mill stocks throughout the world are small. The dry goods market is firm and higher. The demand for gray goods and staple lines last week was really enormous. Most mills have disposed of their unsold production and a general resumption of manufacturing activity in New England is expected.

Bullard Company Has Increased Force

The Bullard Machine Tool Co., of Bridgeport, Conn., has been obliged to largely increase its production in order to meet the demand for mult-au-matics, vertical turret lathes and continumatics, This increased capacity is being secured by gradually building up the working force with the addition of a second shift working 50 hours a week. It is the intention to still further add to the output by putting on a third shift, each working 48 hours so that within a short time the plant will assume war time activity by working "round the clock."

Catalogs Wanted

The Reproducto Manufacturing Co., Newport News, Va., desires catalogs and printed matter from manufacturers of small tools machinery, steel — especially the higher grades of non-warping die steel — and cold rolled and screw machine stock.

Pamphlets Received

Our World Trade. Foreign Commerce Department, Chamber of Commerce of the United States, Washington, D. C. Value and volume of principal exports and imports between United States and chief foreign markets is told in the recently published pamphlet.

Trade Training. The Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. The methods used by this company in training its men are shown in a pamphlet that has been issued by it. The pamphlet outlines just what an apprentice does and also shows the opportunities for advancement in the electrical trade.

Invar and Related Nickel Steels. Department of Commerce. Printed by the Government Printing Office, Washington, D. C. The circular of the Bureau of Standards on this subject is a compilation of data obtained during the last 30 years by various investigators on the different properties of nickel steels.

Directory of Labor Officials. Government Printing Office, Washington, D. C. Labor officials connected with the Government in the United States and foreign countries are listed in a pamphlet that has been issued.

Statistics of Industrial Accidents in the United States. United States Department of Labor, Washington, D. C. This bulletin is a comprehensive report on the accidents in factories or wherever industry is employed. It was prepared by Lucian W. Chaney.

China, an Economic Survey. American Bankers Association. An outline of the outstanding factors of China's present day economic life and the most probable developments of the immediate future, particularly with reference to American interests.

Motorcycles, Bicycles and Parts. Government Printing Office, Washington, D. C. The results of the first biennial census of manufacturers during the calendar year of 1921.

Machinery, Textile Machinery and Machine Tools. Government Printing Office, Washington, D. C. A census of manufacture during 1921 in these industries showing complete classification and much valuable data.

Promoting Foreign Machinery Sales Abroad. Government Printing Office, Washington, D. C. Trade Information Bulletin No. 138, prepared by W. H. Rastall, chief of the machinery division of the Department of Commerce, is an exhaustive discussion of a subject that is of interest to every machine tool builder.

The Use of Statistics of Machinery Exports. Government Printing Office, Washington, D. C. Trade Information Bulletin No. 139, prepared by W. H. Rastall, chief of the industrial machinery division of the Department of Commerce tells how statistics may be used to further business.

Performance Test of Dayton Wright TA-3, Type XIV. Published by the Chief of the Air Service, Washington, D. C. Air service information circular with charts, illustrations, data and descriptive matter has been issued.

Comparative Mathematical Analysis of the Stresses Occurring in the Cam Shaft Drive Gears of the Liberty "12" and the Packard "2025" Engines. Published by the Chief of the Air Service, Washington, D. C. Air service information circular containing data, charts, comparisons and drawings relative to this subject has been issued.

Standard Method of Engine Calculations. Published by the Chief of the Air Service, Washington, D. C. This is a report of the methods adopted by the engine design branch of the engineering division, Air Service.

The Pressure Distribution Over the Stabilizer of the Vought VE-7 Airplane. Published by the Chief of the Air Service, Washington, D. C. The observation of pressure distribution over the horizontal surfaces of the VE-7 airplane at different altitudes of flight has been outlined in this pamphlet.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Automobile accessories. Warsaw, Poland. Agency. Reference No. 7524.

Automobile accessories. Santos, Brazil. Purchase and agency. Reference No. 7535.

Automobile accessories. England. Agency. Reference No. 7552.

Automobile accessories and equipment. Milan, Italy. Agency. Reference No. 7541.

Ball bearings and bearings in general, Milan, Italy. Agency. Reference No. 7541.

Metal-turning machinery. Pabjanice, Poland. Agency. Reference No. 7567.

A well known firm in Poland, Inzynier Marczynski i Spolka, Ul. 27 Grudnia Poznan, Poland, is desirous of obtaining an agency of American manufacturers of various machinery, such as metal and woodworking machinery, and also electric motors. Credit references and additional information may be obtained upon application at the American Polish Chamber of Commerce, 953 Third Ave., New York City.

The South Australian Harbor Board, Adelaide, South Australia, has issued specifications for the construction of four electric coal unloading cranes of seven-ton capacity. The time limit for the receipt of bids is to expire Oct. 30. Specifications may be consulated at the district offices of the Bureau of Foreign and Domestic Commerce in New York City, Chicago and Philadelphia.

The Min River Conservancy Board, Foochow, China, wants to buy a steam-operated river type, hydraulic dredge. The material to be dredged consists entirely of sand. The maximum capacity is to be 200 cu.yd. of sand per hour. Complete specification may be seen at any of the seven district offices of the Bureau of Foreign and Domestic Commerce.

Trade Catalogs

Chain Drive Data. The Diamond Chain & Manufacturing Co., Indianapolis, Ind. A booklet containing charts and formulas on the design and application of roller chain drives. Tables showing horsepower, working loads and speeds, and useful data on sprocket proportions, are also included.

Grinders, Buffers, Drills and Die Sinking Tools. The Stow Manufacturing Co., Binghamton, N. Y. Motor-driven tools made by this company are described in this four page folder.

Electric Hammers. National Electric Manufacturing Co., Chatfield-Woods Building, Pittsburgh, Pa. The Syntron electric hammer is described and illustrated in this folder.

Abrasive Discs. Charles H. Besly & Co. A booklet showing various types of abrasive discs and their uses in factory production. Many testimonials as to this line are to be found in the booklet.

Flexible Insulated Couplings. The Charles Bond Co., 617-619 Arch St., Philadelphia, Pa. The Grundy patent flexible insulated coupling is described and illustrated and charts of sizes are to be found in this pamphlet. Handy ordering sheets and cable codes are also in the booklet.

Semi-Automatic Bench Milling Machine. The Weed Engineering Works, Bridgeport, Conn. A folder with dimensions of the machine, illustrations in two views and descriptiive text has been issued.

Portable Electric Machinery. The R. G. Haskins Co., 520 West Monroe St., Chicago, Ill. Catalog No. 37 describes flexible shaft equipment, portable tools and labor-saving devices. How the tools may be used and a full description of them is contained in the booklet.

Vises. Athol Machine & Foundry Co., Athol, Mass. Catalog No. 36-A shows the many kinds of vises, pipe grips, bench grinders, and grindstones that are made by this company. The catalog is fully illustrated.

Induction Motors—The Reliance Electric & Engineering Co., Cleveland, Ohio. The type AA Reliance induction motors are described and illustrated in a booklet that has been issued. Charts are also to be found in the booklet.

Riveters. The Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill. Catalog No. 5 contains descriptions of many different types of riveters that are manufactured by this company. The riveters are illustrated and there are charts for the guidance of those interested.

Steam Appliances. The Atwood & Morrill Co., Salem, Mass. Catalog D and catalog E contain descriptions and illustrations of various valves and regulators that are made by this company. Both catalogs are complete and useful to engineers and works managers.

Forthcoming Meetings

International Railway General Foremen's Association. Annual convention. Hotel Sherman, Chicago, Ill., Sept. 4, 5, 6 and 7. William Hall, secretary, 1061 W. Wabash Ave., Winona, Minn.

New Haven Branch of the American Society of Mechanical Engineers. Third annual machine tool exhibit Sept. 18, 19, 20 and 21. Mason Laboratory, New Haven, Conn. A. C. Jewett, chairman.

Association of Iron and Steel Electrical Engineers. Iron and steel exposition, Buffalo, Sept. 24 to 28. John F. Kelly, secretary, Association of Iron & Steel Electrical Engineers, 708 Empire Building, Pittsburgh, Pa.

National Safety Council. Twelfth annual congress at Buffalo, N. Y., Oct. 1 to 5. All meetings will be held at the Statler Hotel. Headquarters, 168 No. Michigan Ave., Chicago, Ill.

American Society for Steel Treating. Annual convention at Pittsburgh in connection with the International Steel Exposition, Oct. 8, 9, 10, 11 and 12. W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio, national secretary.

Society of Automotive Engineers. Production meeting at Cleveland, Ohio, Oct. 25 and 26. Headquarters, 29 West 39th St., New York City.

American Gear Manufacturers Association. Fall meeting. Mountain House, Lake Mohonk, N. Y. Oct. 25, 26 and 27. T. W. Owen, secretary, 2,443 Prospect Ave., Cleveland, Ohio.

American Management Association. October 29, 30, and 31, Hotel Astor, New York City.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8. Headquarters, Grand Central Palace, New York City.

New and Enlarged Shops

Machine Tools Wanted

Ill., Chicago—Chicago Metal Mfg. Co., 3724 South Rockwell St.—5 to 10 ft. slip rolls, 10 or 12 in.; deep throat sneers; punches; heavy sheet metal working machinery.

Ind., Jeffersonville—Quartermaster, Intermediate Dept.—precision bench lathe, drill press, drill chuck, also universal chuck.

Kan., Leavenworth—Leavenworth Battery Co.—screw cutting lathe.

Mass., Lynn—Eastern Machine Wks., 24 Marshalls Wharf, address the manager—plain type, 100 ton capacity hydraulic press; high pressure oil pump, capacity 3,000 lb. per sq. in., 250 cu. in. per minute; weight type hydraulic accumulator, about 2 in. ram with 3,000 lb. capacity (used).

Mo., St. Louis—R. C. Woodall, 3725 Garfield Ave. — lathes, drills, emery wheel, jacks, etc., for garage at 3711-17½ Garfield Ave.

N. Y., Geneseo—W. C. Ringland Garage—automobile repair equipment, to replace that which was destroyed by fire.

N. Y., Jamestown—The Chautauqua Products Co., Inc., P. O. Box 581, C. H. Johnson, Purch. Agt.—10-12-14 in. lathe.

N. Y., Jamestown—Red Star Lubricating Service, East 4th St.—equipment for proposed garage and service station.

N. Y., Medina—Colton Bros.—equipment for service station and garage, to replace that which was destroyed by fire.

N. Y., New York—United Metal Hose Co., 532 West 22nd St.—back geared screw machine, 1½ to 2 in. capacity, or to carry a 6 in. die holder.

N. Y., Rochester—Paige Sales Co., Cortland St., H. R. Stewart, Pres.—equipment for proposed garage and service station.

O., Cleveland—Weger Aeronautical Motor Co., 1391 East 49th St., C. Weger, Purch. Agt.—equipment for plant for the manufacture of motors.

Pa., Pittsburgh—J. W. McGee, 693 Preble Ave.—garage and repair equipment.

Tenn., Knoxville—Duncan Mchy. Co., 721 Central Ave., J. G. Duncan, Purch. Agt.—engine lathe, 24 to 30 in. swing, 10 to 12 ft. between centers, for sawmill repair work (used).

Tex., Jacksonville—S. J. Berry—Lathe, 18 or 20 in. swing, for machine shop.

Tex., Lufkin—Lufkin Fdry. & Machine Shop—lathe.

Va., Denbigh — J. W. Hoppes (general machine work)—Universal grinder to grind not over 2 ft. long or a piston 8 in. in diameter; lathe tool post grinder; flexible shaft grinder to carry wheel about 4 in. diameter, ½ in. face, with or without motor.

Va., Norfolk—Taylor-Parker Co., Water St. and Commerce Pl. (machinery)—engine lathe, 24 to 30 in. swing, 14 to 16 ft. centers, plain change gears, cone drive (used); shaper, 16 to 20 in. stroke; 18 to 20 in. drill press; hacksaw.

Va., Richmond—The city, Fire & Repair Dept.—machinery, including radio drill and large lathe.

Va., Richmond—L. S. Clark, Inc., 608 West Broad St.—drill press for automobile repairing.

Va., Richmond—J. G. Thompson, rear 509 West Marshall St.—drill press for automobile repairs.

W. Va., Huntington—A. C. Love Co. (machinery)—one 200 ton hydraulic wheel press to press wheels off and on trucks on small logging railroad; Bliss 5 or 5A toggle press, also Toledo 39 press.

W. Va., Logan—Guyan Machine Shops, B. Shell, Mgr.—milling machine or gear cutter for gears 2 pitch and smaller; 18 or 20 in engine lathe, 10 ft. bed; coil winding machine for field and armature coils; hydraulic press for rubber truck tires, about 250 ton; hydraulic wheel press, about 250 ton.

Wis., Fond du Lac—G. Loomis, South Main St.—automobile repair machinery, gasoline tank and pump for proposed garage.

Que., Foster—A. Bissonette—equipment for blacksmith and small machine shop.

Que., Lyster Sta.—Garage Aubre, P. A. Aubre, Purch. Agt.—garage and repair equipment.

Que., Maskinonge — A. Lemyre — garage and automobile repair equipment.

Que., Montreal—A. Emond, 374 Plessis St.—lathe and screw cutter.

Que., Riviere du Loup—A. Gagnon—automobile repair equipment.

Que., St. George's Est—A. J. Gilbert—automobile repair equipment.

Que., St. John's—Lasnier & Galipeau, 176 Richelieu St., E. Lasnier, Purch. Agt.—garage equipment.

Que., St. Jovite—A. Ranger—automobile repair shop equipment.

Machinery Wanted

Colo., Denver—Denver Catholic Register, 203 Railroad Bldg., G. H. Astler, Purch. Agt.—35 x 48 in. cylinder press.

Colo., Parker—News—paper cutter.

Ill., Chicago—Arpinus Mfg. Co., 2601 Cottage Grove Ave. (tin shop)—36 in. square shears.

Ill., Chicago—A. Vervine & Co., 1478 State St.—acetylene welding outfit.

Ill., Decatur—H. A. Sellers, 1604 North Church St.—44 in. or 48 in. paper cutter.

Ill., Freeport—W. T. Rawleigh Co.—job press.

Ind., Butler—R. D. Higley—job press, newspaper press, pulleys, belting, bearings, hangers, paper cutter and linotype.

Ind., Evansville — Hedderich Bros., 405 Bond St.—equipment for new 1 story addition to brass foundry.

Kan., Caldwell—Messenger—7 x 11 in. or 8 x 12 in press, Gordon preferred.

Ky., Paris—Paris Gas & Electric Co.—cast iron flywheel, 14 ft. diameter, 26 in. wide; 24 in. belting.

La., New Orleans—O. K. Auto Radiator & Sheet Metal Wks., 743-745 Carondelet St., N. M. R. Umbach, Vice Pres.—4 ft. brakes, also 4 ft. rollers and shears up to ¼ in. for sheet metal use (new or used).

Me., Lewiston—Bd. Educ.—manual training equipment, including lathes, planer, drills, matcher, sander, saws, tables, benches, shafting, pulleys and belting, for new high school.

Md., Baltimore—Paper Products Co., 2405 West Franklin St., J. M. Smith, Purch. Agt.—complete equipment for proposed $350,000 plant, to replace that which was recently destroyed by fire.

Mass., Cambridge—Dixon & Fallis, 1 Dock St. (pattern makers)—belt sanding machine (used).

Mo., St. Louis—Skelly Oil Co., Russell and Thurman Aves., W. J. Skelly, Purch. Agt.—two pumps, tanks, air equipment and general accessories for oil filling station.

Mo., Seligman—Silver Lake Mining Co., T. R. Gillian, Purch. Agt.—mining machinery for steam plant.

N. Y., Buffalo—W. Allen, 119 Edson St.—wood turning lathe.

N. Y., Elmira—J. H. Waters Co., 607 John St.—machinery for proposed light manufacturing plant at 559 East 3rd St.

N. Y., Hornell—Holland Lumber Co., J. Brown and W. Phillipson, Purch. Agts.—machinery for proposed $40,000 lumber mill and woodworking factory.

N. Y., New York—L. Jeffrey Linotyping Co., 205 West 19th St.—model 5 linotype.

N. Y., New York—Logan Constr. Co., 13 Park Row—swinging engine.

N. Y., New York—New York Mchy. Co., 200 5th Ave.—hand or power operated baling machines.

N. Y., New York—Superior Auto Radiator Co., 202 West 65th St.—oxweld acetylene torch outfit.

N. Y., Pittsford—Hutchison & Clark, Inc., S. Hutchison, Purch. Agt.—apple evaporators and cider mill equipment for proposed $50,000 mill, to replace that which was destroyed by fire.

N. C., Raleigh—Raleigh Bonded Warehouse Co., N. E. Edgerton, Pres.—electric machinery for warehouse.

N. C., Ronda—Ronda Chair Co.—self feed rip saw and double disk sander.

O., Cleveland — Cleveland Laundry Co., 2840 Carnegie Ave., S. E.—complete equipment for proposed $50,000 addition to laundry.

O., Toledo—Toledo Laundry Co., Prescott St. and Ashland Ave.—machinery for proposed laundry.

Tenn., Nashville—Producers Refining Co., P. O. Box 147—44 mi. of 3 in. pipe.

Tex., De Leon—De Leon Free Press—saw trimmer and wire stitcher.

Tex., Grand Prairie—R. B. Stubbs—tire shrinker.

Tex., Hico—Printers, P. O. Box 7—one 8 x 10 in., one 10 x 15 in. and one 14 x 22 in. job press, also belting, hangers, pulleys, shafting and bearings.

Tex., Lubbock—Lubbock Cotton Compress Co.—machinery for proposed $75,000 plant.

Va., Ashland—L. N. Hank—small lathes for jewelry shop.

Va., Richmond—Prentiss Motor Co., 322 West Broad St.—machinery to replace that which was destroyed by fire.

W. Va., Harrisville—Gazette—7 column quarto press.

Wis., Green Bay—St. Joseph's Orphanage, Route 1—laundry machinery and equipment.

Wis., Madison—Chicago & Northwestern Ry. Co., c/o B. R. Kulp, Engr., 201 South Blair St.—shop equipment, small tools and 20 ton crane.

Wis., Madison—Schmidt Bros. Co., 2611 Monroe St., A. Schmidt, Purch. Agt.—gasoline storage tanks and pumps, also oil tanks and pumps.

Wis., Markesan—Cobb Canning Co., W. Sink, Pres.—canning and conveying machinery for proposed $100,000 cannery at Cobb.

Wis., Milwaukee — M. Carpenter Baking Co., 102 7th St.—mechanical baking ovens and conveyors.

Wis., Milwaukee—W. Hyink & Sons Co., 727 North Water St.—belting and shafting for proposed machine shop.

Wis., Milwaukee—Wisconsin Public Service Co., c/o J. P. Pulliam, 559 Marshall St.—gas making machinery and equipment for proposed $1,000,000 gas plant at Sheboygan.

Wis., Waupun—Bear Brand Hosiery Co.—knit goods machinery for proposed $40,000 addition to factory.

N. B., St. John—J. M. Queen Oil Co., Ltd., c/o J. A. Morris—complete refining and manufacturing equipment for petroleum oils and byproducts.

N. S., New Glasgow—W. McNeil—heavy portable sawmill.

Ont., North Bay—Temiskaming & Northern Ontario R.R., G. M. Alford, Purch. Agt.—creosoting plant for Cochrane.

Ont., Richards Landing—W. E. Owen—sawmill equipment, to replace that which was destroyed by fire.

Que., Montreal—International Hardwood Co., Ltd., c/o R. C. Grant 12 Oldfield Ave.—sawing and manufacturing equipment.

Que., Montreal—Salt's Textile Co. of Canada, Ltd., c/o G. A. Campbell, 189 St. James St.—textile machinery.

Que., Ormstown—D. Beaulieu—blacksmith shop equipment, including small tools.

Que., Rimouski — Garage St. Germain, Riverin & Chassey, Purch. Agts.—small tools, emery wheel, etc.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Iron and Steel—August steel business slower than for any previous month since October, 1921. Prices firm despite dullness of market. August iron trade heaviest since Spring. Furnaces facing higher fuel costs in event of coal strike. Coke higher. Inquiries for steel plates and shapes plentiful but mills finding difficulties in meeting delivery specifications. Plates and shapes firm at $2.50 per 100 lb., f.o.b. mill. Demand for shapes mostly in small lots. Bars firm at $2.40; demand improving.

Advances—Tin firm; up 1¼c. Lead steady; advanced ⅛c. per lb. in week. Antimony and zinc sheets also firmer in New York warehouses.

Declines—Black and galvanized steel sheets lower in New York. Copper at lowest price level since October, 1922. Zinc down 35c. per 100 lb. in week. Copper sheets dropped ⅛c. per lb. in both New York and Cleveland warehouses. Raw linseed oil 96c., f.o.b. New York, in 5 bbl. lots, against 98c. per gal. last week.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$29.05@$31.05
Northern Basic	28.17
Southern Ohio No. 2	28.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.37
BIRMINGHAM	
No. 2 Foundry	25.00@27.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	29.16
Virginia No. 2	32.17
Basic	26.16
Grey Forge	26.16
CHICAGO	
No. 2 Foundry local	28.61
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.51
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	27.77
Basic	26.77
Bessemer	28.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5.00@5.50

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.80	4.45	5.05
Nos. 22 and 24.	3.75	4.85	4.50	5.05
Nos. 25 and 26.	3.80	4.90	4.55	5.10
No. 28	3.85	5.00	4.65	5.20
Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00	5.00	4.70	5.35
Nos. 12 and 14.	4.10	5.10	4.80	5.45
Nos. 17 and 21.	4.40	5.40	5.10	5.75
Nos. 22 and 24.	4.55	5.55	5.25	5.90
No. 26	4.70	5.70	5.50	6.05
No. 28	5.00	6.00	5.80	6.35

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	62	50½	⅜ to 1½	30	13
LAP WELD					
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	26	11
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	60	49½	⅜ to 1½	30	14
2 and 3	61	50½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ⅛-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
⅛	$0.09	50%	⅞	$0.16	35%
¼ to ½	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	8.00	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.65	3.90	4.55
Cold finished flats, squares	5.15	4.40	5.05
Structural shapes (base)	3.64	3.46	3 40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Standard tool steel	15.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.25
Tin, 5-ton lots, New York			41.75
Lead (up to carlots), St. Louis	6.65	New York	7.37½
Zinc (up to carlots), St. Louis	6.40	New York	6.90

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.10	27.00	28.00
Antimony (Chinese), ton spot	8.87½	10 50	8.75
Copper sheets, base	22.75	22.00@22.50	23.00
Copper wire (l.c.l.)	16.50	19.75	16.25
Copper bars (l.c.l.)	20.75	23.00	19.50
Copper tubing (l.c.l.)	25.50	28.00	23.00
Brass sheets (l.c.l.)	18 50	23 00	18.75
Brass tubing (l.c.l.)	24.00	28.50	20.50
Brass rods (l. c. l.)	16.75	19.25	15.75
Brass wire (l. c. l.)	19.00	23.00	.....
Zinc sheets (casks)	10.75	10.45	.....
Solder (½ and ½), (case lots)	29.50	27.75	20.00
Babbitt metal (83% tin)	52.00	49.00	38.00
Babbitt metal (35% tin)	25.00	17.00	16.00
Nickel (ingot and shot)	29.00	.....	35 00
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48 00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	11.50	12 00
Copper, heavy, and wire	11.50	11.00	11.25
Copper, light, and bottoms	10.00	9.00	10.00
Lead, heavy	5.00	5.00	5.50
Lead, tea	4.00	4.00	4.50
Brass, heavy, yellow	7.50	....	7.00
Brass, heavy, red	9.50	9.50	9.00
Brass, light	6.00	5.00	6.25
No. 1 yellow brass turnings	7.00	6 00	6.75
Zinc	3.75	3.00	3.75

TIN PLATES—American Charcoal—Bright—Per box.

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 20x28, 112 sheets	$23.50	$19.50	$18.50
"A" Grade:			
IC, 20x28, 112 sheets	21.00	17.00	17.00
Coke Plates—Primes, 20x28 in.			
100-lb., 112 sheets	14.00	12.60	14.50
Terne Plates—Small lots, 8-lb. Coating			
IC, 14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.11	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13¼x13½, per lb.	10.25	36.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	.96	1.18	1.14
White lead, dry or in oil	100 lb. kegs.	New York,	14.00
Red lead, dry	100 lb. kegs.	New York,	14.00
Red lead, in oil	100 lb. kegs.	New York,	15.50
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville... per net ton		$5.00@5.50	
Coke, prompt foundry, Connellsville... per net ton		6.00@6.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	30%	50-10%	45-5%
1½ and 1¼x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	15%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	20%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	30%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	25%	45%	40-5%
Bolt ends, with hot pressed nuts	30%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 9/16 and smaller	60%	.....	....
Semi-finished nuts, ⅝ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.. ....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, in., per 100 lb. (net)	5.50	4.00	3 50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	List net	2.75	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	40%	50-10%	60%
Rivets, tinned	40%	50-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1⅛ to 1¾-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30-10%	30-10%	30-10%
Heavy grade	20-5-2½	30%	20-5-2½%
Rubber and duck:			
First grade	.50-10-5%	50-10%	40-10%
Second grade	60-10%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20

Que., St. Chrysostome—P. Gagnier—equipment for garage, including emery wheel.

Que., St. Hilaire—Roy & Masse—small tools, etc., for garage.

Que., St. Hyacinthe—L. Dube, St. Rosalie St.—garage equipment.

Que., St. Hyacinthe—H. Foisy, Larocque St.—garage equipment.

Que., St. Jean Baptiste de Rouville—A. Vincelette—sawing equipment.

Que., Sorel—Sheppard & Fils, A. Sheppard, Purch. Agt.—sawmill machinery.

Que., South Stukely—A. Payette—blacksmith shop equipment.

Metal Working Shops

Ark., Brinkley—W. E. Brown awarded the contract for the construction of a 1 and 2 story, 60 x 80 ft. garage. Estimated cost $45,000. Noted Aug. 16.

Calif., Los Angeles—The Los Angeles Ry. Co., Railway Bldg., awarded the contract for the construction of a 1 story, 150 x 150 ft. garage on 16th St. Estimated cost $40,000.

Calif., Los Angeles—The Thompson Co., 1420 East 8th St., is having plans prepared for the construction of 1 story, 50 x 125 ft. garage. Private plans.

Calif., San Francisco—B. Getz, Chronicle Bldg., is having plans prepared for the construction of a 1 and 2 story garage on Ellis and Buchanan Sts. Estimated cost $40,000. Morrow & Garren, Chronicle Bldg., Archts.

Calif., San Francisco—W. W. Hanscom, Engr., 848 Clayton St., is receiving bids for the construction of a 2 story factory on 19th, Florida and Alabama Sts. for the Pelton Water Wheel Co., 19th and Harrison Sts. Estimated cost $100,000. Noted June 7.

Calif., San Francisco — J. Pasqualetti, Humboldt Bank Bldg., is having plans prepared for the construction of a 2 story garage on Market St. near 15th St. Estimated cost $40,000. Private plans.

Calif., Ventura—The Ventura Improvement Assn., c/o A. C. Martin, Archt., Higgins Bldg., Los Angeles, is having plans prepared for the construction of a 1 story, 75 x 100 ft. garage, here.

Conn., Middletown—Wilcox, Crittenden & Co., 3 South Main St., manufacturer of marine and awning hardware, awarded the contract for the construction of a 3 story, 60 x 60 ft. factory. Estimated cost $40,000. Noted Aug. 30.

Conn., Oakville—The Oakville Co., manufacturer of brass, awarded the contract for the construction of a 2 story, 70 x 120 ft. factory. Estimated cost $40,000. Noted July 26.

Conn., Plainville—The Standard Steel & Ball Bearing, Inc., awarded the contract for the construction of a 2 story, 60 x 150 ft. factory. Estimated cost $60,000.

Ill., Chicago—Boshes & Chaet, 1119 South Central Park Ave., are receiving bids for the construction of a 1 story, 125 x 125 ft. automobile sales station and garage on Arthington and Crawford Sts. Estimated cost $60,000. J. H. Klafter, 127 North Dearborn St., Archt.

Ill., Chicago—C. Botis, 105 West Monroe St., awarded the contract for the construction of a 1 story, 99 x 174 ft. garage at 425-33 East Pershing Rd. Estimated cost $40,000.

Ill., Chicago—T. Kohl, 5 North Wabash Ave., awarded the contract for the construction of a 1 story, 170 x 297 ft. garage at 6160-6220 South Wabash Ave. Estimated cost $150,000.

Ill., Chicago—N. A. and S. E. Mittleman, c/o Loewenberg & Loewenberg, Archts., 111 West Monroe St., are having plans prepared for the construction of a 1 story, 75 x 110 ft. automobile sales and service station at 2482-86 Milwaukee Ave. Estimated cost $100,000.

Ill., Decatur—The Wabash Ry. Co., Railway Exch. Bldg., St. Louis, Mo., awarded the contract for the construction of a car repair shop, here. Estimated cost $175,000.

Mass., Dorchester (Boston, P. O.)—The Shawmut Eng. Co., 24 Mills St., Boston, manufacturer of machinery, plans to build a 1 story, 50 x 100 ft. machine shop at 185 Freeport St., here. Estimated cost $25,000. E. F. Hathaway, Genl. Mgr.

Mo., St. Louis—E. T. McGrath, c/o Holbrook-Blackwelder Real Estate Trust Co., 812 Chestnut St., has purchased site and plans to build a 3 story, 89 x 110 ft. garage on Bway near Poplar St. Estimated cost $50,000. Engineer or architect not selected.

Mo., St. Louis—O. J. Popp, Archt., 320 Odd Fellows Bldg., will receive bids until Sept. 10 for the construction of a 92 x 256 ft. steel casting plant on Fairview St. for the Warren Steel & Casting Co., Fairview St. and Kingshighway. Estimated cost $50,000. Noted June 14.

Mo., Trenton — The McVey Motor Co. awarded the contract for the construction of a 1 and 2 story, 90 x 155 ft. garage on 9th St. Estimated cost $50,000.

N. J., Jersey City—The Continental Can Co., 61 Bway, New York, is having plans prepared for the construction of an addition to its factory on 16th St., here. Estimated cost $500,000. Francisco & Jacobus, 511 5th Ave., New York, Engrs. and Archts.

N. J., Newark—The A. G. Constr. Co., c/o R. Botelli, Engr. and Archt., 207 Market St., will build a 2 story, 75 x 300 ft. garage on Broad St. near State St. Estimated cost $60,000. A. Gennet, Pres.

N. Y., Brooklyn—J. Reuben, c/o S. Millman, Archt., 26 Court St., will build a 1 story, 125 x 210 ft. garage on East New York Ave. Estimated cost $50,000.

N. Y., Buffalo—The Albany Garage, 409 Niagara St., plans to rebuild its 2 story, 60 x 80 ft. garage which was destroyed by fire. Estimated cost $50,000. H. Weinstein, owner.

N. Y., Buffalo — The Becker-Hoffman Service Co., 250 Franklin St., plans to build a 3 story, 52 x 115 ft. garage on Elmwood Ave. Cost will exceed $75,000.

N. Y., New York—T. J. Keane, c/o J. G. Dunnigan, Engr. and Archt., 394 East 150th St., will build a 2 story, 100 x 100 ft. garage on 181st St. and Davidson Ave. Estimated cost $50,000.

N. Y., Rochester—The Paige Sales Co., Cortland St., plans to build a 2 story, 60 x 100 ft. garage. H. R. Stewart, Pres.

N. Y., Tottenville—The Tottenville Copper Co., Bedell Ave., awarded the contract for the construction of a 1 story, 75 x 300 ft. addition to its plant, to replace fire loss.

O., Cleveland—The Brush Garage Co., c/o Watson Co., Archts., 4614 Prospect Ave., is receiving bids for the construction of a 2 story, 110 x 110 ft. garage on Prospect Ave. Estimated cost $75,000.

O., Cleveland—A. C. Wolf & F. M. Griffith, Archts., Swetland Bldg., are receiving bids and will open same about Sept. 10 for the construction of a 1 story machine shop and foundry on East 55th St. for the Globe Brass & Mfg. Co., 5532 Perkins Ave., H. F. Schroeder, Pres. Noted Aug. 16.

Pa., Phila.—Berks Bros., Randolph and Wood Sts., awarded the contract for the construction of a 1 story, 72 x 97 ft. shop for the manufacture of ornamental and light iron, at 327 North Randolph St. Estimated cost $21,000.

Pa., Phila.—The Budd Mfg. Co., 25th St. and Hunting Park Ave., manufacturer of automobile bodies, awarded the contract for the construction of a factory on Hunting Park and Wissahicken Ave. Estimated cost $600,000. Noted Aug. 16.

Pa., Phila. — The Fleischman Co., 1223 Race St., is having plans prepared for the construction of a 1 and 2 story, 86 x 154 ft. garage and office building on 20th and Venango Sts. Estimated cost $150,000. L. L. Tieman, 693-701 Washington St., New York, Archt.

Pa., Phila.—The Ford Motor Co., Highland Park (Detroit P. O.) is having plans prepared for the construction of a 1 story, 400 x 920 ft. automobile assembly plant on 63rd St., here. A. Kahn, 1000 Marquette Bldg., Detroit, Archt.

Pa., Phila.—The R. W. Hartnett Co., 1010 Race St., is having plans prepared for the construction of a 3 story, 49 x 93 ft. factory for the manufacture of printing machinery at 1025-27 Cherry St. Private plans.

S. C., Greenville—C. O. Allen awarded the contract for the construction of a 3 story, 60 x 116 ft. garage and showrooms on East Washington St.

Tex., Dallas—The Dallas Brass Co., 4015 Main St., plans to rebuild its factory at 2870 Elm St., which was recently destroyed by fire. Estimated cost $40,000. Engineer or architect not announced.

Tex., Fort Worth — The city is having plans prepared for the construction of a 3 or 4 story garage. Estimated cost $150,000. D. M. Lewis, Engr.

Tex., San Angelo—R. P. Amacher is having plans prepared and will soon receive bids for the construction of a 2 story, 100 x 190 ft. garage. Estimated cost $115,000. J. H. Martling, 517 Massachusetts Bldg., Kansas City, Mo., Archt.

Tex., San Antonio—J. Steves, 509 King William St., awarded the contract for the construction of a 1 story garage on South Alamo St. Estimated cost $51,969.

Wis., Janesville — The Chevrolet Motor Car Co. will build a 1 story, 90 x 288 ft factory. Estimated cost $100,000. Noted July 12.

Wis., Madison — The Chicago & Northwestern Ry. Co., c/o B. R. Kulp, Engr., 201 South Blair St., is having plans prepared for the construction of a 2 story, 50 x 100 ft. machine shop, car repair shop, etc. Estimated cost $40,000. Private plans.

Ont., Oshawa — The General Motors of Canada, Ltd., awarded the contract for the construction of a 2 story, 100 x 600 ft. automobile assembly building on Division St. Estimated cost $300,000. Noted Aug. 2.

Wis., Milwaukee—W. Hyink & Sons Co., 727 North Water St., awarded the contract for the construction of a 1 story, 60 x 100 ft. machine shop on Ogden Ave. Estimated cost $40,000.

Watch The Latest Opportunities

Turn To Pages 181-195

In The Searchlight Section Of This Paper

American Machinist

Volume 59 NEW YORK, SEPTEMBER 13, 1923 Number 11

Development of Machine Tools in New England

BY GUY HUBBARD

The fifth article—Invention of the bandsaw—Two rotary pumps, one a failure and the other a marked success—A patent signed by John Quincy Adams

IN PARTNERSHIP with his son George W. Hedge and Edwin F. Johnson, Lemuel Hedge set up as an inventor and mechanical engineer in New York, being especially interested in the improvement of sawmills. On June 18, 1842, he patented one of the early types of circular sawmills for sawing logs. As perfect saw plates of large diameter were difficult to produce in those days, he employed two rather small saws, one set above and ahead of the other so that their cuts would come together—an arrangement which, in large sizes, was later used a great deal in the big mills of the west. In this Hedge mill, the log was stationary and the saws moved forward, a long belt passing over one saw-pulley, under the other and then over an idler, allowing the saws to move without disturbing the drive.

In May, 1849, Lemuel Hedge produced his most famous invention, which was the bandsaw in almost exactly

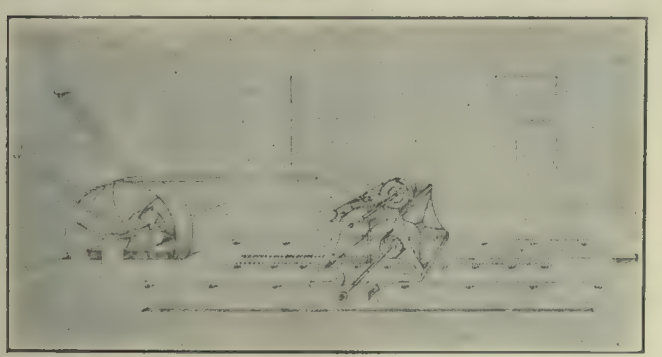


FIG. 23—HEDGE'S DOUBLE CIRCULAR SAWMILL
(Drawing by Lemuel Hedge)

its modern form. To get ahead of my general story I will say that this machine, now in increasing use for cutting both wood and metal, was originally built for Mr. Hedge by The Robbins & Lawrence Co., Windsor, Vt., and was first demonstrated to the public at its car shop in August, 1849. Of this demonstration, the *Vermont Journal* of August 24, 1849 had the following to say:

"The Belt Sawing Machine" advertised in our columns seems, on investigation, to justify if not demand further notice at our hands. Its remarkable simplicity and adaption to all possible purposes ever effected by saws, cannot fail, if known, to command the attention of mechanics. It is capable of sawing on straight lines or on curves of any radius down to ¼ of an inch. Its natural adjustment ensures its working at exactly right angles from any sur-

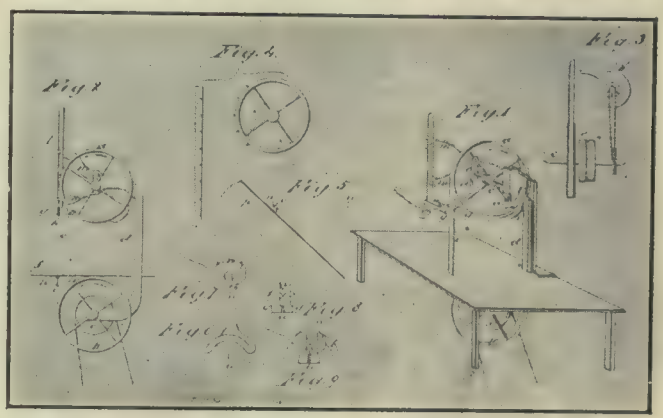


FIG. 24—HEDGE'S BANDSAWING MACHINE, 1849
(From the patent drawing)

face of the timber to be sawed, but is easily adjustable to saw through the timber at any desired angle, whether the line in which the saw progresses be straight or curved. It is capable also of sawing tortuous or winding surfaces, and this, also, whether the line of progession be straight or curved; this property enables it to saw every species of ship timber, mould boards for plows, etc., thus annihilating to a certain extent the use of the adze. As a sawmill for lumbering purposes, it is adapted to saw with equal facility, boards of any width, up to ten feet or more, if required. To keep it sharp, and otherwise in good order for work, requires, in the opinion of the best judges, to do the same amount of work, less labour than ordinary saws It has also the advantage of cutting a kerf by one half thinner than the common sawmill, by which means an important amount of lumber is saved. It is cheap in its construction, and not liable to disorder save by necessary wear or accident. But to cap the climax of its advantages, it is evident that with less than one half the power, it will execute twice the amount of work in the same time,

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when compared with the execution of the common sawmill. We hope the inventor may find sufficient enterprise in this place to patronize so valuable an improvement.

Hedge's belt sawing machines were later exhibited at London, Paris and Vienna and received considerable attention. They first came into general use (in small sizes) to replace jig saws, but of late years the prophecy of the old newspaper item has come true, for in the

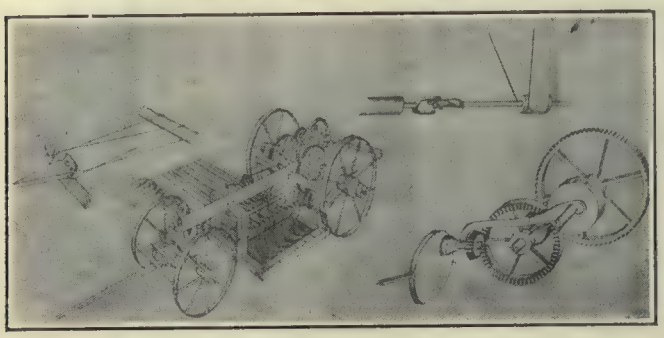


FIG. 25—HEDGE'S GRAIN REAPER, ABOUT 1855
(Drawn by Lemuel Hedge)

lumber mills of Oregon and California, heavy and powerful band saws have now generally replaced Hedge's earlier invention—the double circular saw—for handling the huge logs of these regions.

Lemuel Hedge combined many qualities. He was, in his youth, a fine cabinet maker and there is no question but that the handsome furniture he made in his younger days is now highly valued as heirlooms by the descendants of the original owners. Then to this accomplishment, he added that of a builder of fine musical instruments—an art in itself. Beginning his career as a blacksmith, he developed into a skilled mechanic and as his drawings (which are still preserved by his family) show, he later became an exquisite draftsman, working in tints and in perspective. By constant study he cultivated his great natural inventive ability, until his mind was able to conceive and to work out delicate and

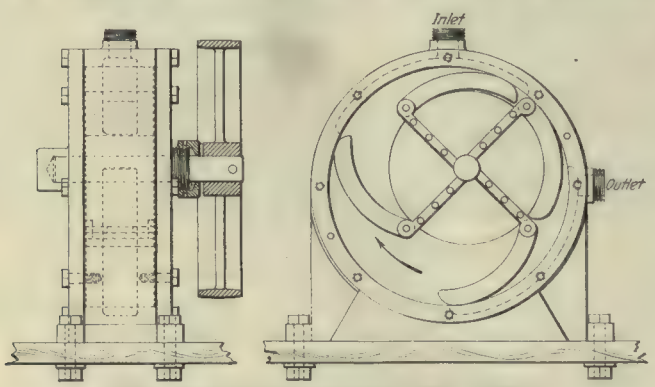


FIG. 26—COOPER'S ROTATIVE PISTON

complicated mechanisms so completely that no great amount of experiment was ever necessary upon the finished machines. In his later life he was in comfortable circumstances and he died in New York at about the age of eighty, an active engineer almost to the last—being in his old age engaged in the perfecting of a grain reaper. As the biographer of Oliver Evans might have said "Lemuel Hedge has a memorial wherever paper is ruled, wherever band saws are in use and, most of all, in certain departments of the great Stanley Works of New Britain, Conn., where accurate scales are made. Besides being one of the earliest Windsor mechanics and inventors, he was one of the greatest and the writer is proud of this opportunity to bring Mr. Hedge and his work to general public attention for the first time.

On July 16, 1827, John M. Cooper, an inventive mechanic of Guildhall, Vt., received a patent upon a device which he called a rotative piston. This device was designed for use in pumping water, the object being a pump to which continuous rotary motion could be directly applied and from which a continuous stream of liquid would be expelled, without the use of an air chamber.

The rotary pump as built with the Cooper rotative piston, shown in Fig. 26, consisted of a cylindrical casing with an inlet at the side and an outlet at the top, these openings connecting with cored recesses on the inside. The casing was bored out and fitted with bolted-on cylinder heads. The rotative piston revolved within the casing, being supported by eccentrically located bearings in the cylinder heads. It consisted of a drum with a shaft through the center, the drum being considerably smaller than the diameter of the bore of the cylinder and in width, the same as the space in the cylinder. Equally spaced about the drum were four curved leaves or buckets, which were pivoted at one end to straps set flush with the sides of the drum. The buckets were sections of a ring, the inside diameter of which was the same as the drum. In thickness, the buckets were the same as the clearance between the drum and the bore of the cylinder at the closest point and in length, they were one fourth the circumference of the drum. The free ends were rounded to slide smoothly on the case and the fixed ends were drilled for the pivot pins and counterbored to fit the eyes of the straps, the ends being carefully rounded to maintain a tight joint with the surface of the drum.



FIG. 27—ASAHEL HUBBARD, INVENTOR OF THE REVOLVING HYDRAULIC ENGINE
(From an old painting)

As the rotative piston was turned rapidly within the casing, the buckets were thrown outward by centrifugal force and by liquid pressure and came in contact with the casing, being opened and shut during each revolution by the eccentric action of the case. This caused the liquid to be constantly squeezed out at the top and a vacuum created at the intake, thus constantly drawing in more liquid from the reservoir.

Cooper believed his revolving piston to be particularly suited for a combination bilge and fire pump for steamboats, as it could be driven by hand or belted to an engine with equal facility. For this reason he went to Windsor where the steamboat excitement was then at its height, and in the winter of 1827, (even before

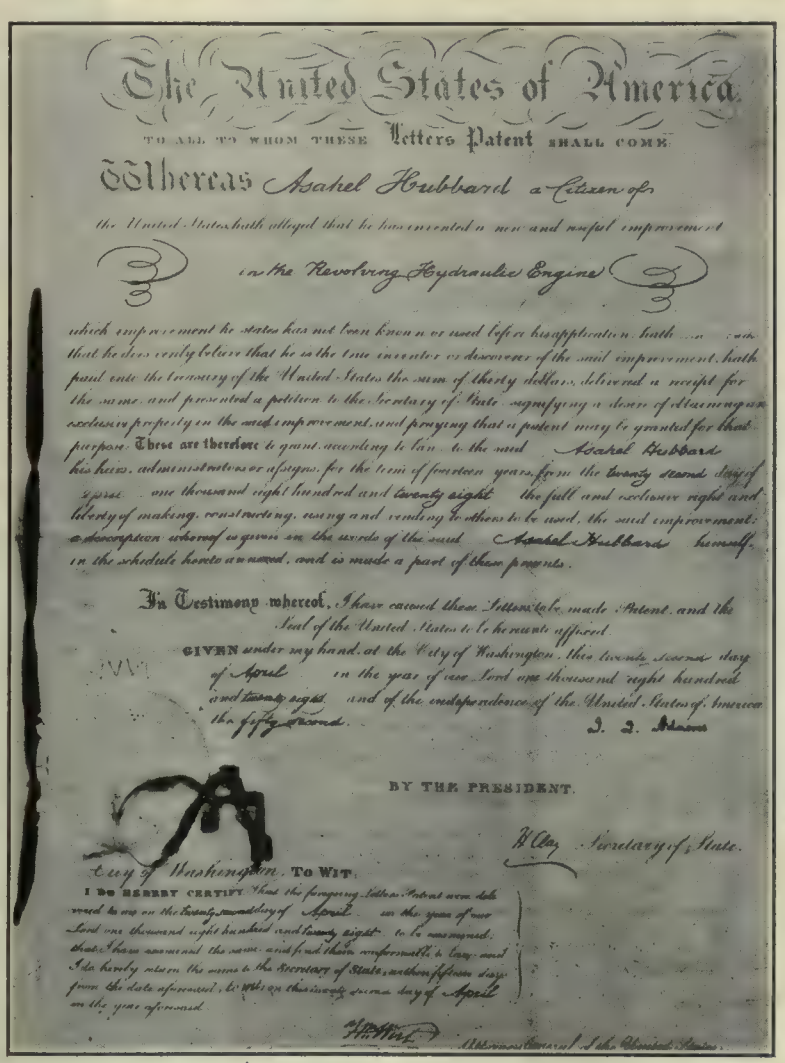
thorough tests had been made) he persuaded two local capitalists, Elisha Phelps and Edward R. Campbell, to finance his invention. The partnership of Cooper, Phelps & Campbell was formed in March, 1828, and preparations were at once made to manufacture Cooper's rotative piston on a large scale, in one of the abandoned buildings of the defunct Essex Merino Association, on the second fall of Mill Brook in Windsor Village. In addition to the ship pumps, fire engines and well pumps with the rotative piston were designed and it was confidently believed that high-pressure industrial pumps, as large at 20,000 gal. per min. capacity, would be entirely practical upon this plan.

So great seemed to be the field for this invention to the optimistic backers, that on Oct. 30, 1828, Cooper, Phelps & Campbell, incorporated at Windsor as the American Hydraulic Co., with a capital of $100,000. A representative was sent to Europe, numerous agents were appointed and plans were made for greatly enlarging the business at Windsor. A force of fifty men was set to work, hundreds of pumps of various sizes were turned out and because of the extravagant claims made by the agents, the pumps sold rapidly.

No sooner had this production been reached, however, than the extremely unpleasant discovery was made that the pumps, especially those of the larger size, by no means came up to the expectations in actual service. One drawback which appeared (even in the experimental model) was that as the head was increased, the greater became the sliding friction of the piston and the consequent wear and loss of power, on account of the buckets being forced against the inside of the case. This fault was particularly evident when gritty water was pumped. Another defect which appeared was that of slip or leakage within the pump itself, not only between the buckets and the case but at the hinges of the buckets as well. This defect would appear even in a new pump unless very carefully constructed.

The result was that many of the hundreds of pumps already sold began to be returned and the sales of new ones rapidly fell off. With the crude mechanical equipment available in those days, the Cooper pump could scarcely have been improved upon and the upshot of the matter was that about 1830, the American Hydraulic Co. failed—both Mr. Phelps and Mr. Campbell losing considerable amounts of money in the venture. It is pleasant to know that of late years the Cooper rotative piston has been improved greatly and as built by careful modern methods, it is sold under a variety of names both as low-pressure blowers and as pumps for liquids, which give excellent results.

It so happened that had it not been for the following fortunate circumstance attending the advent of the Cooper pump, the heavy blow of this initial failure might easily have killed the Windsor machine industries almost at birth. This circumstance was, that one of the Windsor citizens to whom John W. Cooper demonstrated his rotative piston shortly after the patent was granted, was a sort of "Jack of all Trades," Asahel Hubbard by name, who was at that time running a combination of sawmill, gristmill, and machine shop about three miles west of Windsor village, at a wild and picturesque fall in Mill Brook at the base of Mount Ascutney.



The United States of America.

TO ALL TO WHOM THESE Letters Patent SHALL COME

Whereas Asahel Hubbard a Citizen of

the United States hath alleged that he has invented a new and useful improvement

in the Revolving Hydraulic Engine

which improvement he states has not been known or used before his application, hath ... and that he does verily believe that he is the true inventor or discoverer of the said improvement, hath paid into the treasury of the United States the sum of thirty dollars, delivered a receipt for the same, and presented a petition to the Secretary of State, signifying a desire of obtaining an exclusive property in the said improvement, and praying that a patent may be granted for that purpose. These are therefore to grant, according to law, to the said Asahel Hubbard his heirs, administrators or assigns, for the term of fourteen years from the twenty second day of April one thousand eight hundred and twenty eight the full and exclusive right and liberty of making, constructing, using and vending to others to be used, the said improvement, a description whereof is given in the words of the said Asahel Hubbard himself, in the schedule hereto annexed, and is made a part of these presents.

In Testimony whereof, I have caused these Letters to be made Patent, and the Seal of the United States to be hereunto affixed.

GIVEN under my hand, at the City of Washington, this twenty second day of April in the year of our Lord one thousand eight hundred and twenty eight and of the independence of the United States of America the fifty second.

J. Q. Adams

BY THE PRESIDENT.

H Clay Secretary of State.

City of Washington, To Wit:

I DO HEREBY CERTIFY That the foregoing Letters Patent were delivered to me on the twenty second day of April in the year of our Lord one thousand eight hundred and twenty eight to be examined, that I have examined the same, and find them conformable to law, and I do hereby affix to the same to the Secretary of State, authority from the date aforesaid, to wit: on this twenty second day of April in the year aforesaid.

Wm Wirt Attorney General of the United States.

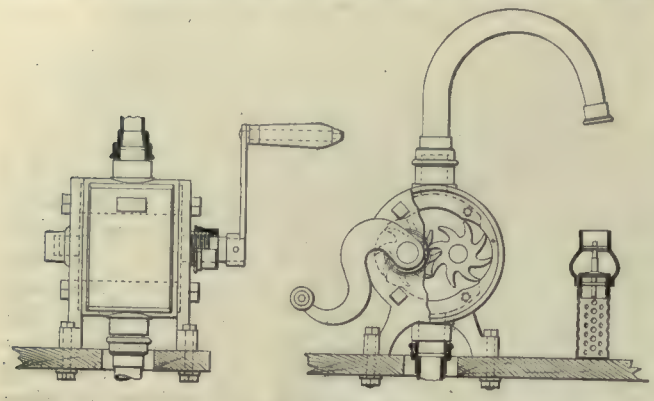
FIG. 28—FIRST PAGE OF LETTERS PATENT ON HUBBARD'S REVOLVING HYDRAULIC ENGINE

Asahel Hubbard, whose portrait is shown in Fig. 27, was born at Meriden, Conn., Jan. 8, 1787, and removed to Windsor in 1800, where his father had for twenty-five years been one of the large land holders. As a boy he drove freight wagons between Windsor and Boston and later he ran a store for a time and also was a tavern keeper but, being a natural mechanic and inventor, he drifted into mechanical work.

When he saw the Cooper pump, he at once appreciated the value of the revolving principle but detected the grave faults mentioned above. With his interest thus aroused, he set to work to invent a rotary pump which would avoid the faults of Cooper's rotative piston and its complication of parts, yet still have its advantages. The result was his revolving hydraulic engine, upon which he obtained a strong patent, dated April 28, 1828, signed by John Quincy Adams, President; Henry Clay, Secretary of State and William Wirt, Attorney General. It was upon this patent, the first page of which may be seen in Fig. 28, that the modern industries of Windsor were based.

The revolving hydraulic engine, Fig. 29, is clearly though rather quaintly described by the inventor in the patent, in the following way:

"This is an engine for raising and discharging water and other fluids. It consists of two metallic or wood cylinders with curved leaves, which play or mash into each other, the rounding side of the leaves coming in contact



(From the original)
FIG. 29—HUBBARD'S REVOLVING HYDRAULIC ENGINE

—the hollow sides forming buckets for the conveyance of the fluid. Each cylinder revolves on an axis, and may be placed either in a horizontal or perpendicular position. The cylinders may be confined in a metallic or wooden box strongly bolted or screwed together, the inside of the box corresponding with the form of the two cylinders when placed together. In the lower part of the box (if the cylinders are placed in a horizontal position) is an aperture of sufficient capacity to keep the box filled with fluid when the engine is in operation, the size of the aperture graduated by the size of the engine. A pipe or tube is introduced, which will fit the aperture, of sufficient length to reach the reservoir, or fountain, intended to supply the engine. At the top or side of the box, as occasion may require, is another aperture, to which a suitable pipe is attached to discharge the fluid, the form and size adapted to the use to which the engine is applied.

This engine may be operated by hand, horse, steam or water power, and any kind of cranks, wheels, bands, chains, pinions, cogs or pulleys, may be applied, that will give the cylinders a rotary motion, the particular application depending upon the size of the engine, the purpose for which it is intended, the quantity of fluid required to be raised, and the valocity with which it is necessary to be discharged.

For a small hand engine, a crank is attached to the axis of one of the cylinders; by turning the crank both cylinders are put in motion, which raises the fluid thro' the tube at the bottom and discharges the same at the top or thro' the pipe on the upper side of the engine." ASAHEL HUBBARD.
Witnesses:
THOS. M. POMROY,
CARLOS COOLIDGE.

In this pump there are but two working parts. There are no sliding joints (the action of the "leaves" being a rolling one) and increasing pressure has scarcely any effect in increasing the friction. Thus were the advantages of the rotative piston retained and its defects eliminated.

Teach Your Boy a Trade—Discussion

BY WILLIAM J. FISHER, JR.

There was a very interesting article in the *American Machinist* on page 872, Vol. 58, by W. H. Myers, advising us to teach our boys a trade. There is much in the article to make us wonder where we are going to get our future mechanics.

I well remember that when I applied for a place to serve my apprenticeship, there were eighteen to twenty boys ahead of me and all of them had to have letters of recommendation—and these letters were from influential men. Not so now; if you need a boy to learn the machinist trade you have to look him up.

A short time ago I asked an employment bureau head if many boys applied for places to learn a trade, and he said, "No, they seem to be looking for something cleaner than working in shops, and they do not like apprenticeship wages." Boys today learning a trade receive about four times as much pay as formerly, have shorter hours, and many other advantages that boys of the past generation did not have.

IMPORTANCE OF THE MACHINIST

Surely the machinist trade is an honorable one and has the brightest of prospects, as there is not a large engineering project of any kind that is not dependent on machinists directly or indirectly for its successful accomplishment. I remember an executive in a large rolling mill near the shop where I served my time, who not from necessity sent his boys into our shop and had them learn the machinist trade. It certainly was an advantage to them when they went into the mill.

Where is there any trade that is more interesting than the machinist trade, or offers better prospects in these days of wonderful machinery for both farms and city? Perhaps if the *American Machinist*, with its large influence in the machinery business, would publish more articles on the prospects of the machinist trade, it would help fill up the ranks of one of our most interesting occupations. It is much to be regretted that boys today when they come out of high school or college, seem to look for places where they can have clean hands and clothes.

While I feel that I am in the minority, I still believe that the old-fashioned apprenticeship system is the best; that is, serving time in a machine shop with real machinists after having received instruction from vocational teachers.

Automobile Piston Clearance—Discussion

BY E. JACKSON

I notice on page 65, Vol. 59 of the *American Machinist* an article under the above title by Otto M. Burkhardt. I fear that he is under the impression that the piston is the only part of the engine which expands.

While he is correct in the figures he has taken as regards the expansion at the temperatures specified, he has not said how much the engine block, or cylinder, will expand.

From experience and figures that I have taken and applied, I find that the expansion of the automobile engine is 0.007 in. for the block and 0.016 in. for the piston. I feel that the chart D. P. Muirhead has given is as close as one could devise, figuring on the expansion of a 4-in. piston. I also find that it makes a difference whether you have a four-cylinder or six-cylinder engine. In a "four" I make the No. 1 piston about 0.002 in. larger than I do the other three as it seems to get the most severe wear. But on a "six" I make them all the same.

Emergency Repairs on a Gold Dredge Gear

By FRANK C. HUDSON

Saving undue delay on a million-dollar dredge—Reinforcing a cracked hub with heavy plates shrunk and bolted into place—Simple but sturdy repair work

GOLD DREDGES run so heavily into money that it is necessary to keep them in operation as constantly as possible. Every day of delay on a plant which costs in the neighborhood of a million dollars, has a very disheartening effect when it comes to figuring out dividends.

It so happened that the main driving gear of a large gold dredge developed cracks in and near the hub,

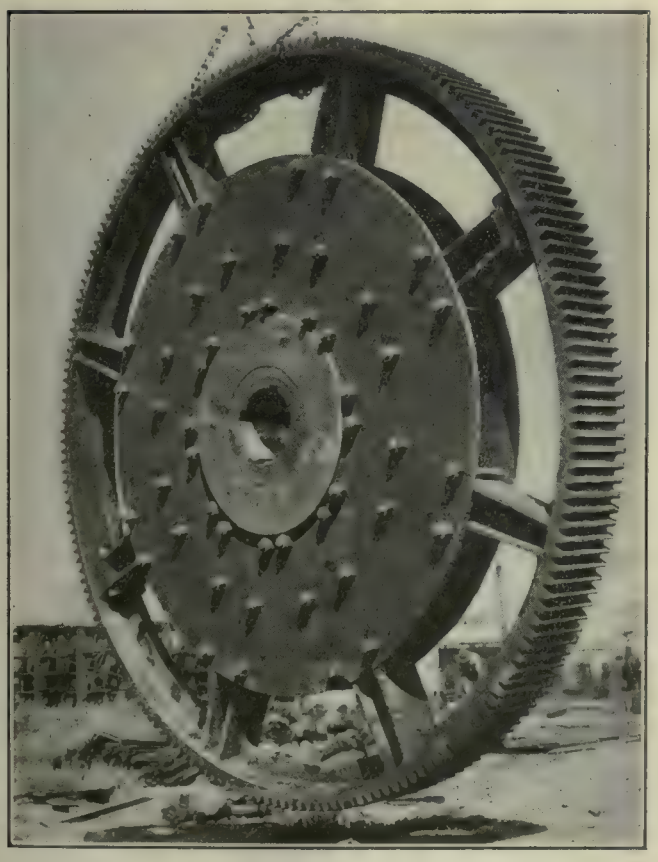


FIG. 2—SHOWING BOTH PLATES AND THE CONNECTING BOLTS

and it became necessary to either repair it or get a new gear. So the Yuba Manufacturing Co., at Marysville, Calif., tackled the job of repairing the old gear.

The gear was about 14 ft. in diameter, or 168.426 in., to be exact, and had a 15-in. face. The first operation was to turn down the outside of the hub to 26 in. in diameter. Then reinforcing plates were shrunk on each side. The first or inside plate on each side was 10 ft.

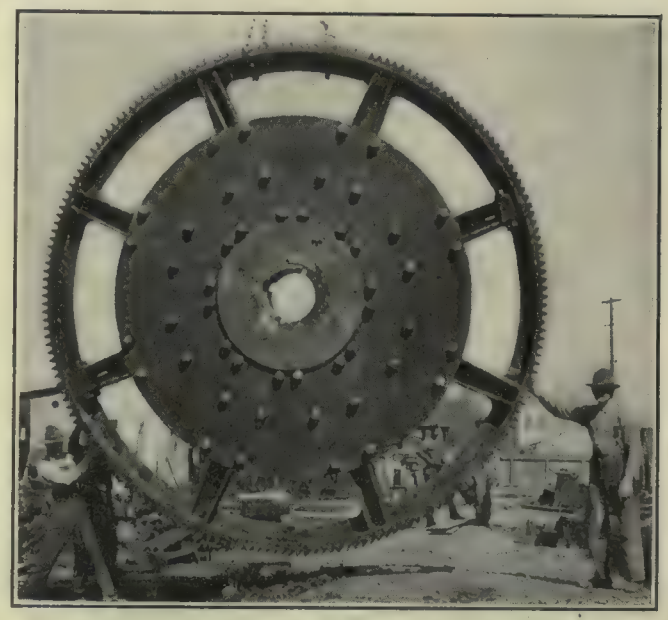


FIG. 1—A SIDE VIEW OF THE REPAIRED GEAR

in diameter by 1⅜ in. thick, and the second or outside plate was 48 in. in diameter and of the same thickness. Fig. 1 gives an idea of the size of the gear, as well as the arrangement of the plates.

Before shrinking on the large plates, however, it became necessary to cut a recess out of the flanges of the

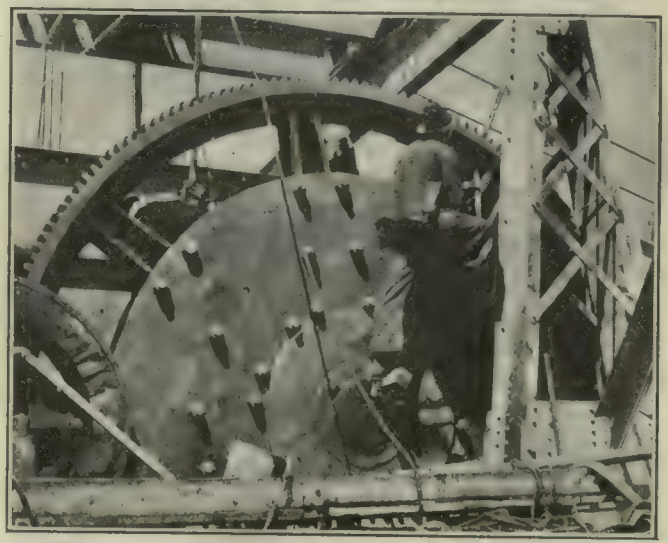


FIG. 3—PUTTING THE GEAR BACK INTO PLACE

eight arms, which were of I-section. The first side of the gear was entirely recessed in this manner on a 10-ft. Betts boring mill with the housing run back to the extreme limit. On the second side, however, it was decided to try cutting out nearly all the metal from the flanges with an oxy-acetylene torch, leaving the boring mill to finish the surfaces to uniform dimensions. This procedure was found to be very much quicker than cutting it all out on the boring mill.

After the arms and the hub were properly surfaced on both sides the plates were shrunk on. The smaller or outside plates were welded to the large plates by means of the electric arc. Six holes were then drilled close to each arm to receive 2-in. bolts having nuts on each end, there being 48 bolts in all. The bolts were made of chrome-vanadium steel. Fig. 2 shows how the repaired gear appeared.

The cracked wheel reached the Yuba plant on a Tuesday night and was carted away at 11 a.m. the following Friday. Fig. 3 shows the gear being put into place on the dredge after the repairs had been made.

Give the Shop Man a Visit Through the Shop—Discussion

By James Vose

With respect to the editorial on page 776, Vol. 58, of the *American Machinist*, under the above heading, it may be of interest to note that the idea of taking men through their own shops was put into practice in England quite a number of years ago.

A custom grew up in Manchester, and lasted at least a few years, of shop groups, comprising representatives of principals, technical and office staffs and shopmen, visiting other shops and tool warehouses on Saturday afternoon, the compliment being returned by inviting the representatives of the visited shops to inspect the shops of the visiting groups.

As is suggested in the editorial, much good was accomplished by these mutual visits. For one thing, it increased the knowledge of their own products and methods on the part of the various works hosts, and helped to give the workmen a self-respecting interest in their daily work and shop surroundings. It also brought together, in a social capacity, the representatives of the various departments and crafts in the shops of the district, since the visits usually concluded with the serving of light refreshments and congenial chats on shop topics and problems.

Those Participating

Among the works taking part in the informal scheme may be mentioned Mather & Platt, John Hetheringtons, B. & S. Massey, Meldrum Bros., George Richards, British Westinghouse Co., Hans Renold, Brauphaus, Browelt & Lindey, Charles Churchill, etc. In some cases printed programs were prepared and distributed. These served as a reminder of the various machines and processes inspected and led to more systematic and helpful ways of showing visitors in general through the shops at other times.

The effect on the workmen was sufficiently marked to call forth comment from incidental visitors regarding the noticeably more intelligent, knowledgeable and self-possessed bearing of those who had participated, not only in visiting other shops, but also in doing the honors at their own shop.

It occurred to the writer that what was appreciated sauce for the visitor goose should serve equally well for the resident gander. As a consequence, a visit to the shop by the regular personnel was arranged, the guests being piloted through by the specialist stewards exactly as in the case of outside visitors. The party afterwards adjourned to a social evening provided by the company, the music being contributed principally by the guests themselves. Full particulars were given at the time in this journal and commented on by the New York editors under the heading of "How to Show the Shop"—An English Improvement. (Page 1090, Vol. 25.)

This was in 1902. The visit was even more successful than the group affairs, and bore out fully the conclusions reached in the recent editorial article. One general result of the group visits was to give to the participants a more comprehensive grasp of the leading engineering productions of the district, thus helping forward the creation of good public spirit. The specialized publicity gained was also mutually advantageous to all parties in the groups.

I do not expect anyone would claim special credit for the idea of men being invited to visit their own shop, but, like many other useful innovations when accomplished, it only seems just plain common sense.

Drawing Office versus Machine Shop—Discussion

By William H. Kellogg

Referring to the article with the above title by F. P. Terry on page 867, Vol. 58, of the *American Machinist*, it is apparent from what he says that there must be some friction between the management of the two departments in question. Inasmuch as the existence of such a condition suggests the searching out of its cause with a view to finding a remedy, the writer would mention three fundamental causes that usually underlie troubles of that kind.

The first cause may be traced to the fact that the concern has in charge no competent engineer, with experience as a shop man as well as being a fully trained technical man. This condition would lead up to the second cause; namely, that there is a tendency to employ draftsmen who are not qualified to do the work, due to the fact that drafting work is very often underestimated. This condition, in turn, leads to the third cause; that the shop is left largely to its own resources. Inasmuch as the shop is not equipped with drawing material, instruments, files and the like, nor with men skilled in designing and checking, it cannot very well be expected to remedy the deficiencies of the drafting room. Much less could it make designs, check drawings or prepare stock lists.

If a fully qualified engineer were in charge of the shop and drafting room, having equal authority over heads of both departments, differences could be referred to him and disputes would be readily settled. Such a man would employ only competent draftsmen, as he would realize that every hour well spent in drafting work would mean a saving of many hours and much material in the machine shop.

There is a growing tendency among the best manufacturers to eliminate waste by beginning the job right with the best trained help, and the right place to begin is in the drafting room.

Manufacturing the Slocomb Center Drill

SPECIAL CORRESPONDENCE

Operations of manufacture largely automatic—Much special machinery used—Relief is made before fluting —Grinding and sharpening the drills

WHEN the combination center drill and countersink first made its appearance on the market something over a quarter of a century ago the machinists and toolmakers of that day accepted it grudgingly and with many reservations, mental and otherwise. A tool that would do in one operation what had heretofore been done very comfortably in two was not altogether welcome; and, besides, it was an apprentice boy's job to drill centers, anyway.

It was not long, however, before the little tool had demonstrated its right to a place in every tool crib and



FIG. 1—BATTERY OF AUTOMATIC TURNING MACHINES

kit and, as the trend of the times became more and more in the direction of intensive production, the saving effected by combining the two simple operations, insignificant though they were of themselves, assumed greater importance until now the manufacture of combination center drills has become a separate industry, requiring whole departments, or even shops, each with special machinery and skilled operatives devoted to its production.

Without going into exhaustive research to determine to whom should be given credit for priority of invention, it may be said that the J. T. Slocomb Co. was the first to make the tool a commercial possibility, and the methods and machinery here described are in use in the plant of the above named company in Providence, R. I.

Fig. 1 shows a battery of the turning machines that form the ends of the drills, not only turning the stock down to the diameter of the drill on both ends simultaneously, but forming the "relief" on the lips of the countersink at the same time.

The round bar stock is first cut up into pieces of approximately the overall length of the finished tool and without further preparation these pieces are fed into the hoppers of the machines, each machine being set for a certain size of drill. The machines shown in Fig. 1 are all alike except in the matter of size, and each machine is capable of producing a range of drill sizes.

Fig. 2 shows a single machine, being the end one of the row shown in the preceding illustration. The "hopper" is the inclined part about midway of the machine and directly behind the splash guard. It is open along the upper side and confines the pieces only at the ends, with an inwardly projecting strip about half an inch wide to cover just enough of the blanks at the ends to prevent any one blank from being forced out of line by the weight of those above.

The blanks roll down the incline by gravity and at each cycle of the machine the lowest blank in the stack is transferred to the chuck, or vise, at the center of the machine, where it is held stationary and in line with the revolving tools until the turning is completed.

The tools are of the ordinary box type, familiar to

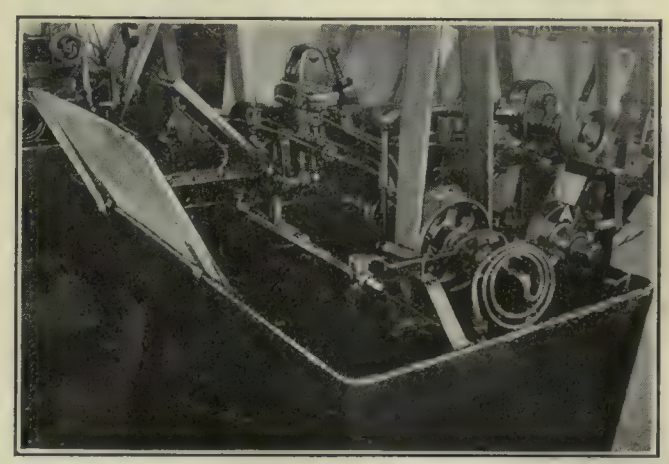


FIG. 2—ONE OF THE TURNING MACHINES

all screw machine operators. Both are right hand, and they are revolved in opposite directions by means of open and crossed belts so that the torsional effect of the cut is practically balanced and no undue strain is imposed upon the holding fixture. The tools are fed forward by cams, and until they have reached nearly the limit of their movement there is no unusual action.

The cams transmit the feeding movement to the spindles through spring suspended levers in such manner that it may be interrupted or modified by other cams without interfering with the steady advance of the feeding cams; the variation being absorbed by the springs. The cams, one of which may be seen at *A* in Fig. 2, are mounted upon a worm-driven shaft at the

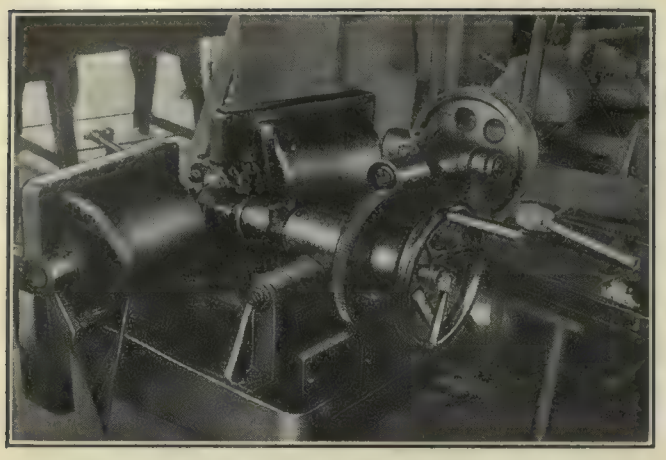


FIG. 3—MILLING THE FLUTES

back of the machine. They have a single uniform rise with an abrupt drop to the starting point, a complete revolution of the cam shaft corresponding to one cycle of the machine. The lever and yoke by means of which the movement is transmitted to the spindle may also be seen in this picture, as well as the spring suspension feature at the end of the lever.

Upon the inner side of each driving pulley is a two-lobed face cam, the shape of which corresponds to the relief upon the lips of the countersink. As the spindles approach the end of the feeding movement these cams contact with fixed rollers, mounted upon the frame of the machine, so that for the remaining distance of their advance the spindles take up a sharp vibratory movement endwise, the contour of the revolving cams following the stationary rollers under the impulse of the springs that form the fulcrums of the levers.

One Drill at Each Cycle

The result of this movement is that the machine turns out at each cycle a double end combination center drill and countersink that is completely formed as to diameter of drill, angle of the lips of the countersink, and relief; but as yet without flutes. The machines are entirely automatic, the operator having only to see that the hoppers are kept supplied with blanks and to inspect the product.

Not the least ingenious feature of these machines is the means of feeding oil to the tools. The oil passes through the hollow spindles which not only have a considerable endwise movement but, toward the end of each cycle, take up a rapid vibrating or reciprocating motion that would prove destructive to any ordinary means of connection. To absorb the vibration the spiral coil of copper tubing to be seen at the end of the machine is used to convey the oil to the spindles, the natural spring of the coil relieving the outer connection of any shock due to the movement.

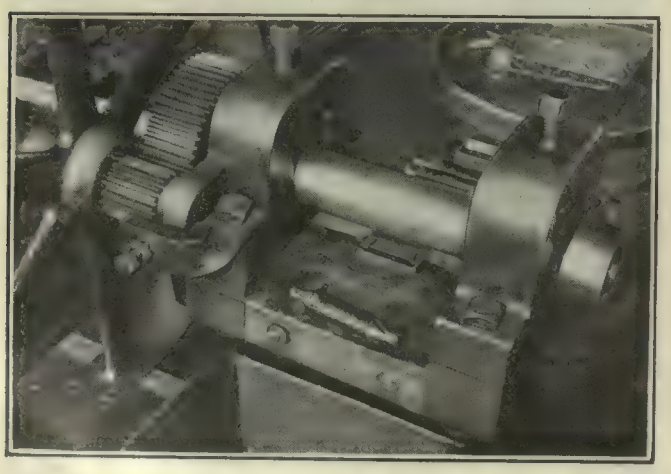


FIG. 4—STAMPING SIZE AND TRADE-MARK

After the turning operation the drills go to the special fluting machines, one of which may be seen in Fig. 3, where both flutes are cut at once. In this machine there are two spindles, each carrying a small fluting cutter, driven in opposite directions by open and crossed belts.

The heads carrying the cutter spindles are set at an angle complementary to the helix angle of the flutes and so located with reference to each other than one cutter is above and the other below the centerline of the work spindle. Once set to the correct angle and at the correct relative height for a given size of drill, the cutters have no further movement other than that of rotation. The drills to be fluted are held in a draw-in chuck at the end of the work spindle and as the latter advances endwise the drill passes between the cutters with a movement corresponding to the helix of the flutes.

The Work Spindle

The work spindle is in two parts, the outer member being a sleeve capable of rotation within the supporting bearing but having no endwise movement. It is rotated by the worm wheel and worm to feed the work to the cut. The inner member turns in a stationary cut of coarse pitch, corresponding in fact to the helix angle of the flutes, and is turned by the handwheel. Means

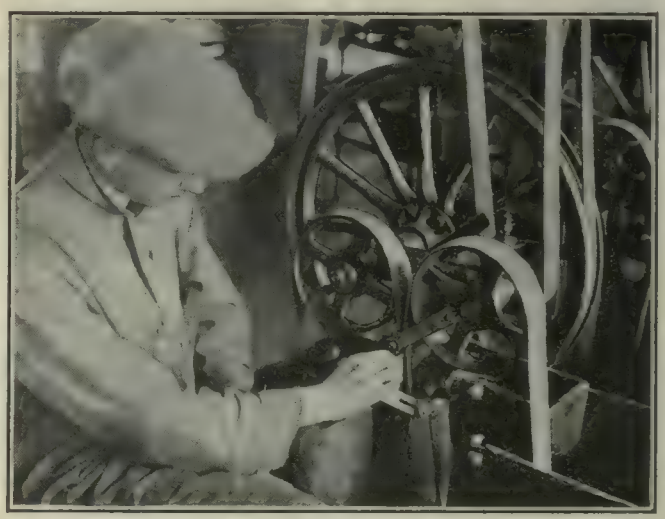


FIG. 5—POLISHING THE DRILLS

are provided for locking the inner and outer members together for the purpose of applying the power feed.

The bracket supporting the work spindle is mounted upon trunnions so that when the work is withdrawn from the cutters the spindle may be tilted to an angle of 45 or more degrees for convenience in unloading and reloading.

Because of the fact that the countersink portion of the drill is already relieved it is essential that the work be exactly placed in the chuck with reference to the threads that cause the advance of the spindle. In order to do this with certainty the operator is provided with a setting dog which he attaches to a drill in proper relation to the relief, and when he sets the drill in the

chuck the tail of the dog bears against a locating pin in the face of the spindle. As soon as the chuck is tightened the dog is removed.

The operator then swings the spindle to a horizontal position where it is held by a latch, turns the handwheel until the cutters come into action and locks in the feed. While the cutters are at work he has time to reset the dog on the next piece.

Each machine is manually operated and requires the sole attention of the operator. The operation is, however, quite rapid, and each fluting machine can take care of the product of two or more of the turning machines.

Following the fluting operation the drills are stamped with the maker's trademark and the size. The stamping machine is shown in Fig. 4. Contrary to usual practice, the stamp is flat and is set in the bed of the machine while the work passes between it and a plain roll. This is possible only with a narrow stamp, but wherever it can be used it has the advantage that the work may be fed in as rapidly as the operator can handle it, and no effort or mechanism is necessary to synchronize the feeding with the revolutions of the roll.

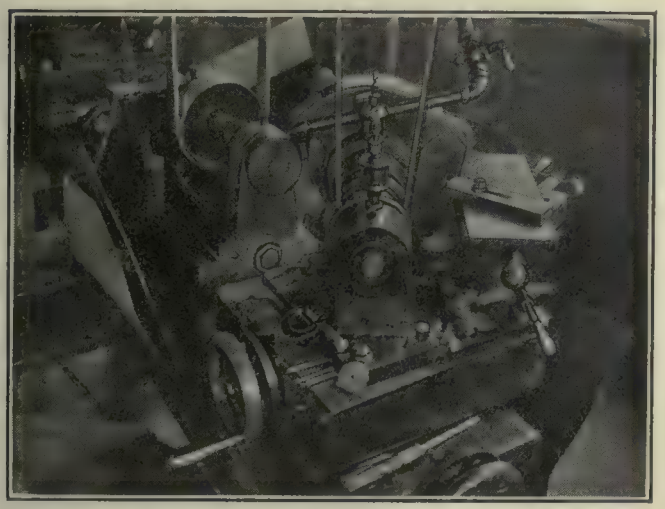


FIG. 6—GRINDING WITH A SET WHEEL

Tempering and Polishing

The drills are heated for hardening in an electric furnace and tempered in oil baths in the usual manner, after which they go through a sand blasting operation to remove any scale and discoloration from the hardening, and from thence they go to the polishing machine shown in Fig. 5, which device consists primarily of two abrasive belts running in the same direction but at different speeds. The work rests upon a stationary steel bar set between the belts at a slight angle or inclination to the direction of their line of travel.

The operator has only to lay a drill on the projecting end of the rest and push it between the belts, when it will take up a slowly rotating movement and at the same time advance endwise exactly as if impelled by a screw. There is no screw, however. The movement is caused by the differential speed of the belts, and the rate of advance may be altered by merely changing the angle of inclination of the rest. Strange to say, the drills travel *up-hill*, both as regards gravity and the direction in which the belts are moving.

The next operation is grinding the cutting lips of the countersink and the diameter of the drill, done on the machine shown in Fig. 6. A formed "set" wheel is used (that is, it has no traverse). The wheel head stands at an angle corresponding to that of the cutting lips of the countersink and about half of the wheel width is beveled off on a line that is nearly parallel with the centerline of the work. That portion of the wheel's periphery that remains parallel with its own centerline grinds the lips while the beveled portion grinds the diameter of the drill.

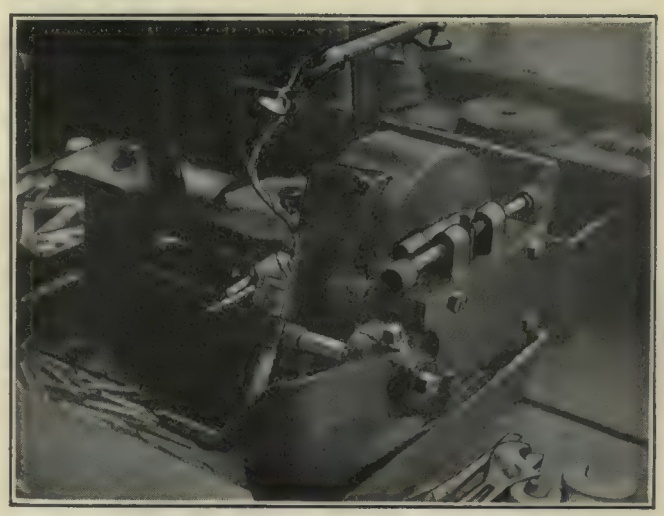


FIG. 7—SHARPENING THE DRILL POINTS

Drill Portion Tapered

The reason that the beveled portion of the wheel face is not made exactly parallel with the centerline of the work is because it is desired to make the drill portion of the tool slightly tapered, with the largest diameter at the point, for the sake of clearance. The wheel dressing slide-rest is permanently mounted at the back of the wheel, where it may be seen in the picture.

Redressing the wheel is a matter of but a few seconds, as it is necessary only to pass the diamond over the parallel portion of the periphery by turning the corresponding screw of the compound slide-rest, and over the beveled portion by turning the other screw. The diamond is always set.

As so far described, the reader is left in doubt as to how such a wheel can grind the necessary relief on the lips of the reamer. The answer is that the work spindle has an endwise vibratory movement, controlled by a cam, much like that of the corresponding parts of the turning machine except that it is in action all the time, and the rate of rotation is much slower. It is essential that the operator locate each piece in the chuck with exact reference to the flutes, and this is done by means of a gage that determines the position not only circumferentially but also the distance the tool projects from the chuck.

The only movement of the wheel head is in a direction at right angles to the centerline of the work spindle. This movement is obtained by the handwheel in front of the machine or by power feed. Ratchet feeds and positive sizing stops enable the operator to maintain accurate sizes.

The final machining operation is grinding the drill points, performed on the machine shown in Fig. 7, which works upon the same principle as the well-known forms of drill grinders. After passing through this operation the drills are completed and ready for the final inspection.

Inspection Methods in a Steel-Ball Factory

By Major Johnstone-Taylor
Shrewsbury, England

IN THE inspection of steel balls as used in ball bearings a good deal depends upon visual inspection and, in consequence, upon the skill of the viewers. Ample light and suitable surroundings are the first essentials. In the works of Ransome & Marles, a British concern whose business is the manufacture of small and moderate sized ball bearings of the highest class, the inspection is carried out by girls in a well lighted room.

The girls are seated at a table and each is provided with a light, shallow, rectangular tray, the surface of which is reflected in the undersides of the polished balls, rendering any defects in them visible to a trained eye. A momentary glance at the row of balls suffices, and they are then rolled about by motion of the tray so as to present fresh parts of their surfaces to inspection. When the whole of the surface has been examined and any defective balls picked out, the remaining balls are tipped into a box for gaging.

One of the defects which is detected by visual inspection is soft spots. They show up in a kind of brown cloudiness on the surface of the ball, but this marking is observable by the trained eye only. The softness is only relative to the glass-hard surface of the rest of the ball, but under the microscope file marks are visible upon these spots. The soft spots are generally seen to be minutely pitted and to lack the high polish of the harder part. In order to ensure the absolute cleanliness essential to proper inspection of steel balls, the viewers wear soft chamois leather gloves and also have cloths of similar material on which to place the balls, since any trace of grease makes examination impossible.

Obtaining Accuracy in Gaging

The average number of balls that can be inspected by a trained viewer in a day of eight hours is about 5,000, the average rejections per 1,000 balls in the works named being 12.3 for soft spots, 4.0 for cracks and 12.3 for serious defects. After visual inspection the balls go to the gaging room, which is kept at constant temperature. Every individual ball is passed through a ring gage, the makers guaranteeing accuracy within 0.0001 in. of standard size. The ring gage is set by a standard ball of known accuracy and the balls pushed through it, the viewer knowing by the sense of touch whether it is within the permissible limit of size. Those thrown out are again tested on a machine giving a magnified reading.

The methods of manufacture have been brought to such a high state of perfection that the actual variation is very much less than the guaranteed 0.0001 in. The balls are graded into a total of eight sizes intermediate between the limiting permissible sizes. The difference in size, therefore, between the balls of two successive groups is only 0.00002 in. and all the balls in one bearing are taken from the same group. Almost dead accuracy is therefore obtainable.

The grading is effected by the viewer placing all acceptable balls in one or other of three different heaps, according to the degree of ease with which they will pass the ring gage. There are thus three heaps, oversize, standard and undersize. The oversize and undersize are then passed again through ring gages, set to fractionally higher or lower sizes than standard. By a repetition of this process all of the balls are sorted into groups in sizes varying by about 0.00002 in., or one fifty-thousandth of one inch.

How Labor Can Be Made More Productive —Discussion

By Herbert D. Harper

The interesting report by Harold C. Smith of the educational activities of the National Metal Trades Association in Vol. 58, page 793 of the *American Machinist* contains a great amount of interesting information to those interested in training boys for industry.

His statements that less than 300 employers are training apprentices and that during the depression in business training activities were halted, would indicate that there is something radically wrong with industrial training in factories. It would seem that modern conditions have made the old system of apprenticeship impossible, and that some other institution must step in and train boys if the country is to have a supply of skilled workmen at all times. The youths of today will not consent to be bound out under contract for little or no pay as they did a century ago, and they rebel when it is attempted. In this they are right, for apprenticeship systems have not been efficient, and some have been more or less like slavery, or at least paternal.

Then, how many boys of the 700,000 mentioned by Mr. Smith had an opportunity to learn a trade? Can all the apprenticeship systems take care of them? For if any boy leaving grammar school who wanted to learn a trade did not have an opportunity to train, then industry has fallen down on the job and some other means must be provided. This training must not be halted whenever there happens to be a business depression, but should be continuous, so that every boy may have his chance to learn a trade. It must take the boy after his common school education is complete, and make him into a wage earner.

History shows us that when an institution becomes incapable of performing the functions for which it was created, society gathers up the neglected functions and assigns them to the public school, the one institution entirely under its control.

The only institution that has all the requirements for training boys in trade work is the public school, and where good trade schools are in operation they are a success. These schools give an industrial training that is more than an appendage to a liberal education, for the shops are real shops with conditions closely approximating those of industry. The school gives a more democratic form of training than the apprenticeship system, for it gives every boy a chance, with the least expenditure of time. The result will be that the school will supplant the apprenticeship system. There will be some confusion and maladjustments during the transition period, but with the co-operation of employers this disturbance can be made slight.

There are individuals who for personal profit would restrict the number of boys learning trades, and would keep the supply less than the demand. The school by proper vocational guidance would overcome this economic farce and see that enough boys are ready at all times to supply the demands of industry.

It Pays to Replace—

How a Shop Saved by Replacing Old Shop Equipment with New Equipment

These articles won honorable mention

By J. Howard Studholme
Master Mechanic, Thos. Wolstenholme Sons & Co., Inc., Philadelphia, Pa.

SOME time ago, I took charge of a repair shop that had been run in a slipshod manner for a number of years. The machinery throughout the plant was all patched up to keep it going and the store room contained nothing but junk.

The gears needed for repairs were all cast, and anyone who tries to run a series of such gears in train at high speed, knows the result of their use.

Among the equipment was a second-hand gear grinding machine, made about Noah's time—one of the kind where the gear was indexed by a pawl dropped between the teeth and the grinding wheel was dressed to approximately the shape of the teeth. This machine just about cleaned the sand off the teeth without making them uniform.

A great many studs of various kinds were used and, as they were all made on engine lathes from samples, they were not interchangeable.

Among other repair parts we had to make, were rollers with spiral grooves in them. These rollers we fluted on an old milling machine without a dividing head, by means of a plate having a slot on an angle to guide the work carrier by the movement of the table. The result was that the spirals were not correct and the rollers were continually breaking when in use.

As the shop had been run in this way for a number of years, it was difficult for me to make changes without encountering opposition. When I asked for new machines, the management wanted to know why the shop had run so many years without such a request from other foremen.

I told them they were losing money through loss of production in the mills by having machinery shut down waiting for replacements, and tried to convince them that the repair shop was the heart of the plant. After listening to the suggestions I made, they agreed to buy a Jones & Lamson flat-turret lathe.

This machine now takes care of all the stud work, relieving the other lathes. The work is all interchangeable, which is a great improvement over that made under the old method.

The president of the company saw the machine in operation and asked me how long it had been on the market. When I told him, he said they ought to have had one years ago.

The success of this machine established the confidence of the management in my judgment and resulted in the purchase of the following machines at various times:

1 24-in.x16-ft. Lodge & Shipley engine lathe.
1 16-in.x8-ft. Hendey engine lathe.
1 20-in. Cincinnati back-geared crank shaper.
1 No. 2½ Rockford milling machine with vertical milling and slotting attachments.
1 23-in. Snyder ball-bearing drilling machine.
1 4-ft. Carlton radial drilling machine.
1 14-in.x10-ft. Lodge & Shipley selective-head engine lathe.
1 30x30-in.x10-ft. double-head Whitcomb planer.
1 No. 0 Avey sensitive drilling machine.
1 No. B-2T Grand Rapids twist-drill grinding machine
1 No. 3 Oakley universal toolroom grinding machine.
1 No. 1 Diamond wet tool grinding machine.
1 Motor-driven United States tool grinding machine.
1 No. 4 Marvel high-speed hacksaw.
1 36-in. Brown & Sharpe gear cutting machine.

After retaining the best of the remaining tools, the shop is fairly up-to-date.

What is the result? Outside purchases are not necessary to keep the plant in operation and the storeroom is filled with interchangeable repair parts. I can now take care of all emergencies, make all cut gears and do not have to depend on the outside for anything. Besides all this, the plant, through fewer breakdowns, is able to produce more.

In addition to the regular work, the repair shop is now keeping in condition the following equipment belonging either to the company or some of its officials:

Automobiles, yacht engines, guns, moving picture machines and radio equipment. So, you see, it "Pays to Replace."

By John B. Walsh
Foreman Dept. G
Mergenthaler Linotype Co., Brooklyn, N. Y.

FOR a number of years the distribution screws on one model of linotype machines were finished by filing and polishing in a lathe.

These screws are 1⅛ in. in diameter and about 40 in. in length. While the thread is 2 per inch, the lands are about three times the width of the grooves, which leaves more surface to polish than that on a standard screw of the same pitch.

The finish on these screws must be good as they are to be nickel-plated and are exposed for the full width of the machine. Filing and polishing the screws took from 12 to 15 minutes each to do a good job and we had our own troubles to keep a man at such monotonous work.

About six years ago, I experimented on grinding the outside of the screws in the same lathe in which they were polished. An endless belt coated with abrasive was used, power being supplied by an electric motor held in the toolpost. While this method was an im-

provement over hand polishing, it was the best I could do without a cylindrical grinding machine, but the reduction in time was sufficient to have some of the screws sent to the grinding department, where they were finished on cylindrical grinding machines of the standard type. Until about three months ago all the screws were finished in the grinding department in 5 minutes each, as against 15 minutes in the lathe.

The company then bought a Heim centerless grinding machine and on this machine the screws are now finished in good shape at the rate of 63 per hour. The limits on the diameter are, +0.000, —0.001 inch.

As can be seen, the increase in production over the old method is nearly 1,600 per cent, while over the method of grinding on a machine using centers, it is more than 300 per cent. As the work is paid for by the piece and the prices have been adjusted accordingly, replacement showed a large profit.

By Wilson D. Mathewson

Gang Foreman, Brown-Lipe-Chapin plant, General Motors Co., Syracuse, N. Y.

WE MANUFACTURE automobile differentials, including ring gears and pinions.

Up to about seven years ago the ring gears and cases were machined on turret machines, of standard type. Since that time, we have installed twenty-two Bullard mult-au-matics of which eight of the first lot have been replaced by a later model.

We also make a little drive gear about 8¼ in. in diameter that we run in very large quantities. Our schedule calls for 28,000 for this month. Now if these gears were to be run on the old machine we used to have, it would cost for the first operation alone $0.0675 each. The cost on the mult-au-matic was $0.0100, which resulted in a saving of $0.0575 in this one operation. The saving on all operations together with the saving in overhead was $0.180 per piece, so that on 28,000 pieces, $5,040 represents the total saving.

We also make steel cases 12.375 in. in diameter, on which the cost of the first three operations was $0.5590, when done on the old machines.

The cost on the mult-au-matic was $0.1710, a saving of $0.5590 for the first three operations. The saving on all operations, including that of overhead, was about $1.75 per piece and, as the cases were made in lots of 1,000 a total saving of $1,750 was made.

As one man on the mult-au-matic can produce as much as five men on machines of older types, it goes to show that a saving of both men and floor space, by the use of improved machines, means a big saving in these times of high cost of labor and buildings.

By T. O. Giller

Gray & Davis, Inc., Cambridge, Mass.

UP TO eight months ago, we were turning armature shafts for starting motors and generators on ordinary lathes turning all bearings to grinding size, necking shoulders and chamfering ends. The price varied from $11 to $17 per hundred pieces, according to length, and three or four men were kept busy on this work nearly all the time.

By investing in a Reed-Practice rapid production lathe, we cut the cost of turning these shafts 50 per cent, and outside of the turning cost, the use of this machine has saved in both man power and floor space.

Book Reviews

Details of Typical Mechanisms. By C. M. Linley. Volume 31 of the Broadway Engineering Handbooks. Clothboard covers, 4¾x7½ in., 104 pages, 85 illustrations. Published by Scott, Greenwood & Son, London, England; distributed in America by the D. Van Nostrand Co., 8 Warren St., New York, N. Y. Price, $2 postpaid.

This little book is unique in some respects, partly because it aims to present the unique side and to explain the least understood points about the more common mechanisms. As the author himself states, the work is not intended to cover the whole subject of mechanical movements and mechanisms. Consequently, many forms of mechanical devices are not dealt with. Despite this fact, there is considerable valuable and interesting material for those interested in mechanism.

What the book does is to explain briefly the important features that should be known about the design and application of those mechanisms that are commonly employed in almost all classes of machinery. Rather than describe a mechanism as a whole, the author points out the difficulties that are likely to arise in connection with its use. Thus, the book is not primarily a textbook, but is best suited to the designer and the practical man to aid them in planning and operating machinery.

Naturally the treatment of each subject is brief, because of the size of the book, but the important points are covered. The material is divided into eleven chapters, which are well subdivided so as to make reference easy. The subjects treated are ratchets, clutches, variable-speed gears, toggle and universal joints, screws, brakes, reversing mechanisms, belt and chain drives, worm gears, stops and releasing mechanisms, and ball bearings.

A designer or mechanic would probably find the material of interest because of the unique phases presented. For example, under the subject of gearing are presented several arrangements of frictional and hydraulic gearing for speed variation, such as found in commercial mechanisms.

How to Think in Business. By Matthew Thompson McClure, Professor of Philosophy in the University of Illinois. One hundred seventy pages, 5x8 in. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y. Price $2.

Any business man, busy or not, can find time to read this little book, and in doing so will see that his way of thinking has been a very important factor in his success. There will be few who do not find that Mr. McClure's explanation of how to think adds an improvement here and there that in the aggregate will be worth a great deal.

For the student, also, the book is admirably adapted, wherever emphasis is being placed upon directive and applied thinking. It need not interfere with the study of the theory of thinking.

The illustrative material has been drawn almost exclusively from the field of practical business experience, and the presentation is in a form which makes its suggestions readily and easily accessible.

Another good book for the business library.



Where Machine Tools Are Made

The Heald Machine Company

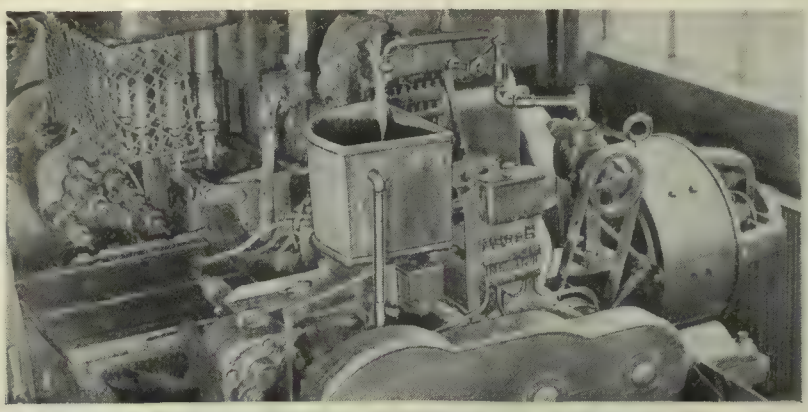
Established 1830

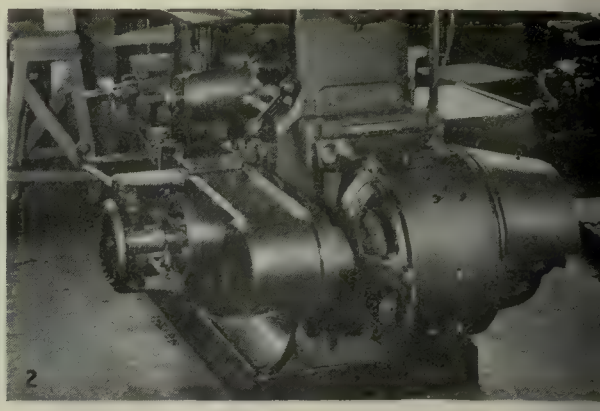
General View of Assembly Floor

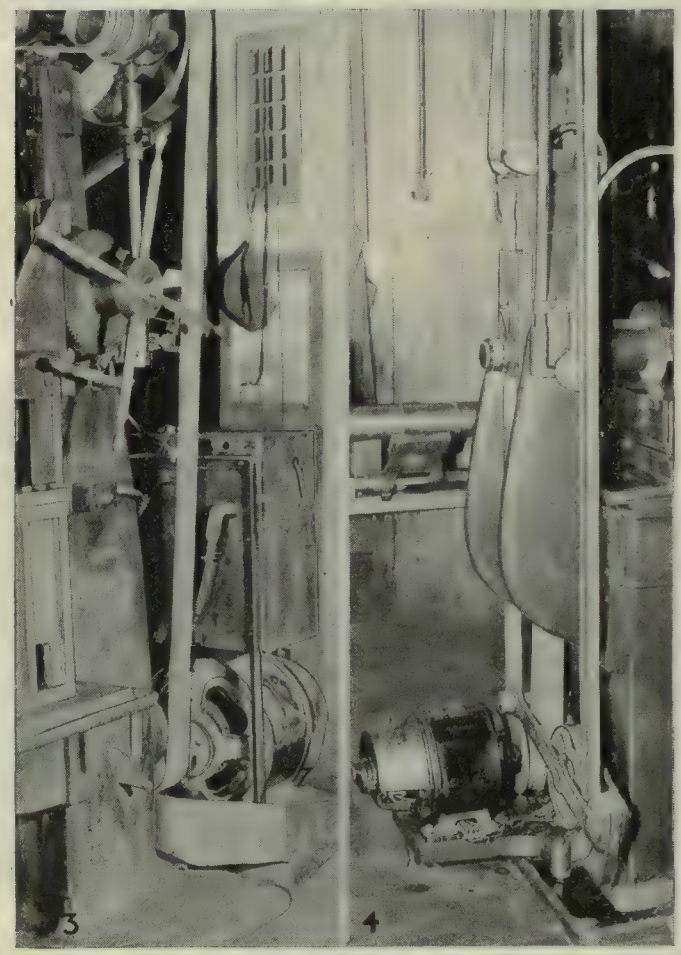


General View of Machine Shop





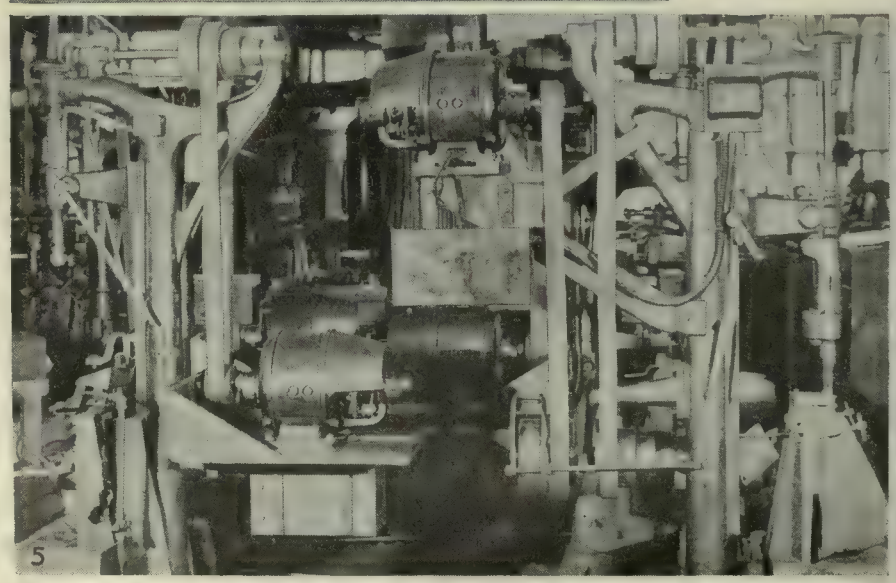


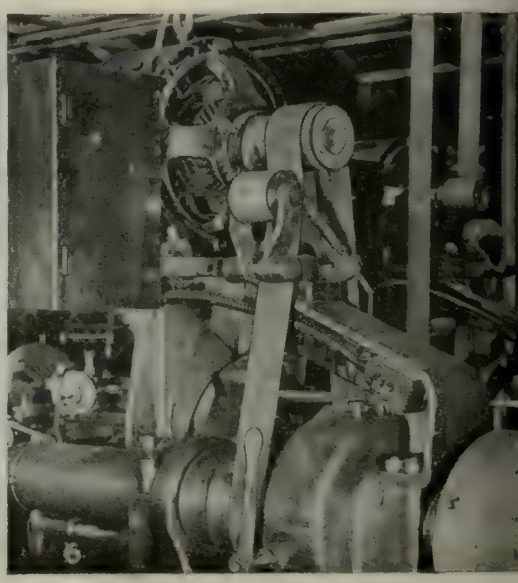


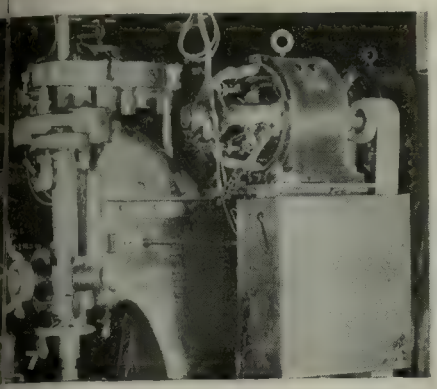
Changing 2,700 Machine Tools

THE new plant of the Ford Motor Company of Canada, at Ford, Ontario, Can., has been planned for individual motor drive. In order to utilize as much of the present equipment as seemed advisable. motor drives have been installed on the machines before moving them to the new plant. This has required much ingenuity on the part of the engineers and the results are of unusual interest.

In some cases the cost of the motor drive attachment has been very high, owing to the lack of consideration of motors when the machine was designed. It is the belief of the engineers that the lowered cost of a building without provisions for line and countershafts will go a long way toward paying for the extra cost of motor driven machines. Current is generated in their own power plant at 4,600 volts a.c. and transferred to 230 volts d.c. for use in the motors. The motors range from ¼ to 75 hp., the average being from 3 to 5 hp., these being built by the Canadian Westinghouse Co. at its plant in Hamilton.











to Individual Motor Drive

Fig. 1—Three way, 25 spindle, cylinder tapping machine direct driven with 10 hp. reversing motor. Clutches replaced with full automatic electrical control. Operation highly satisfactory and a saving of over 25 per cent in tap breakage.

Fig. 2—Tool room shapers. Cone replaced with clutch and sprocket using chain drive to variable speed motor, 400 to 1600 r.p.m.

Fig. 3—Special 15 spindle drill for bolt holes in cylinder heads. Only one speed required.

Fig. 4—Surface grinder. Large pulley is at top of machine.

Fig. 5—Two types of brackets for 20 in. drills. One arranged for variety of speeds.

Fig. 6—Screw machine motor bracket held by bearing cap bolts.

Fig. 7—Two heavy duty drills for drilling drop forged transmission parts. Motor bracket made of boiler plate and angles.

Fig. 8—Cone drive miller using constant speed motors on production work and variable speed motors 450 to 1800 r.p.m. when machines are for general work.

Fig. 9—Heavy duty drill press. Motor support made by inserting boiler plate between sections of machine frame.

Fig. 10—Direct drive for lathe. Lever operates clutch and brake.

Fig. 11—Chain drive on manufacturing miller. Motor plate built up from structural steel shapes.

Fig. 12—Four spindle drill.

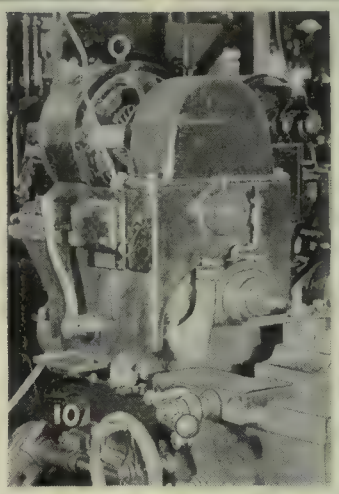
Fig. 13—Radial drill on die work. Motor plate mounted over change gear box.

Fig. 14—Double end centering and drilling machines arranged in this way.

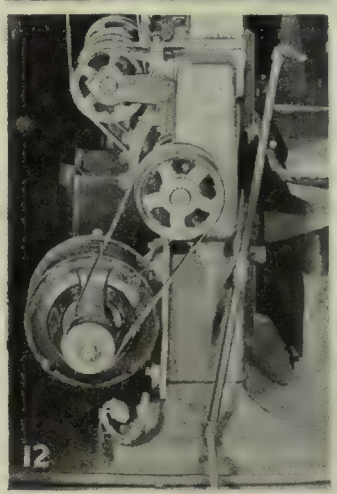
Fig. 15—Special crank shaft lathe. Motor plate carried on long bars which take the place of bearing cap bolts.

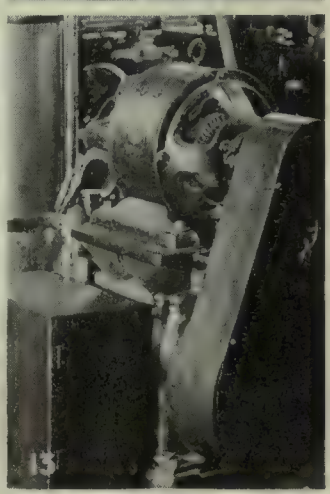
Fig. 16—Power press for forcing bevel gear on axle shafts.

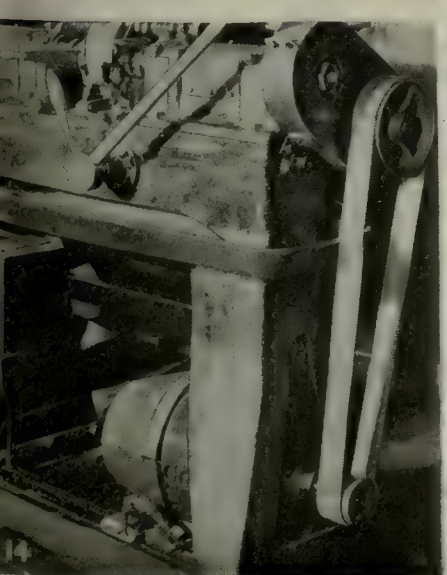
Fig. 17—Two types of drives on large drawing presses.



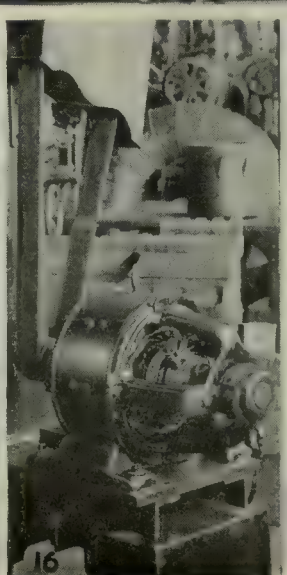


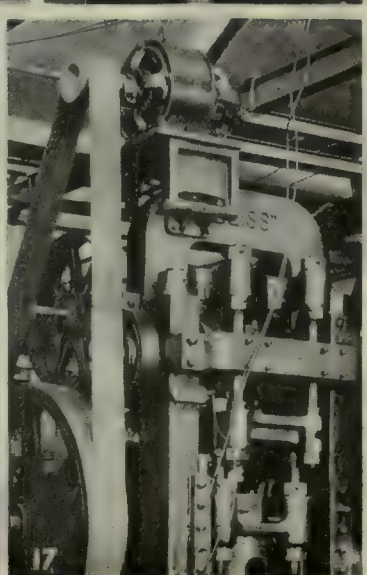


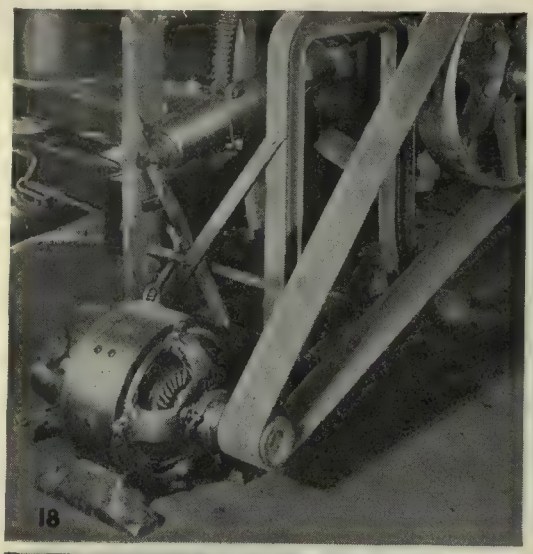




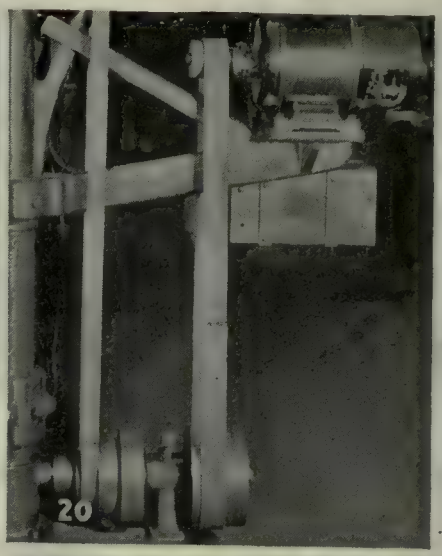




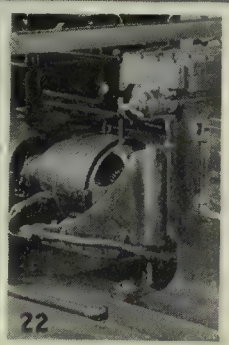


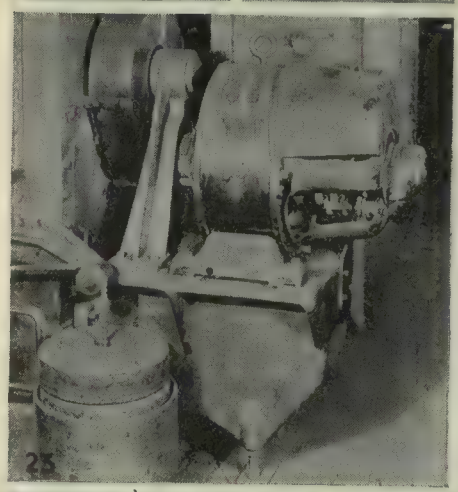












Changing 2,700 Machine Tools to Individual Motor Drive

(Continued)

Fig. 18—Tumbling barrel drive.

Fig. 19—Large surface grinders on die work.

Fig. 20—Drill press with tapping head. This arrangement of motor drive used where variety of speeds is required.

Fig. 21—Rear view of screw shaver, roughing heads of valves.

Fig. 22—Direct driven milling machines milling square on drive shaft.

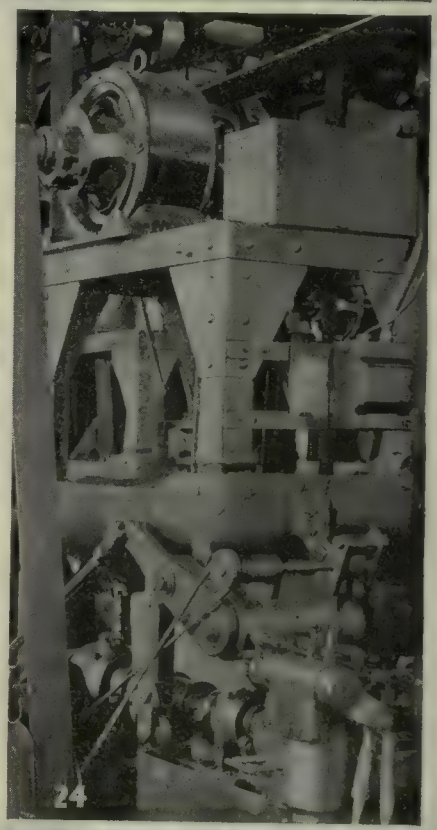
Fig. 23—Rear view showing 15 hp. motor on 4 way 45 spindle drill for cylinders.

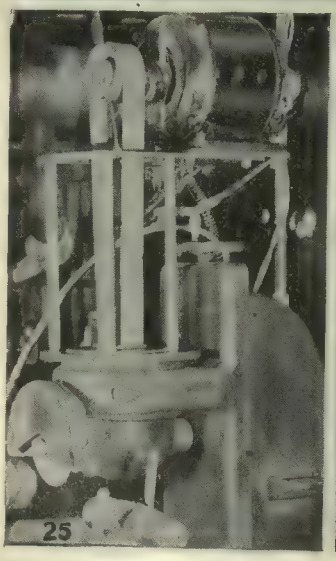
Fig. 24—Double spindle automatic threading machines. Motor bracket mounted on top of hopper.

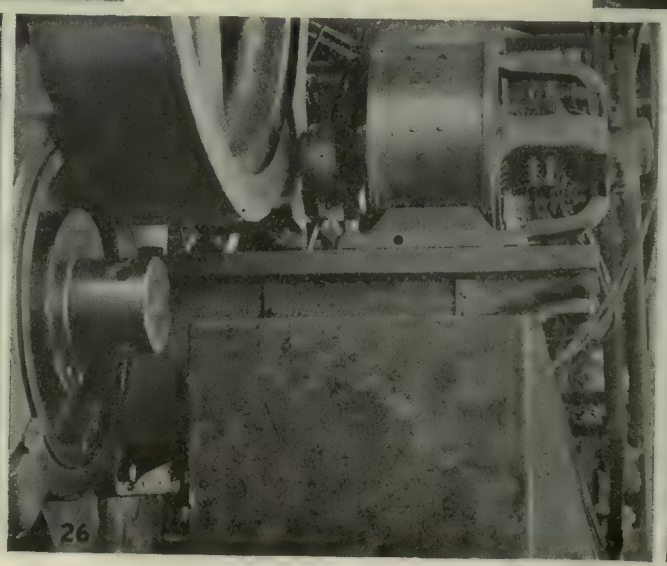
Fig. 25—Hob grinder with motor mounted so that it will swing with head to any angle.

Fig. 26—Large press with toggle joint action. Tight and loose pulleys removed and fly wheel cut for motor gear; 90 per cent of the punch presses were equipped by gearing into fly wheel.

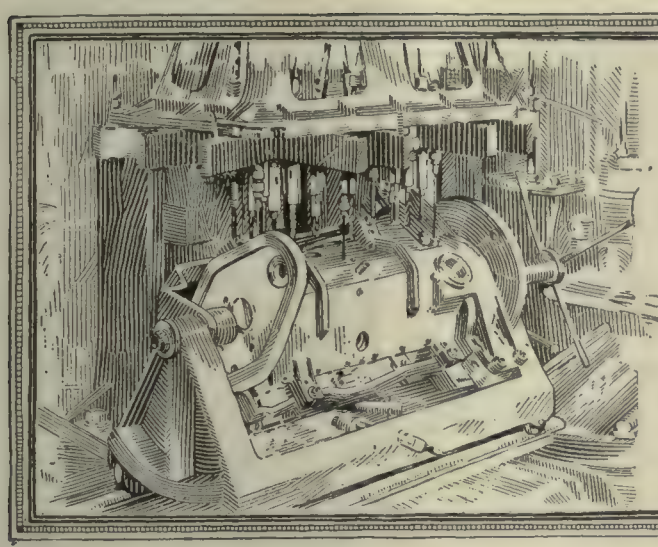
Fig. 27—Very satisfactory drive for tool room lathes.











Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Inspection and indicating gages continued—Miscellaneous gaging problems—Taper gage with dial—Indicating keyway gages—Fixture for testing backlash of gears

THERE are a number of problems which require solution when designing gages, and many of them cannot properly be classified except under a "miscellaneous" heading. Occasionally gages which may be a combination of inspection and work gages are required, and in many instances the same type of gage is used by the workman when producing the work that is later used by the inspector in the final inspection. We have previously mentioned a few of the important points which enter into the design of gages for tapered work, both external and internal. The importance of the diameter at the large end of the taper has been emphasized, and we believe that the tool engineer realizes its importance.

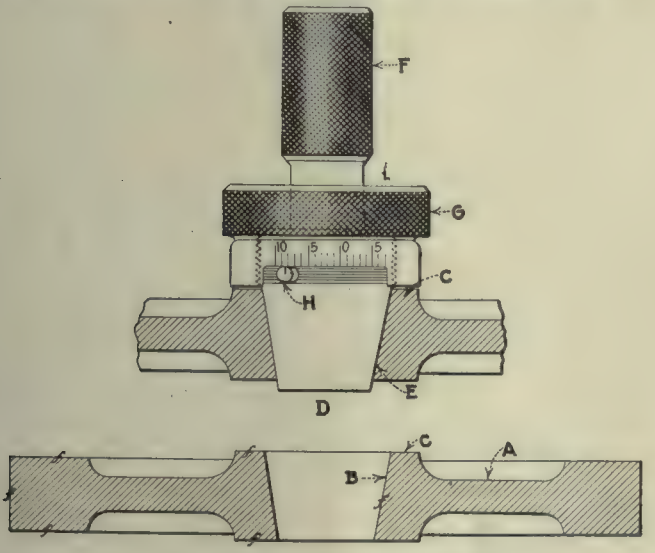


FIG. 557—TAPER GAGE WITH DIAL

In the example shown in Fig. 557 the work *A* is a casting which has been machined on the surfaces marked *f*. The tapered portion *B* must be so made that it bears a close relation to the finished boss *C*, in order that the work may draw back on to a tapered shaft and at the same time not strike against the shoulder on the shaft. In order to make sure that the diameter at the large end of the taper is not too great and at the same time to determine whether it is within the limits of accuracy desired, a special gage like that shown at *D* may be used to advantage. In this case it must be remembered that the angularity of the taper is not in question, as this feature should have been tested previously.

The gage shown at *D* consists of a tapered plug *E* which enters the hole as shown. The plug is made with a knurled handle *F* and a knurled collar *G* which is threaded on to the body. The plug *E* has in it an inserted plug *H* as shown, and on this small plug a line is scribed. The threaded collar is cut away and graduated with a series of lines and numbers in order to give the inspector a chance to see how much variation there is in the relation of the taper to the boss. In using this instrument the collar *G* is loosened and the plug

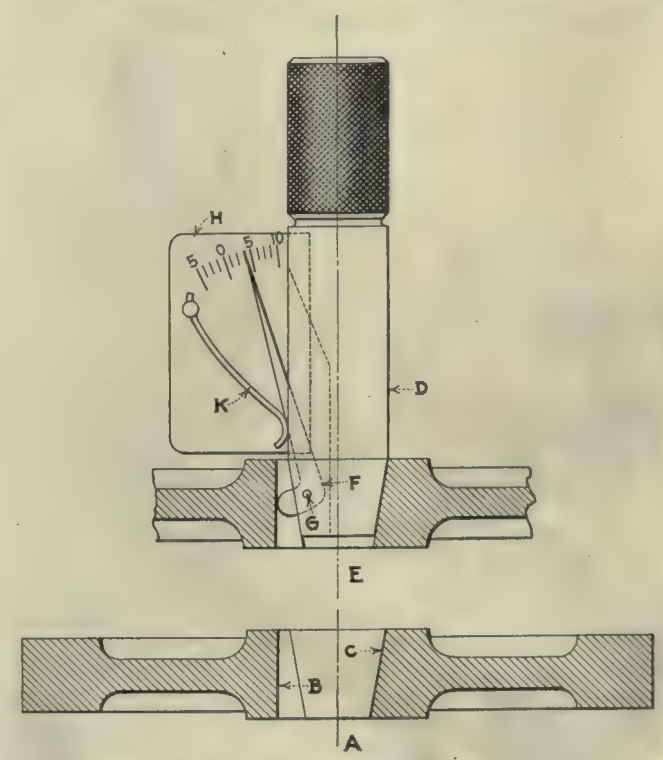


FIG. 558—INDICATING GAGE FOR KEYWAY

For the authors' forthcoming book. All rights reserved.

inserted in the hole, after which the inspector turns the graduated collar until it makes contact against the surface *C*. At this time a reference to the position of the graduations with respect to the line on the plug *H* will immediately show whether the hole and boss are in the correct position or not. If incorrect, the amount of variation can be easily noted by the difference in the position above or below the zero mark.

The depth of a keyway is occasionally an important matter, and it is not always easy to gage it by ordinary methods. This is particularly the case when the keyway is straight and located in a tapered hole. It is, of course, always necessary to make sure that the taper itself has been previously gaged before attempting to use the keyway gage in the hole, as variations

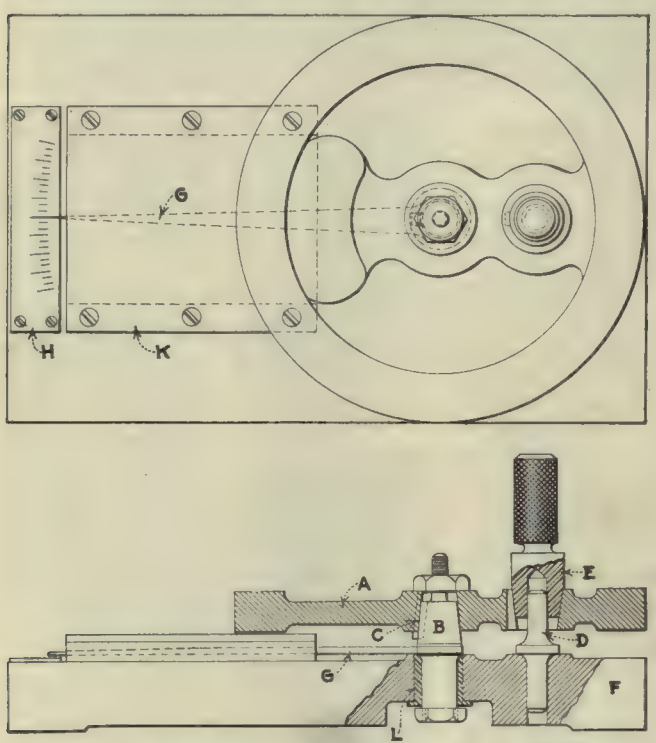


FIG. 559—KEYWAY GAGE FOR MOTOR FLYWHEEL

in the taper would cause incorrect reading at the indicator point.

In the work *A* shown in Fig. 558 the keyway *B* is to be gaged from the tapered hole *C*, and in order to do it quickly and with sufficient accuracy a plug *D* is designed so that it fits the taper, as shown at *E*. The plug is slotted to receive the indicator arm *F*, which is pivoted at *G*. A steel plate *H* is set into the plug gage as shown, and there are a number of graduations on it which will show the limits of accuracy within which the keyway has been cut. The spring *K* bears against the side of the indicator lever *F*, so as to keep the latter always in contact with the bottom of the keyway.

It is important that the thickness of the lever should be considerably less than the width of the keyway, so that it will not be affected by burrs in the corner of the keyway. It will be seen that any variation from the correct depth will be clearly shown by fluctuations of the indicator point with respect to the zero mark. This type of gage can be used for either work or inspection.

In a motor flywheel of the type used on small motorcycle engines the position of the hole which carries the crankpin is important in relation to the keyway in the center of the flywheel. In order to gage this relation a special form of indicating gage is required. One which has proved successful is shown in Fig. 559. The flywheel *A* is mounted on a tapered plug *B* in which a key *C* is carefully located. The other location of the flywheel is obtained by means of a straight plug *D*, which enters the crankpin hole but does not fit it.

The fit is obtained by placing the plug *E* over the portion *D*, and pressing the plug down until it "makes up" firmly in the taper. Both plugs *B* and *D* are located in a cast-iron base *F*. The plug *B* has attached to it directly opposite the keyway a pointer *G*, which moves over a graduated scale *H* according to the variations in the keyway. Any errors in the location are multiplied several times, according to the length of the pointer with respect to the distance from the center of the keyway.

In making gages of this sort where a delicate pointer is used, it is advisable to protect the pointer from

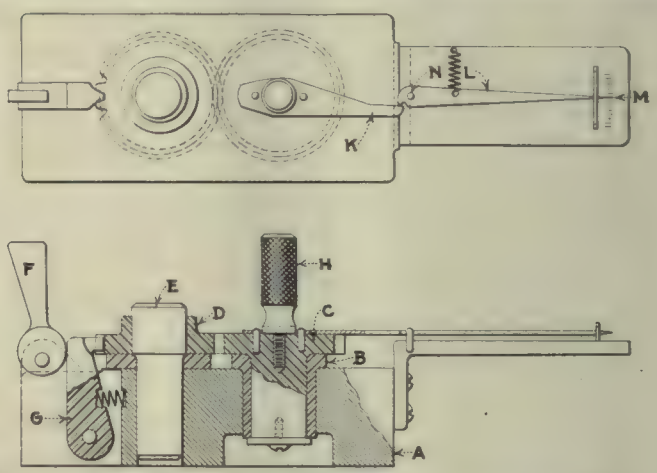


FIG. 560—GEAR TESTING FIXTURE FOR DETERMINING LOST MOTION

injury by putting a plate over it, as shown at *K*. The only portion of the pointer which is unprotected is that which extends beyond the edge of the plate *K* and travels over the graduated dial. The center plug *B* is located in a bushing *L*, in which it is a running fit, thus permitting the plug to revolve freely. Gages of this type are not common, but they become necessary when the position of the keyway must be accurately determined. The multiplication of the lever can be made sufficient to show variations as small as 0.001 in. in the position of the keyway.

We have previously taken up a number of important points connected with the gaging of gears, but we have not considered anything except work gages. It is evident that various points connected with the manufacture can be looked into during the process; and while the limits can be held very closely, it may be found that after the gears have been hardened, and also from other causes, certain changes have taken place which can be found only by careful inspection. For this reason we must consider not only the limits within which the work has been manufactured, but also the effect of errors in manufacture in the running of the gears. Inspection fixtures for determining whether the gears have been correctly cut and whether they will run together smoothly are of great importance, and their principles should be carefully studied before the design is attempted.

If gears are cut too deeply or if their pitch diam-

eters are not correct, there will be a certain amount of lost motion between the teeth when two gears are in mesh. The ordinary method of testing gears to determine whether or not there is too much lost motion or back-lash is to place both gears on studs, and the operator then determines by the "feeling" whether they are too loose or too tight. This method is dependent largely upon the judgment of the operator, and in order to obviate the personal element the fixture shown in Fig. 560 was designed.

The base of the fixture *A* is of cast iron, and it is provided with a bushing *B* in which a master gear *C* revolves. The gear which is to be tested is shown at *D*, and it is placed in position on the stud *E*, which is made small enough to allow the gear to move freely on it. After the gear has been placed in position the cam lever *F* is thrown over, and the pawl *G* is forced in between the teeth to hold the gear rigidly in place.

After this has been done the operator takes the knurled handle *H* between his fingers and tries to turn the master gear in both directions. The master gear *C* has on it a lever *K*, which bears against the end of the indicator *L*. If there is any shake between the teeth of the master gear and of the one which is being tested, the error will be multiplied by the pointer *L*, which will immediately show the amount of error by its fluctuations on the graduated scale *M*. The amount of multiplication can be controlled by the lengths of the levers *L* and *K* and by the position of the fulcrum pin *N*.

This is a very simple type of fixture and it is economical in its construction. There would be no great expense involved in the building of it, and by the addition of certain refinements it could be so made that several gears of different sizes could be tested in the same fixture. It would be necessary only to make the center distance adjustable and to provide the master gears to suit conditions.

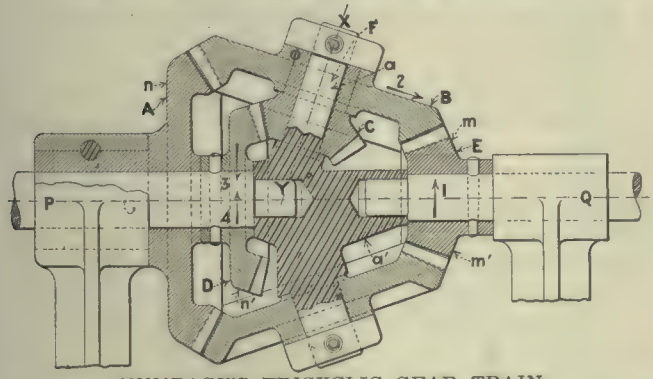
A Problem in Epicyclic Gearing—Discussion

By F. E. Bardrof

THE analysis of the epicyclic gear train by Mr. De Leeuw on page 283, Vol. 58, of the *American Machinist* is interesting, both on account of the labor the author uses and because his solution of the problem is not correct. This is not a new gear by any means, being strictly similar to the so-called Humpage's gear which is described and analyzed in almost every text book on kinematics.

In the first place, there is a typographical error in the statement of the problem, as *A* should be *D* in the third line of the second paragraph. It is evident that the ratio between *E* and *D* is desired.

It seems to me that the solution goes wrong when the



HUMPAGE'S EPICYCLIC GEAR TRAIN

writer makes the following statement in the second column of the article: "Gear *E* also causes gear *B* to move around the axis *XY*. The amount of this movement will be $\frac{E}{B}$ revolutions."

The rotation of *B* about its axis is not caused primarily and simply by gear *E*. It is evident that if the part carrying the pin *XY*, which I will hereafter designate as the arm *F*, is held stationary neither *E* nor *B* can revolve, and therefore the rotation of *B* about *XY* is found by an analysis of the motion of the arm F. If the arm is revolved once about the axis *PQ* in the direction of arrow No. 1, *B* will make $\frac{A}{B}$ turns about *XY*.

Since one revolution of *E* causes the arm *F* to make $\frac{E}{E+A}$ turns about *PQ*, the number of turns of *B* about *XY* for one turn of *E* will be

$$\frac{A}{B} \times \frac{E}{E+A} = \frac{B(E+A)}{AE},$$

instead of $\frac{E}{B}$ as given in the solution under discussion.

Substituting this value in the analysis for gear *D*, we find that the number of revolutions of *D* for one revolution of *E* will be

$$-\left(\frac{AE}{B(E+A)} \times \frac{C}{D}\right) + \frac{E}{E+A},$$

or, with numerical values,

$$-\frac{48 \times 21 \times 18}{42 \times 69 \times 30} + \frac{21}{69} = 0.0956$$

Therefore, 100 revolutions of *E* will cause *D* to make

$$100 \times 0.0956 = 9.56 \text{ revolutions.}$$

A much simpler solution of the problem may be made be the use of the tabular system. This system has two steps:

(1) Hold the arm still and rotate one gear, finding the revolutions of the others;

(2) Revolve the whole train in such a manner as to bring the fixed member back to its original position.

In this problem let us consider the arm *F* and the gears *E*, *D* and *A*.

	F	*E*	*D*	*A*
1st step	0	$-\frac{48}{21} = -\frac{16}{7}$	$\frac{48}{42} \times \frac{18}{30} = \frac{24}{35}$	1
2nd step	—1	—1	—1	—1
	—1	$-1-\frac{16}{7} = -\frac{23}{7}$	$-1+\frac{24}{35} = -\frac{11}{35}$	0

As an explanation of the table, in the first step *F* is held stationary and *A* is given one turn in direction No. 1. By tooth ratios the number of turns of *E* and *D* are readily found, as shown, being careful of signs. In the second step the whole train is revolved in the opposite direction, in order to bring *A* back to its original or fixed position. By addition we find that one revolution of *F* in the negative direction will give *E* $\frac{23}{7}$

turns and D_{35} turns in the same direction. The ratio between E and D is, therefore,

$$\frac{11}{35} \times \frac{7}{23} = \frac{11}{115} = 0.0956$$

which checks with the result just obtained by the method employed in Mr. De Leeuw's solution.

Another good method for solving epicyclic trains is by a formula derived from the above. I am indebted to Mr. L. F. Moody for this formula, which I have found very useful. I will not take time to give the derivation, which is comparatively simple.

$$e = \frac{n - a}{m - a} \qquad (1)$$

e = value of train with the arm fixed.
n = turns of last wheel.
m = turns of first wheel.
a = turns of arm.

The wheel at either end of the train may be called the "last" when $e = \frac{\text{turns of last}}{\text{turns of first}}$, and if direction signs are properly used.

In this solution the gearing must be split up into its component parts. It is evident that there are two simple epicyclic trains, one of which drives the arm and the other gear D. The first step is to imagine that the gears C and D are removed, leaving the epicyclic driving the arm. Then, referring to the illustration for the meaning of the letters,

$m = 1$, $n = 0$, and $a = ?$

$$e(\text{arm fixed}) = -\frac{E}{A} = -\frac{21}{48}$$

Substituting in (1),

$$-\frac{21}{48} = \frac{0 - a}{1 - a}.$$

$$a = \frac{21}{69}. \left(\text{This value is } \frac{E}{E + A}\right)$$

The second step is to suppose that the gear A is removed, leaving the epicyclic driving D, and then give the arm the number of turns found above.

$$m' = m = 1, n' = ?, a' = a = \frac{21}{69}.$$

$$e(\text{arm fixed}) = -\frac{E \times C}{B \times D} = -\frac{21 \times 18}{42 \times 30} = -\frac{3}{10}$$

Substituting in (1),

$$-\frac{3}{10} = \frac{n - \frac{21}{69}}{1 - \frac{21}{69}}$$

$n = 0.0956$ revolutions of D for one of E.

The gear ratio of Humpage's gear as generally used is higher than the gear in question due to different tooth ratios. If the numbers of teeth on the gears were E, 12; B, 42; A, 48; C, 16; and D, 18, it would take 315 turns of E to produce one revolution of D in the opposite direction.

The Status of Tool Designers

By Herbert W. Cable

THE time is coming when a change in the policy of some manufacturers toward tool and machine designers will be necessary. This will be due to pronounced shortage of capable men and an increased cost of special tools.

Some years ago it was thought necessary, when tools were needed, to employ a highly skilled mechanic at a good salary to develop the necessary equipment. The attraction of the substantial pay and white collar job offered an opportunity for correspondence schools, and night schools, to induce thousands of young men to study for the better job.

The war caused an increased demand for tool designers and almost anyone who could push a pencil called himself a tool designer. In order to get work of any value from these men, a close and direct supervision was necessary. This gave rise to the leader, or squad, system which was costly inasmuch as it required a large number of non-producing straw bosses. These straw bosses were generally picked from the best men in the department but their ability was not always high and their leadership frequently resulted in delay and inefficiency.

The poor quality of work, the large number of costly errors and the demand for high wages of men who had a good flow of language, but were lacking in mechanical knowledge, has shaken the confidence of the shop managers. As a result the remuneration for even the best of designers is below what is fair and necessary or proper. Other trades, in which the amount of training and experience is far less than that of tool designers, but in which the men are organized, are paying nearly twice as much.

It takes a man of intelligence and resourcefulness to make a good designer and this class, finding it impossible to make a good living as draftsmen, are rapidly going into other lines of business. This leaves the mediocre men, who are contented if they can just hold the job at a comparatively low salary, regardless of the cost to the company of their errors and poor quality work. This also has enabled department heads to make the payroll look small, while they are able to cover up with diplomacy the losses due to changes in design. A poorly designed tool will prove costly in the efforts of the shop to get it to work, in alterations necessary, in decreased production and poor quality.

It behooves the manufacturers, while there are still a few good men in the business, to offer higher salaries and better working conditions to make it worth while for the ambitious and progressive man to remain a designer. The manufacturer should demand increased efficiency and high grade work, judging men by their actual ability. A basis for value can be found in the increased production of new tools, the cost of getting the tool to operate after it is in the shop, and the quality of the pieces or work turned out.

High salaries are paid to big league ball players, but only the highest type of player is able to stay on the team. The same should apply to tool designers, a demand for first class work and the proper encouragement in the way of remuneration. A few good men will do more and better work than a whole roomful of pencil pushers and the sooner the manufacturers see the losses in the shop, and are not blinded by the apparent low cost of designing, the better conditions will be. There is no other line where ability is of more value.

A doctor can sometimes cure a patient of an imaginary illness by cheerful words and chalk pills but it takes real medicine and real action to handle a diseased condition. In these days of keen competition, it is up to the manufacturer to keep his organization healthy and he will need real ability in his employees to keep it so.

Some Details of Lathe Design

BY ALBERT CLEGG

Push pin lock for heavy machinery—Double back gears—Cone clutches applied to feed-starting devices—Reducing the friction in a powerful clutch

THE SERIES OF articles published in the *American Machinist* on "Methods of Machine Tool Design," by A. L. De Leeuw, are worthy of the highest appreciation from all sections of the machine tool trade, and should eventually attain to the dignity of a machine tool classic, as Unwin's "Elements of Machine Design" and several other important works have done in connection with general engineering practice. One does not need to read far in any of these articles to be convinced of the fact that the author is an intensely practical man who has very little to learn concerning the design of machine tools. Because of this conviction, the present writer is rather diffident in pointing out what he considers are omissions on the part of Mr. De Leeuw, and he does so with the single object of helping to make the series more complete and more up-to-date even than it is at present. These suggestions, however, are made in no spirit of destructive criticism, but with the best of intentions and also with a note of the deepest appreciation for Mr. De Leeuw's efforts up to the present.

With reference first of all, to the chapter beginning with page 287, Vol. 57, and dealing with the design of lathe back gears, I cannot understand Mr. De Leeuw's reference to the push pin lock for connecting the cone to the spindle gear as being useful for light machinery only. It seems to me that the diameter of the pin can

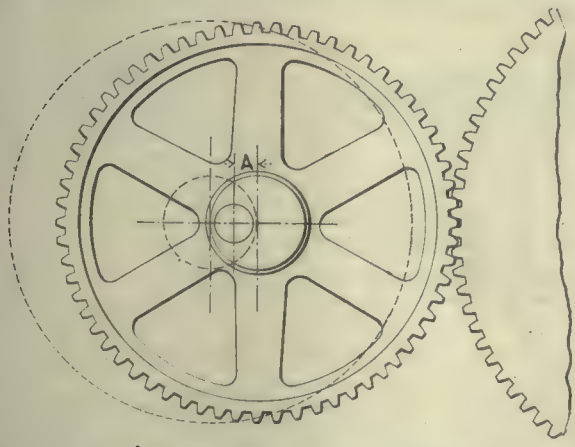


FIG. 1—ECCENTRIC SHAFT DESIGN

be made as large as is required to suit the heaviest conditions. I have used it on 36-in. lathes having belts up to 6 in. wide, but apart from this, there seems no real reason why the pin method should not be in every way as strong as the bolt and nut method. There can, of course, be no doubt as to the handiness of the two arrangements, one operated by the fingers and the other requiring the use of a spanner. It must be remembered that the pin is only subjected to the pressure from the open belt; that is to say, when the back gears are in use, the pin is inoperative and under no load whatever. Such being the case it is improbable that the load on the pin will ever exceed three or four hundred pounds even in the largest lathe, and there should be no difficulty in designing a circular push pin or

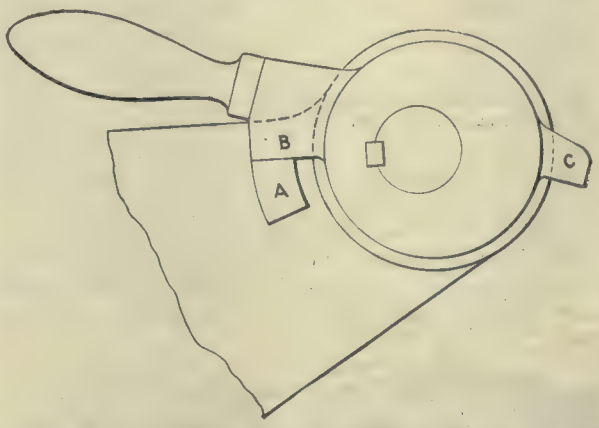


FIG. 2—STOP FOR ECCENTRIC SHAFT

plunger, easily able to negotiate a load of this magnitude.

Further, in dealing with the eccentric shaft, it is stated that the throw, that is, the distance from the fixed center of the eccentric shaft to the movable center, will need to be ¾ in. for a 3-pitch gear. With reference to Fig. 1 the ¾-in. throw relates to dimension *A*. Now such a large throw as this is obviously unnecessary unless it is required to move the operating handle of the eccentric through not more than 90 deg. It is quite evident that the maximum possible movement of anything mounted on an eccentric is always equal to twice the throw. The stroke of an engine is twice the throw of the crank and the same holds good with an eccentric.

With this modification—and I have never yet seen a lathe in which the eccentric shaft handle did not move through practically 180 deg.—Mr. De Leeuw's analysis of the various elements of the eccentric shaft will require some overhauling. It will not be necessary to have the body of the shaft anything like 3½ in. in diameter, in order to provide for the location of the two sets of center holes.

With reference to the stop and locking device shown in Mr. De Leeuw's Fig. 115, an exactly similar idea,

as shown here in Fig. 2, can be used for the heaviest class of machines. Instead of the concealed pins as used in his method, there is a stop *A* cast or fixed to the headstock against which abut two lugs *B* and *C* on the eccentric shaft handle. I quite agree that some form of clamping screw is desirable. The forces tending to throw the gears out of mesh are so nearly equal to those tending to hold them in, that the gears are more or less in a state of unstable equilibrium and liable to be thrown out by any sudden fluctuation of the cut. It should be noted that while the reaction from the front pair of gears is tending to hold the eccentric shaft in the "in-gear" position, the cone pinion and its gear are exerting a smaller force which is tending to throw the eccentric shaft out. Further, the friction of the quill on the eccentric shaft has a tendency to disengage the gears. This tendency is neutralized by the friction of the eccentric shaft in its bearings in the headstock. It is comparatively easy to analyze the forces acting on the shaft, but it is not so easy to calculate their intensity, and since they so nearly balance each other, it is safest to provide some simple form of clamp to take care of any temporary abnormal condition.

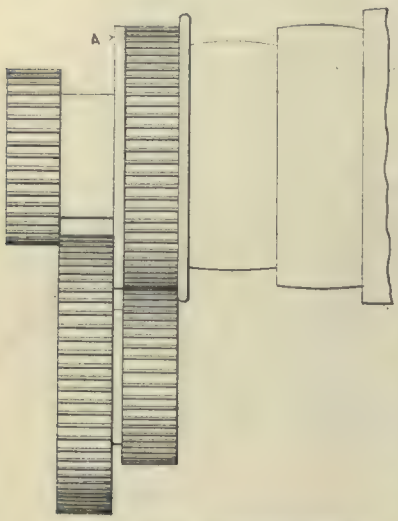


FIG. 3—NON-INTERFERING DOUBLE BACK GEARS

A Correction for Double Back Gears

Just a couple of points about double back gears. Mr. De Leeuw points out that it is not very easy to obtain a high gear ratio—on the face of it, it seems rather strange that for a given range of speeds a higher gear ratio is required with double back gears than with the ordinary type—or a wide range of speeds with double back gears. This fact is quite true, but the ratio can be slightly increased and the running qualities and strength of the gears, improved by the use of corrected addenda for both the gears and pinions. In effect, this fact merely means that the pinions are cut with a tooth less than the blank is sized for and the gears a tooth more. The cutting of the teeth, however, must be by the generating process and not by formed cutters unless the cutters have been specially made for the particular job. Now reducing the number of teeth in the pinions and increasing the number of teeth in the gears, obviously gives a slightly higher gear ratio. This ratio in turn will allow a wider range of speeds. But it also gives a shape of tooth for the pinions which is 20 to 30 per cent stronger than a standard tooth, and in addition, by lengthening the arc of action, will result in smoother running, and greater durability.

When the twin sliding gear on the quill of a double back-geared lathe is moved across from one position to the other, there is always a possibility that it might not be moved the full distance, the result being that both pairs of gears would be in mesh when the eccentric shaft was thrown in. This condition could quite easily result in a serious smash if an attempt were made to start up the machine.

To overcome any such possibility, the simple device shown in Fig. 3 has always been used by the writer when designing this type of gear. A plate *A* is fixed to the larger of the cone pinions, whose outside diameter it equals. The sliding gears have a space between them to accommodate the plate as shown. When the gears are moved, the eccentric shaft cannot be engaged if they have not been moved the full amount. They must be in either the extreme left or extreme right position, otherwise the plate *A* interferes with the outside diameter of the smaller sliding gear, and prevents the engagement of either of the gears. Similarly, it is not possible to slide the gears until they have first been thrown out of mesh by the eccentric shaft. The idea is quite a simple one and costs very little to produce.

Cone Clutches for Feed Starting Devices

The writer now wishes to elaborate somewhat on the question of cone clutches, more particularly as applied to the feed starting devices for lathes and other tools. Mr. De Leeuw shows a typical example of such a clutch. As regards the arrangement of the clutch surfaces to give equality of wear and continued success of operation, it is absolutely essential that the theories propounded by Mr. De Leeuw should be observed. If there is any overlap on either of the two friction surfaces of a cone clutch, sooner or later a shoulder will develop, which, though possibly quite minute in size and almost imperceptible, will seriously interfere with the correct operation.

At one time, it was the regular practice for a spanner to be used for engaging the friction feed of a lathe, and under these conditions it mattered little how great the pressure between the frictions was required to be—there was always plenty of force in reserve when a spanner was used. Later on, when hand-operated frictions were introduced, it became necessary, if successful operation were to be assured, that the clutch should be carefully designed so that by hand the requisite pressure could actually be applied.

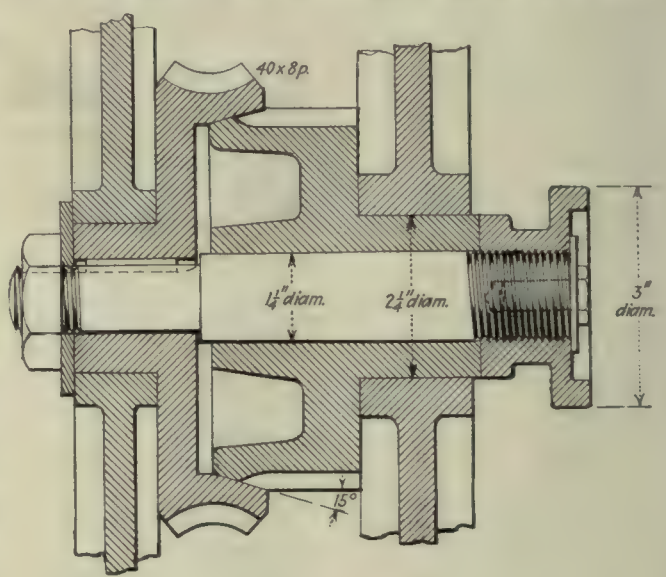


FIG. 4—A TYPICAL FEED FRICTION CLUTCH

Now it is perfectly true and probably within the experience of most readers that many of the so-called hand

frictions are not hand frictions at all. Through faulty design, it is almost impossible in many cases to engage the clutch with sufficient pressure to transmit the required load. The writer has often seen pieces of lead, spanners, and all kinds of weapons used to tighten the hand friction knobs. In some cases, it is a fairly easy matter to do the tightening, but if the cut has been

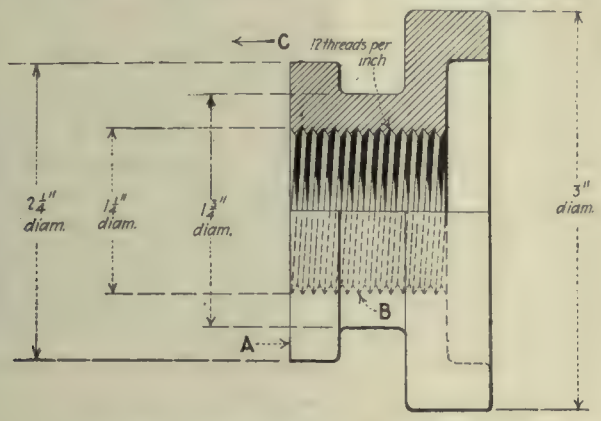


FIG. 5—ENLARGED VIEW OF HAND KNOB

moderately heavy, it is practically impossible to unclamp by the use of the hands alone. In other cases, the tightening is difficult because there is a tendency for the knob to slacken off under the cut.

The writer many years ago came up against these difficulties and got out a design of clutch which is claimed to be one of the most powerful on the market. But before describing the type of clutch evolved, it might be profitable to consider some of the forces with which the hand-operated knob has to contend—we shall then more clearly see the necessity for the principles adopted.

Forces on the Hand Knob

A typical feed friction clutch is shown in Fig. 4. The 40 x 8 pitch, cast-iron gear is required to be coupled at will to the worm gear by means of the 3-in. diameter hand knob. Now a cast-iron gear of the dimensions given will safely stand a tooth load of about 250 lb. As the mean diameter of the friction clutch is roughly equal to the pitch diameter of the gear, the circumferential pull of the clutch will also be 250 lb. If a 0.1 coefficient of friction is assumed, and P is the axial pressure on the clutch, with the angle of the cone 15 deg., then the actual axial pressure required to give a mean pressure between the friction surfaces of 250 $\div$ 0.1 will be $P = 250 \div 0.1 \times (\sin 15 \text{ deg.} + 0.1 \times \cos 15 \text{ deg.}) = 900$ lb. approximately. Now this means that the hand-operated knob must be able to develop an axial thrust of 900 lb. Let us endeavor to find the pull required at the knob's periphery.

There are really three loads on the knob: (1) That due to the development of the required pressure C, without considering friction; (2) that due to the friction at A in Fig. 5, between the face of the knob and the boss of the gear; (3) that at B, due to the friction of the thread.

The total effort required at the periphery of the knob will be the sum of the efforts necessary to overcome the three resistances mentioned. With the dimensions given and with the same friction coefficient of 0.1, the various resistances will be as follows: Pull on the knob to produce end pressure $= 900 \div (3 \times \pi \times 12) =$ 8 lb. Pull on knob to overcome friction of thrust faces $= 0.87 \times 900 \times 0.1 \div 1.5 = 52$ lb. Pull on knob to overcome friction of thread $= 0.62 \times 900 \times 0.1 \div 1.5 = 37$ lb. The latter ought really to be increased by between 10 and 20 per cent to allow for the increased pressure due to the angularity of the thread. This pressure has been ignored, however, as it does not very seriously affect the problem.

We find then that the three loads are equal to an effort on the knob of $8 + 52 + 37 = 97$ lb., of which 8 only is actually doing useful work, the remainder being swallowed up by friction. The writer by experiment, has satisfied himself that it is not practicable to exert more than 20 lb. turning effort *by hand* on a hand-operated knob. If more is required, it means considerable effort on the operator's part, and usually a two-handed effort, to clamp the knob, and this effort, will sooner or later be assisted by some outside instrument to secure easier engagement and disengagement. Obviously then, if 20 lb. is a reasonable figure, the 97 lb. given by our example will be very much wide of the mark. Yet it will be generally recognized that the arrangement is quite a usual one in every way, with nothing abnormal about its design. How is it possible to bring it within the realm of practical and successful mechanics?

It is quite obvious that the frictional loss is abnormal and that any economy of effort must necessarily be largely made from the saving in friction. If the whole of the useful-work load were cut out, there would only be a saving of 8 lb., that is, of course if the friction remained the same. In the first place then we will

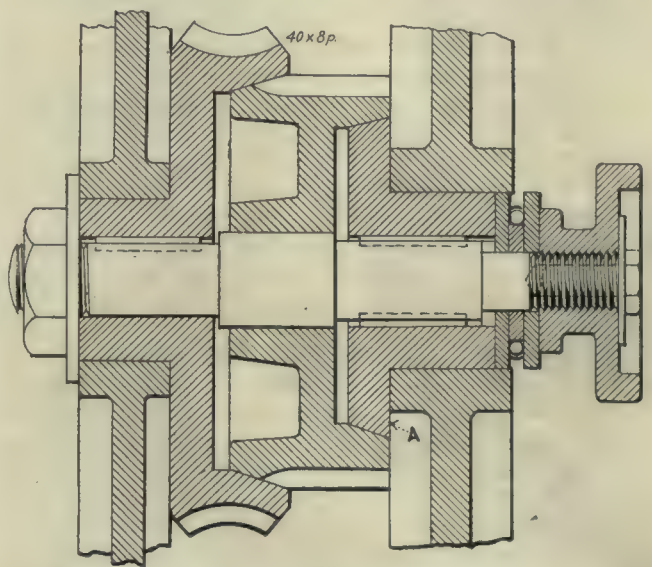


FIG. 6—IMPROVED DESIGN OF DOUBLE CLUTCH WITH BALL THRUST

eliminate the thrust friction at A in Fig. 5 by interposing a ball thrust bearing between the knob and the boss of the gear. While there would be some friction even under these conditions, it would be so slight with a ball thrust that, for all practical purposes, it can be said to have been eliminated altogether. This elimination will cut out the biggest of the three loads on the knob, reducing the required effort on the periphery from 97 to 45 lb., which, though quite a substantial reduction, does not bring us within our prescribed limit.

We could in the first instance have increased the diameter of the knob to a considerable extent. The ob-

jection to this course is that any increase would materially affect the operation of the machine, since it would be necessary to make the knob large enough for operation by two hands. In some examples, the size of knob has not been carefully proportioned, it being too large to operate comfortably with one hand and too small to accommodate both hands. Of course, if the knob were made large enough, it might be possible to secure the requisite pressure by only one hand, but in most cases the knob would then cease to be a knob at all—it would attain to the dignity of a hand wheel, and as such, would be rather clumsy in appearance on the carriage of a lathe. Our efforts are directed towards securing an arrangement which will be neat in appearance and, above all, which can be operated *comfortably by one hand.*

An Effective Design for a Clutch

The diameter of the thread on which the knob screws seems to be much greater than is necessary. It should be borne in mind that the knob is *hand* operated, and consequently, the screw can never be very heavily loaded. It should therefore be quite reasonable to reduce the thread diameter to $\frac{3}{4}$ in. so that, with the same pitch of thread, the load on the knob will now be 8 lb., as before, for the actual pressure, and $0.37 \times 900 \times 0.1 \div 1.5 = 22$ lb. for the thread friction, or a total of 30 lb. altogether. We are evidently getting nearer to the mark, but not yet quite near enough. If 20 lb. is the *comfortable* figure, then 50 per cent more will be tending very largely towards discomfort and non-success.

The design shown in Fig. 6 is the writer's solution of the problem, and he has used this design on all sizes of lathes up to 32-in. swing with never a single complaint respecting this particular portion. The worm gear is keyed to a shaft on which is also slidably keyed a male friction *A*. Between the worm gear and the sliding friction *A* is the 40 x 80 feed gear having a male friction at one side to engage the worm gear and a female one at the other side to engage the sliding friction. The whole of the three parts are clamped together in the ordinary way by a hand-actuated knob, of the dimensions given above, and fitted with a ball thrust.

With this arrangement, since there are two sets of friction surfaces almost equal in size, the axial pressure must be little more than half that of a single clutch of the ordinary type. Since there is a slight difference we will put the axial pressure at 60 per cent of the previous amount. This means that the pull on the knob will be now only $30 \times 0.6 = 18$ lb., or 2 lb. within our predetermined standard, and obviously, a great improvement on the 97 lb. of our original calculation.

It should also be noted with reference to the design shown in Fig. 6, that there is no tendency for the knob to either tighten or slacken under the influence of the cut. With the arrangement shown in Fig. 4, if there is any slip between the friction surfaces, the knob will tend to tighten itself when running in one direction and slacken when running in the opposite direction. The latter is not a very desirable condition as it might prevent the quick operation of the knob.

In conclusion, it is not suggested that Mr. De Leeuw's design will not "stay put"—there will be no tendency for the knob to either tighten or slacken—but the writer's design is offered as a much more satisfactory and more powerful arrangement.

Obstacle Charts

By L. J. Voorhees

The essence of a job is its Obstacles,
They're troubles that are hard to be found.
But success is attained by their solving,
So, let's each be an "Obstacle Hound."

THE purpose of the charts illustrated herewith is to help the busy executive find his obstacles. The solution of them we will leave with him for the present.

It is not enough to remove the obstacles that we stumble over, even if we do it promptly. We should hunt out the obstacles that are usually overlooked. It is better to find them and have them overcome before someone higher up discovers them and asks why they have not been attended to. It puts one in a bad light to have to make excuses. Perhaps you will say this is all good general talk, but what are some of these obstacles, and how can they be found?

An obstacle may be a change in the rate of production, a change in the price of a commodity, a change in the rate of movement of a commodity, a change in the quality of a commodity or product, or, a calamity. If there were no changes or calamities there would be little need for most of our executives. If a manager could telephone from his summer home to the workmen in his bossless factory and tell them to repeat last week's production, and then run down the last of the week and find it done, manufacturing conditions would be about ideal. But, unfortunately, due to changes or obstacles that arise in nearly everything that enters into or affects a product, a number of highly experienced men are required to overcome them.

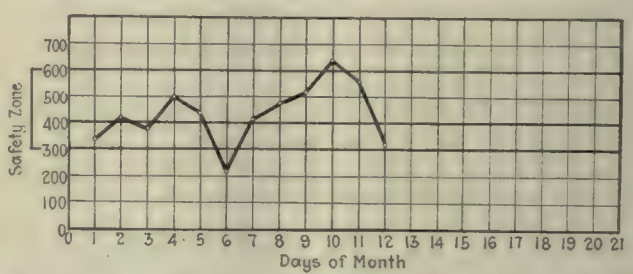


FIG. 1—OBSTACLE CHART FOR DAILY PRODUCTION OF 400 PIECES

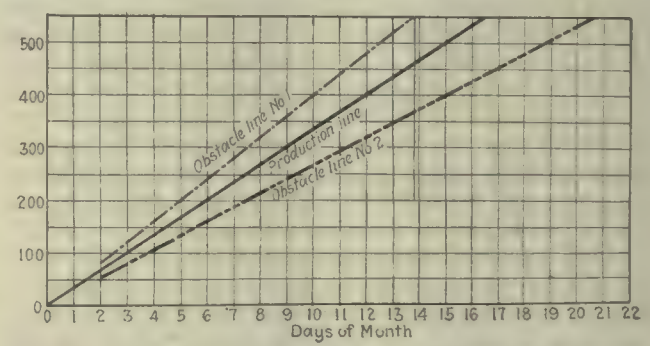


FIG. 2—A CUMULATIVE CHART WITH OBSTACLE LINES

In order to anticipate, find, or follow these fluctuations or obstacles, many men collect great masses of figures and then to save the time required to go through them repeatedly, they transfer them to charts where they are more visible. Still, these charts must be followed carefully by a frequent scrutiny in order

to derive the desired benefit, and even this requires a lot of time. Nearly all of this time can be saved by the addition of a few lines to the charts, or by the use of obstacle charts.

An ordinary clock is useful when you look at it but it is no good to get you up in the morning. An alarm must be added for that purpose and then it is called an alarm clock. Likewise, an ordinary chart is useful when you look at it but with the addition of zone or

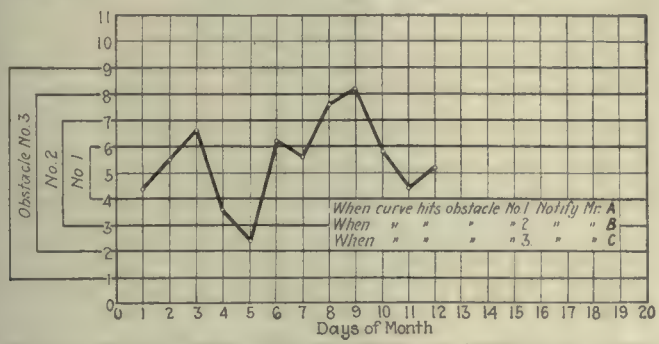
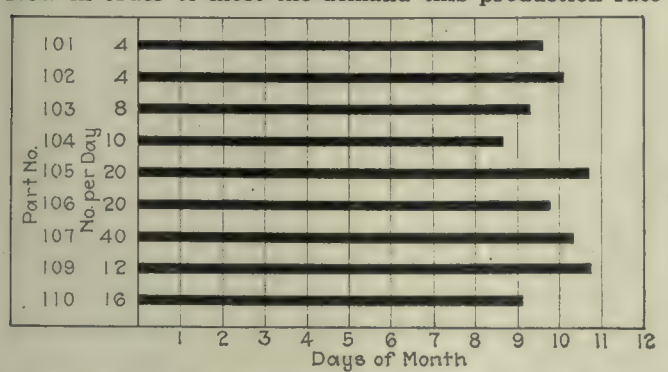


FIG. 3—CHART WITH THREE SETS OF OBSTACLE LINES

obstacle lines it gives a warning when an obstacle is encountered and therefore it is an obstacle chart.

Let's suppose, for instance, that your product is such that your machines run a number of weeks on an article, and it takes two weeks for that article to pass through its operations. When you start production you don't want to keep constantly running to each operation to see how it is going, and you can't afford to wait two weeks to see how the parts are coming through. So as you start each operation you prepare a chart to record its progress. Suppose you start the first operation at the rate of 400 parts a day and you record this on a chart something like the one shown in Fig. 1. Now in order to meet the demand this production rate



Notify Mr. A. When any production line falls behind the date line

FIG. 4—CHART SHOWING PRODUCTION OF COMPONENT PARTS

should not drop below 300 a day and if it reaches 600 a day it is so exceptionally good that you want to know about it. Instead of continually looking at this chart or inquiring about it you place two obstacle lines on it, one at 300 and one at 600. Then you give instructions to the person who posts the chart to let you know when the production curve crosses either obstacle line. Now, unless the chart is placed before you, you know that material is coming in and that this operation is running as you intended. Therefore, you can give your time to something else.

How obstacle lines can be applied to other types of charts is shown in Figs. 2, 3 and 4. The one shown in Fig. 2, is a cumulative or Z-chart with obstacle lines. The one shown in Fig. 3, has three sets of obstacle lines and is used to record things of unusual importance where more than one person is to be notified. For instance, the superintendent might be notified when the curve touches obstacle line No. 1, the factory manager when it touches, or crosses No. 2, and the general manager when it crosses No. 3. Of course, the arrangement and values must be changed to meet particular conditions. The chart shown in Fig. 4, is used to record the rate of production of the component parts of a machine to insure a constant supply of parts for the assemblers and to prevent their being held up for some part that has been overlooked and has gotten behind. Letting the daily spaces opposite each part number represent a number of units of finished machines, keeps the production lines nearer even. If the machine assembly rate is four a day, then any production line that is a day ahead indicates that enough parts are ahead for four machines. The four machines may take four of these parts or one hundred. The obstacle on this chart is to keep the production lines ahead of the date line. When one falls behind, the chart should be placed on your desk. Then you can give your attention to the one that is behind. That is where these charts effect the saving in your time. They do not require continued watching as each one has its own tickler.

One of the hardest tasks a factory executive has is to find the things that really need his attention. Usually most of the day is spent in fruitless search, with routine matters and with minor troubles, while the overcoming of the real obstacles is either put off or slighted. The use of charts with an alarm attachment—obstacle charts—will save time spent in searching; will automatically bring the real obstacle to your attention, and give you more time to remove the causes.

Trouble with Countershaft Clutches—Is It Common?

BY H. MAPLETHORPE
West Bromwich, England

The countershaft pulley clutch such as is supplied with many machine tools and lathes, and lathes in particular, has caused me much anxiety and annoyance during the last 20 years. During that time, I have never seen a really good clutch for the countershaft. I have tried every kind of an adjustment and have had the pulleys rebored and bushed. In some cases I had to have them removed and replaced by fast and loose pulleys, which appears to me to be the only satisfactory remedy.

If you tighten the clutch adjustment, so as to make it grip sufficiently to drive the lathe with a heavy cut, then the clutch will not release the pulley when you want to stop the machine. On the other hand if it is not fairly tight it will not drive with a heavy cut. Then too, when the pulley bore gets somewhat worn, the pulley rides the clutch and the lathe will not stop. I have seen this kind of annoyance upon every kind of make of clutch and often the operator can be seen to throw off the belt on the cone pulley, rather than bother with the clutch.

At the present time I have under my charge a horizontal boring machine that will not pull and it will not stand still. I have a lathe that will not stop, so we have taken one belt off. I have two other good new lathes with countershaft clutches that retard output. What is the remedy?

Standard Dimensions of Nut and Tapper Taps

The accompanying tables show the dimensions of nut taps and tapper taps which were recently adopted by a number of leading tap makers. They are in line with the Commercial Standards formerly adopted by the Tap and Die Institute, published on pages 883 to 890, Vol. 57, of the *American Machinist*.

TABLE 15

STANDARD DIMENSIONS OF TAPPER TAPS

Diam. of Tap Inches	No. of Threads Per Inch		Diameter of Shank Inches	Length of Thread Inches		Length Overall Inches
	U.S. Std.	S.A.E.Std.		U.S. Std.	S.A.E Std.	
¼	20	28	.185	1⅝	1¼	12 & 15
5/16	18	24	.240	1 11/16	1⅜	12 & 15
⅜	16	24	.294	2	1½	12 & 15
7/16	14	20	.345	2¼	1 11/16	12 & 15
½	13	20	.400	2¼	1 11/16	12 & 15
9/16	12	18	.450	2½	1⅞	12 & 15
⅝	11	18	.503	2½	1⅞	12 & 15
11/16	11	16	.565	2½	1⅞	12 & 15
¾	10	16	.616	2¾	2	12 & 15
13/16	10	...	.679	2¾	...	12 & 15
⅞	9	14, 18	.727	3	2	12 & 15
15/16	9	...	.789	3	...	12 & 15
1	8	14	.834	3½	2⅝	12 & 15
1⅛	7	12	.933	3½	2⅝	15
1¼	7	12	1.058	3½	2⅝	15
1⅜	6	12	1.153	4	3	15
1½	6	12	1.278	4	3	15
1⅝	5½	...	1.383	4	...	15
1¾	5	...	1.484	4½	...	15
1⅞	5	...	1.609	4½	...	15
2	4½	...	1.705	4½	...	15

TOLERANCES

Diam. of Shank ¼" to ½" incl. = Size to Size minus .005"
Diam. of Shank 9/16" to 1" incl. = Size to Size minus .006"
Diam. of Shank 1⅛" to 2" incl. = Size to Size minus .008"

FORMULAE

Sizes ¼" to ½" incl. Diam. of Shank = U.S.S. Basic Root Diam.
Sizes 9/16" to 1" incl. Diam. of Shank = U.S.S. Basic Root Diam. minus .004"
Sizes 1⅛" to 2" incl. Diam. of Shank = U.S.S. Basic Root Diam. minus .006"

TABLE 14

STANDARD DIMENSIONS OF NUT TAPS

Diam. of Tap Inches	No. of Threads Per Inch		Diam. of Shank Inches	Size of Square Inches	Length of Thread Inches		Length Overall Inches
	U.S. Std.	S.A.E. Std.			U.S. Std.	S.A.E. Std.	
5/64	24, 32	...	.133	.100	1⅜	*1	4½
¼	20	28	.185	.139	1⅝	1¼	5
5/16	18	24	.240	.180	1 11/16	1⅜	5½
⅜	16	24	.294	.220	2	1½	6
7/16	14	20	.345	.259	2⅜	1¾	6½
½	13	20	.400	.300	2½	1⅞	7
9/16	12	18	.450	.337	2¾	2	7½
⅝	11	18	.503	.377	3	2¼	8
11/16	11	16	.565	.424	3	2¼	8½
¾	10	16	.616	.462	3¼	2½	9
13/16	10	...	.679	.509	3¼	...	9½
⅞	9	14, 18	.727	.545	3⅝	2¾	10
15/16	9	..	.789	.592	3⅝	...	10½
1	8	14	.834	.625	4	3	11
1⅛	7	12	.933	.700	4¾	3½	11½
1¼	7	12	1.058	.793	4¾	3½	12
1⅜	6	12	1.153	.865	5⅜	4	12½
1½	6	12	1.278	.958	5⅜	4	13
1⅝	5½	..	1.383	1.037	5½	...	13½
1¾	5	...	1.484	1.113	5½	...	14
1⅞	5	...	1.609	1.207	5½	...	14½
2	4½	...	1.705	1.279	6⅛	...	15
2⅛	4½	...	1.828	1.371	6⅛	...	15½
2¼	4½	...	1.953	1.465	6⅛	...	16
2⅜	4	...	2.042	1.531	6⅞	...	16½
2½	4	...	2.167	1.625	6⅞	...	17

*For 32 Threads per inch U. S. F.

TOLERANCES

Diam. of Tap Inches	Shank	Square
5/64 - ½	Size to size minus .005"	Size to size minus .004"
9/16 - 1	Size to size minus .006"	Size to size minus .006"
1⅛ - 2	Size to size minus .008"	Size to size minus .008
2⅛ - 2½	Size to size minus .010"	Size to size minus .010"

FORMULAE

Diam. of Tap Inches	Diam. of Shank
5/64 - ½	U. S. S. Basic Root Diam.
9/16 - 1	U. S. S. Basic Root Diam. minus .004"
1⅛ - 2	U. S. S. Basic Root Diam. minus .006"
2⅛ - 2½	U. S. S. Basic Root Diam. minus .008"

Size Square = Diam. of Shank × .75

Wrongly Used Statistics Encourage Depressions

By C. T. Bragg
Bragg Engineering Co., Detroit

The wrong use of business forecasts and the various statistical reports available to business men is responsible in some degree for the periodic upsets in business conditions. If you go to a fortune teller and he tells you that a dark man is about to enter your life, the chances are that you immediately think of a dark man to fit the description. You are likely to get yourself into a frame of mind that helps to bring on whatever the fortune teller foretold—particularly if it was something unpleasant.

It is pretty much the same way with business men who subscribe to statistical services. If the expert who writes the reports predicts a depression in any given month, most of his clients will stop buying until they can find out whether or not he is right. By so doing, they help materially towards bringing on the very thing of which they are afraid.

There can be no doubt as to the value of the work that is being done in analyzing business conditions and forecasting the trend of events in the commercial world. I have a great deal of respect for the very able men who are rendering this service. I do feel, however, that they could do more good by encouraging their clients to make a positive rather than a negative use of the facts thus brought to light. If the general situation of business points to a depression in any given month, the concerns that are advised of this condition in time can do a great deal to offset the danger by wisely distributed buying and by throwing the weight of their optimism and of their dollars into the balance at the right time, so as to cause a favorable reaction.

Almost every important business house in the country subscribes to one or more of the leading statistical services. The combined influence of these firms would be tremendous. If, therefore, instead of waving a red flag, the statistician would say, "Unless such and such steps are taken, there are indications of a coming depression," he would greatly increase his usefulness to industry as a whole. The action that should result from this service would serve to alleviate instead of aggravate the strain of the period.

Heat Treating Equipment in a Truck Plant

SPECIAL CORRESPONDENCE

The kinds of furnaces used, their arrangement and sizes —Pot for melting cyanide—Carbonizing and heat treatment for the different steels used in transmissions

THE NEW PLANT of the Moreland Motor Truck Co., at Burbank, Calif., has a very complete heat treating equipment, even though the plant is not a large one. This plant makes its own transmissions, and the heat treating equipment shown is largely used for that purpose.

The two large annealing furnaces shown in Fig. 1 are 8x6x3 ft. inside measurements, the latter dimension being the height above the table of the truck which handles the material in and out of the furnace. This truck, it will be noticed, has a floor built up of fire brick and has a channel *A*, around the outer edge. The side channels go around the projecting T-bars shown at *B* and *C*, while the edge *D*, on the door, lowers into the channel on the front. This arrangement seals the heat in the annealing chamber and prevents it from being dissipated below the floor of the truck.

In Fig. 2 are shown the three carbonizing furnaces, each 7x3x2½ ft. and at the left two tempering furnaces, each 48x30x19 in. These are all inside measurements. At the left of the tempering furnaces is a pot for melting cyanide, and at the extreme right, a small furnace for tools and similar work. The large quenching tank is shown in the foreground.

A direct supply line of natural gas makes this the natural fuel to use and the price is very reasonable.

The steels used are almost entirely S.A.E. No. 3120 or 3140, these grades being selected for the transmission gears and the shaft. All gears are drop forged and are annealed in the furnaces shown in Fig. 1, before being machined in any way. The annealing treatment consists of heating the gears up to 1,600 deg. F. and letting them cool gradually in the furnace.

Carbonizing is done in the usual way, using pots or boxes for holding both the work and the carbonizing material. The materials used are those prepared by E. F. Houghton & Co. The boxes are heated in the carbonizing furnaces to 1,650 deg. F. and held at this

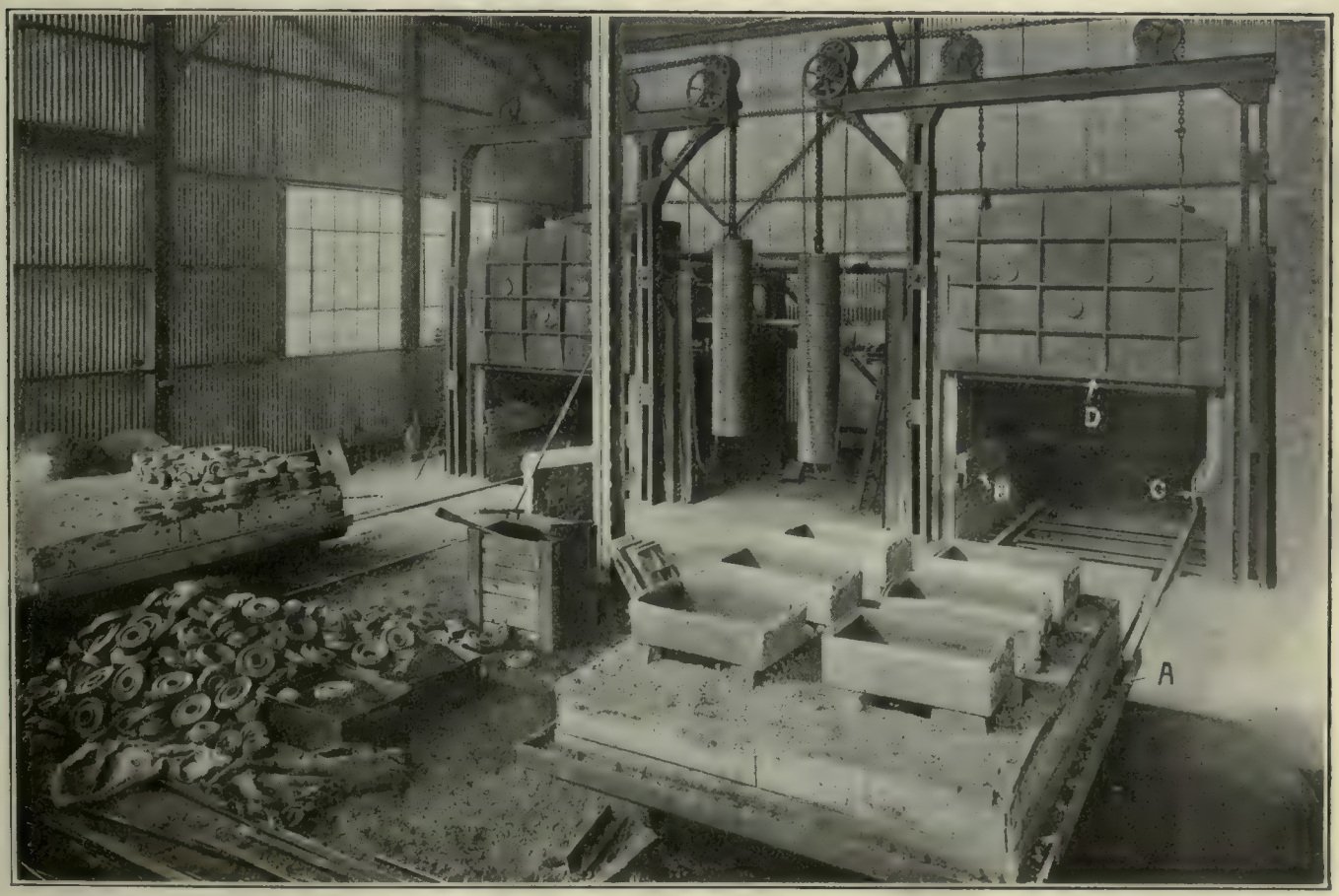


FIG. 1—ANNEALING FURNACES AND CARS

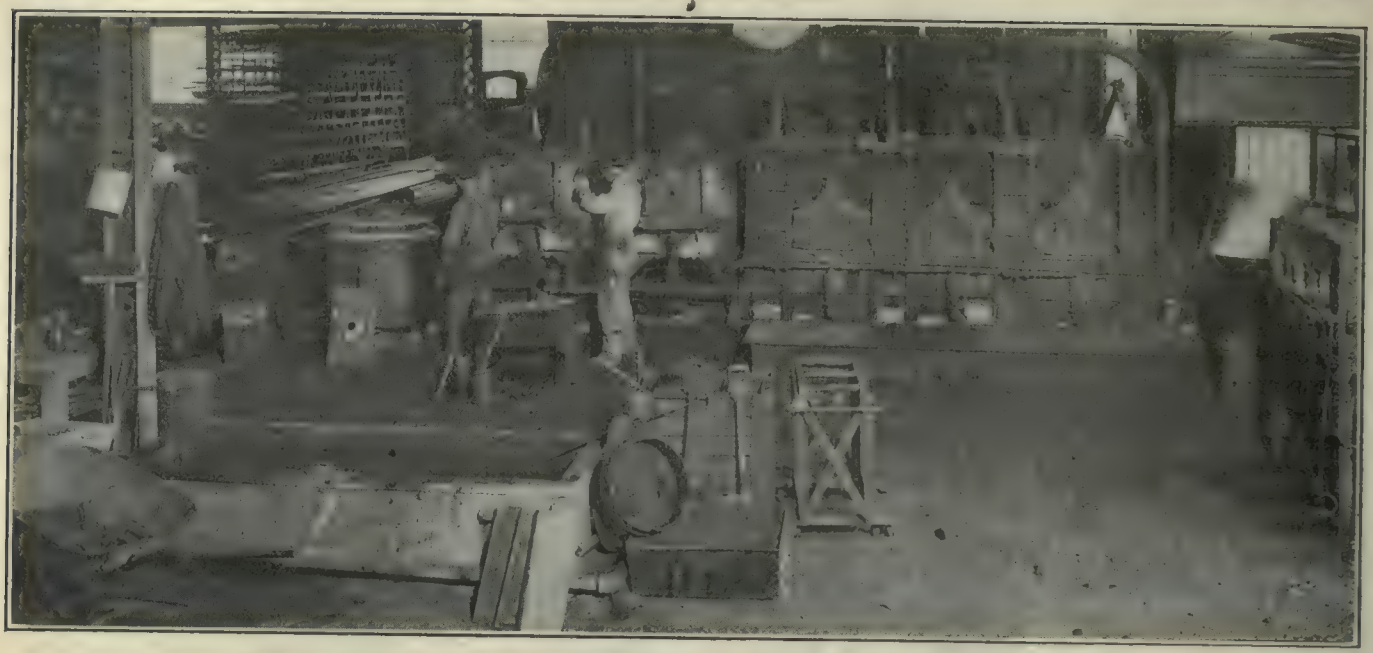


FIG. 2—CARBONIZING AND TEMPERING FURNACES AND QUENCHING TANK

heat for approximately six hours. The heat is then turned off and the work allowed to cool down with the furnace during the night, all carbonizing being done during the daytime.

After the carbonizing, the treatment is as follows: Gears are reheated to 1,650 deg. F. and quenched in oil. A second heating to 1,400 deg. F. and another quenching in oil follows. After this second quenching the gears are drawn at a temperature of 450 deg. Farenheit.

The heat treatment for shafts varies slightly from that for gears. The first two heatings and quenchings are the same, but instead of being drawn to 450 deg., the drawing heat is continued up to 800 deg. F., before the final quenching.

Both gears and shafts are tested for hardness by the Brinell method. Gears are kept between 425 and 450 and the shafts between 20 and 275, Brinell hardness. The equipment shown secures the desired uniformity.

An Old Time Shop in Old England

By J. T. Towlson
London, England

As I look back nearly fifty years to the time when as a boy, I served my apprenticeship in a little old-fashioned machine shop located in a prosperous Eastern city of England and compare the crude and limited equipment of that period with the strong, sturdy and powerful machinery of the modern shop; when I recall the makeshifts and improvisations to which we were obliged to resort to get out work that in size, weight and complexity was far beyond the recognized capacity of such tools as we possessed and weigh them in my mind against the methods of the present day in which every possible contingency is anticipated and splendid tools for every conceivable purpose provided; I am no longer surprised at the passing of the old time "all-round" machinist. He was a product of the conditions no less surely than was he who made axes of stones and tipped his spears with flint.

The machine shop lad of the present day has all his problems worked out for him in advance. When a piece of machinery is to be built it is known beforehand just how every job is to be done; how every part is to be machined. He has but to follow a "cut and dried" routine, with charts and diagrams to guide his every step. Under such circumstances it is small wonder that he should not develop the initiative and resourcefulness of the boys of an earlier day.

In the old days; there was the job—do it as best we could. Before a move could be made upon any but the most ordinary job, ways must be devised and means recruited from the meager resources at hand. It was, therefore, but natural that resourcefulness should be developed, that ingenuity and skill should go hand in hand, and that the youth whose wits were matched against such conditions and who was in constantly daily association with men who had gone through the same experiences before him should grow into a man capable of grappling confidently with any problem in iron and steel that might present itself.

In the shop where I learned my trade we had neither planer, slotter nor milling machine except such as were improvised for the occasion. Twist drills had barely made their appearance in the market and I do not remember ever seeing one in our shop. One piece of equipment that we *did* possess, however, and one that was not at all common in shops of that size, was a set of planed floor plates that together covered a space 26 by 36 ft. in size and that had planed T-slots in both directions at intervals of 12 in. These plates were located in front of a ten-ton pit lathe with 12-ft. face-plate, capable of swinging 20 ft. in diameter.

One of the jobs turned out in our shop, remarkable because of its size and weight when compared with our facilities for doing it, was three large cross-compound condensing horizontal engines that are today driving the Norwich mills of the well-known J. & J. Colman's Carrow works. Though these engines were built about 1877 they were contracted for under the exaction that they should develop one horsepower-hour for each two pounds of coal burned.

To handle this job we were obliged to resort to many

expedients; not the least of them being the building of the milling head shown in Fig. 1. This home-made device proved to be indispensable; for, in conjunction with the floor plates it became in turn a milling machine, a slotter, and at times a planer. It carried a four armed cutter head, or spider into which the cutting tools were fixed at a radial distance from center of 12 in. The drive was through a worm and worm wheel from a 20-in. pulley on the worm shaft and during the day its power was delivered to it through a belt

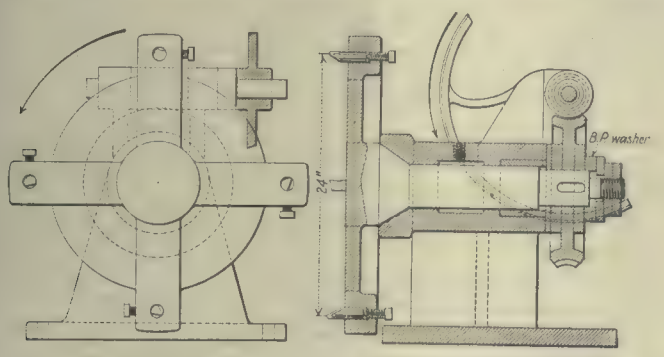


FIG. 1—A SHOP MADE MILLING HEAD

that was made to lead from the main shop line. At night (on overtime work), when the shop engine was not running, it was driven by a small rotary steam engine; also a product of the shop and later to be described.

Perhaps the most difficult and interesting of the many jobs performed with our equipment was the building of the flywheels for the above-mentioned engine. These were built-up wheels, each weighing 16 tons complete, 20 ft. in diameter, and were composed of a cast-iron hub, six rim segments and a corresponding number of cast-iron arms.

To finish the ends of the rim segments the milling



TED TOWLSON, AN OLD TIME ENGLISH MASTER MECHANIC

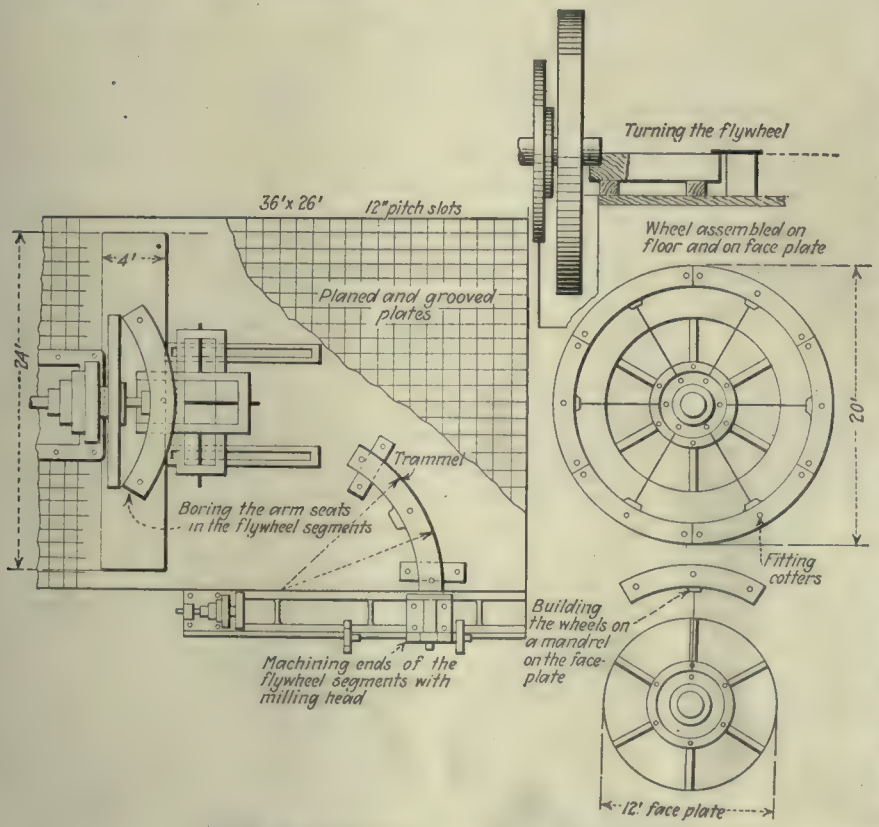


FIG. 2—MACHINING LARGE FLY WHEELS

head was attached to the saddle of an 18-in. x 25-ft. lathe that was placed along one side of the floor plates. The segments were blocked up on cast-iron stools, as shown in Fig. 2, to a height to correspond with that of the milling head and firmly secured to the floor plates. A temporary center was established on a pedestal and the segments located by means of a trammel and a straight-edge run out from the faceplate of the lathe. The lead screw of the 18-in. lathe supplied the feed movement.

The set-up for boring the boss in the middle of each rim-segment to take the arm is shown in the same sketch. The segment was mounted upon the heavy slide rest of the big lathe and located by squaring from the floor plate. It was centered with relation to the lathe spindle by gaging from the faceplate of the lathe, which made an excellent base line for this purpose. A short flanged arbor bolted to the faceplate carried an adjustable boring tool. Because of the rigidity of the set-up and the super-power of the big lathe, heavy cuts could be taken and the boring job was completed in excellent time.

Handling a 16-ton flywheel in a shop where a 5-ton rope block represents the limit of capacity in hoisting equipment is a job that requires careful consideration and forethought. A flanged mandrel was bolted to the faceplate and turned in position, and upon this mandrel the hub of the wheel was first assembled. Next, one of the rim segments to which an arm was cottered, was raised by means of the 5-ton blocks until it was directly over the hub in the lathe, when the corresponding arm was secured by cotters, or keys, to the hub.

With a plank brake under the edge of the faceplate

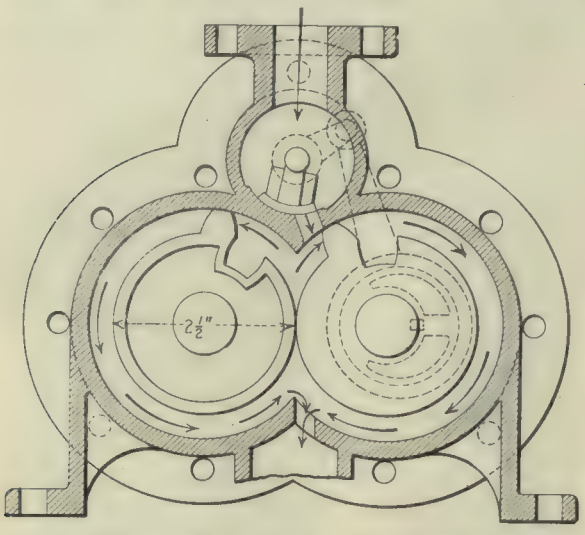


FIG. 3—SECTION OF ROTARY ENGINE

and the blocks still doing duty to forestall any unforeseen slip, the lathe was carefully rotated by pulling the belt until the segment was at the lowest point—down in the pit. A second segment was then placed opposite to the first and a condition of balance established. The remaining assembly was merely a repetition of the previous movements until all were in place, when all were securely bolted together and the wheel was ready for turning.

Because of the excessive overhanging weight upon the lathe spindle it was necessary to rig a temporary support under the outer end of the arbor, and this was done by placing a half box, fitted to the arbor, upon a pedestal that was secured to the floor plate. This remained in position while the wheel was being turned. When the turning was completed the wheel had to be dismantled and taken out of the lathe in the same way it was put in.

Utility of Cast Iron Floor Plates

The cast-iron floor plates of which frequent mention has been made were to us what a center line is to a draftsman—a point of departure from which all measurements were taken; and to which all set-ups and improvisations were made to conform. They cost several hundred pounds, but were worth, to that little shop as many thousands, for without them we could not have undertaken many of the jobs that with them seemed easy of accomplishment. So many and so varied were the uses to which they were put and so constantly were they employed as the basis of improvised rigging for doing unusual jobs that people who knew him were wont to say that what Ted Towlson (the writer's father, now long since dead) could not do with his floor plates and his brains, was impossible of accomplishment.

I have previously spoken of the little rotary steam engine used in the shop to furnish power at times when the shop engine was shut down, and in Fig. 3 I have endeavored to show a section through the cylinders that will enable the reader to grasp the details of its construction.

A duplex cylinder with intersecting bores having centers 2½ in. apart contained two revolving drums, each 3 in. long and each having a single tooth and space like a gear. These drums were geared together outside the case and one of the shafts carried an eccentric to operate the semi-balanced Corliss valve to admit and cut off the supply of steam at the proper moments.

The Drum Shafts

The drum shafts ran on ball bearings and had light leather glands to prevent the slight leakage that might occur around the stems. These glands and another at the valve stem were all the packing that was required. The drums ran very close to the heads of the cylinders but as there was no end thrust there would be no wear and consequently practically no steam leakage.

The engine ran at a speed of 1,600 r.p.m. on a gage pressure of 80 lb. of steam and furnished ample power to drive the milling head or lathe. It has often been used to drive large generators slowly for the purpose of truing up the commutators, and for turning wooden cogged mill wheels in place.

What Is a Screw Machine? —Discussion

By L. L. Thwing

I see from the article entitled "What Is a Screw Machine," appearing on page 177, Vol. 59, of the *American Machinist*, that Mr. Godfrey has been having another session with Johnson, who apparently is some relation to the late Mrs. Harris. I infer that Johnson is a modest man and not inclined to crowd his knowledge on us too fast. No doubt he knows what a screw machine is as well as any of us. He is probably old enough to remember that when he was learning his trade all screws, studs, etc., were turned on centers, which is a slow job and wastes stock.

Some time about the middle of the last century some Connecticut or Vermont Yankee conceived the idea of drilling a hole through the head spindle through which a bar of stock might be passed and gripped at the end by some sort of a chuck. This saved time because the pieces did not have to be centered nor the center holes turned off. Whoever made such a machine invented the basic principle of the screw machine.

Turrets were in use at that time and it probably did not take long to improve the original conception by the addition of a multiple toolpost. Whatever additions in the way of automatic chucks, wire feeds or cam activated movements have been added since are merely improvements and refinements of the original idea.

Today, when all lathes have hollow spindles, these cannot be used to distinguish screw machines. But we can say that any turret lathe that is equipped with automatic chucks, and bar or wire feed, is a screw machine. If it does not have these it is a turret lathe. If it is equipped for both bar and chucking work, it might be called a universal turret lathe.

Liability of a Collateral Contractor

BY LESLIE CHILDS

The right of the manufacturer to hold the collateral contractor liable for damages—A case of a contract providing for liquidated damages—Rules of the case

THE QUESTION of the right of a manufacturer, who contracts to complete a given contract upon a stipulated date or respond in liquidated damages for delay thereafter, to hold a collateral contractor, who contracts to furnish materials or supplies incident to the performance of the main contract, liable for such damages, where caused by the latter's default, is one of interest and importance to owners and executives of industrial plants in general. This point has been the subject of considerable litigation, and, while the holdings are not precisely in accord, it is believed the rule followed by the weight of authority may be fairly summarized as follows:

Where one enters into a collateral contract to supply materials or work, which are incident to the performance of another contract by his obligee, he may be held liable for all damages caused the latter by his breach of contract which were within the contemplation of the parties when the contract was entered into. If, then at this time, the collateral contractor has knowledge that his obligee may be compelled to respond in liquidated damages for delay in completing his contract, he (the collateral contractor) may be liable for such damages if caused by his default.

THE GENERAL rules for the ascertaining of damages in situations involving breach of contract by the collateral contractor are stated in part as follows:

"Those damages which are the natural and probable result of a breach of contract, those which the parties may reasonably anticipate as the effect of the breach under the particular circumstances of the case which are known to them when the contract is made, and those only, may be recovered in an action upon a contract.

"Proof of knowledge by the defaulting party at the time he makes the contract of special circumstances which make damages other than those implied by the contract, and naturally flowing from it, the natural and probable effect of its breach will warrant the recovery thereof."

The application of this rule of law is illustrated in a most striking and interesting manner in Northwestern Steam Boiler & Manufacturing Co., vs. Great Lakes Engineering Works, 181 Fed. 38. The facts and circumstances which culminated in the action were, in so far as material to this article, as follows:

The Great Lakes Engineering Works entered into a contract whereby it agreed to complete and deliver a steamship to the Cleveland Cliffs Iron Co. on July 20, 1905. The consideration for this undertaking was $380,000, and the contract provided that the engineering works should pay to the other $100 per day for the first ten days and $200 per day thereafter for any delay in completing the contract beyond the date specified above.

Thereafter, the engineering works entered into a contract with the Northwestern Steam Boiler & Manufacturing Co. whereby the latter agreed to construct and deliver two boilers for this steamship for a consideration of $12,450. This contract was entered into in January, 1905, and provided for the delivery of the boilers on June 1, of that year. The contract was not completed on time and the parties thereafter entered into another contract covering the boilers which provided for delivery on or before July 15, 1905.

At the time the first contract was entered into it appears that the engineering works informed the boiler company that the boilers were a necessary incident to the completion of the larger contract for the steamship; that it, the engineering works, was liable to the payment of $100 per day for the first ten days and for $200 per day thereafter for delay in completing the steamship; and that it, the engineering works, would hold the boiler company liable under this stipulation if completion of the steamship was delayed by a default in delivery of the boilers within the time specified.

The boiler company failed to make delivery according to the contract. The engineering works was unable, it appears, to complete the steamship within the time specified, and was compelled to pay the Cliffs Iron Co. $13,300. Six thousand dollars of this amount was claimed by the engineering works to have been caused by the delay of the boiler company in delivering the boilers. The instant action was thereupon brought against the boiler company in an effort to recover this amount.

The boiler company defended the action upon the grounds, among other things, that the $100 per day for the first ten days and the $200 per day for each day thereafter for delay, was so out of proportion to the profits it could have made on the boilers that these sums could not have been within the contemplation of the parties, as a possible liability of the boiler company when the contract was entered into. The contention being that the boiler company could not be held liable for these liquidated damages unless it agreed to be so

liable. The trial of the case resulted in a judgment in favor of the engineering works and the boiler company prosecuted an appeal to the higher court, assigning as error, among other things, the refusal of the trial court to instruct the jury that it, the boiler company, should not be liable for these liquidated damages for delay. The higher court, in stating the general rules for the ascertaining of damages in situations of this kind, in part, said.

GENERAL RULES STATED

"(1) Those damages which are the natural and probable result of a breach of a contract, those which the parties may resonably anticipate as the effect of the breach under the particular circumstances of the case which are known to them when the contract is made, and those only, may be recovered in an action upon a contract.

"(2) In the absence of proof *aliunde* of knowledge by the defaulting party at the time the contract is made of special circumstances which make other damages the natural and probable effect of a breach, such damages only as are implied by the contract itself, such as will naturally flow from its breach in the usual course of things, such as would reasonably be anticipated by the parties to such contracts in the great multitude of such cases, and such damages only, may be recovered.

"(3) Proof of knowledge by the defaulting party at the time he makes the contract of special circumstances which make damages other than those implied by the contract, and naturally flowing from it, the natural and probable effect of its breach, will warrant the recovery thereof."

Following the above statement of the general rules, governing the recovery of damages in situations of the kind involved in the instant action, the court directed its attention to the facts of the instant case to determine whether or not they brought it within the rules announced. In this connection it was, in part, said:

"There was evidence in the case at bar for the consideration of the jury to the effect that, before the contracts in suit were made, the boiler company was notified that the engineering works was liable for $100 per day for the first 10 days' delay in the completion of the steamship and for $200 per day for any delay thereafter, and that, if by its failure to complete and deliver the boilers at the time fixed by the latter contract it caused such a delay in the completion of the steamship, the engineering works would hold it liable for those damages.

"In the absence of evidence to the contrary, these damages appear to have been moderate and reasonable. They were stipulated to be the damages for the loss of the use of a steamship worth $380,000, and they do not appear to have any of the attributes of a penalty. The conclusion is that there was no error in the refusal of the court to instruct the jury that the boiler company was not liable for that portion of these damages which it caused the engineering works to suffer."

In conclusion, after considering other questions not material to this article, the higher court affirmed the judgment in favor of the engineering works rendered in the lower court. Holding, as outlined in the opinion, that in the light of all the facts, including knowledge on the part of the boiler company of the liability of the engineering works for these stipulated damages, it must be held liable for its proportionate share of such damages caused by its default.

The foregoing Federal case was well reasoned and its holding is without doubt in accord with the great weight of authority on the point decided. It illustrates in a most striking manner the great importance to the factory owner or executive of care in entering into contracts, which are from the standpoint of the obligee collateral to larger undertakings, which upon their breach may involve liability for liquidated damages based upon the cost involved in the larger contract. It is obvious that in such a situation the breach of such a collateral contract may entail a liability for damages far out of proportion to the sum of the contract price.

On the other hand, and looking at the case from the standpoint of the obligor in a large contract, who seeks to protect himself from liability caused by the default of one or more collateral contractors, who have agreed to furnish materials or supplies which are incident to the performance of the main contract, it is clear that it may be of the greatest importance for him to notify such collateral contractors of the probable liabilities entailed by a breach of the main contract. If this is done when the collateral contracts are entered into the obligee, as we have seen, may be in a position to protect himself from paying liquidated damages for delay upon his contract, at least to the extent such damages are caused by the default of the collateral contractors. Truly the case reviewed is one of force and value to every factory, manufacturing, or industrial executive, and its holding may with profit be kept in mind when contracts, similar to the one involved in the case reviewed, are being entered into.

Styles in Scratches—Discussion

BY HENRY K. SPENCER

There recently appeared on page 276, Vol. 59, of the *American Machinist*, an article under the title given above, by Frank C. Hudson, in which I was much interested. Mr. Hudson brings out the advances made in grinding very clearly.

I cannot, however, agree with one statement in the sixth paragraph which is, "and though the scratches show plainly, we now know that we cannot detect the depth with any measuring instrument." It is a rash statement in these days of optical methods of measurement to say a thing is so small it cannot be measured. However, in this case, it is probably not necessary to resort to optical methods. A micrometer carefully used will suffice to show the depth of the scratches on soft steel work, as ground on machines of the Blanchard type. This is done by grinding both sides of the piece, measuring it, then lapping both sides to just remove the scratches and measuring again. On cast iron, such as slide valves referred to in the article, the scratches would be more shallow and of course on hardened steel they would be very shallow, but no doubt their depth could be determined by measuring the thickness, lapping both surfaces, and measuring again, using a precision measuring machine instead of the micrometer.

It is, however, absolutely true that these scratches make no difference in the tightness of the joint formed by such ground surfaces.

In many quarters the prejudice against the curved scratches has entirely disappeared, and we find many people who look askance at any other kind of a finish because they suspect irregularities, rounded corners, etc., which cannot occur on the vertical-surface grinding machine product.

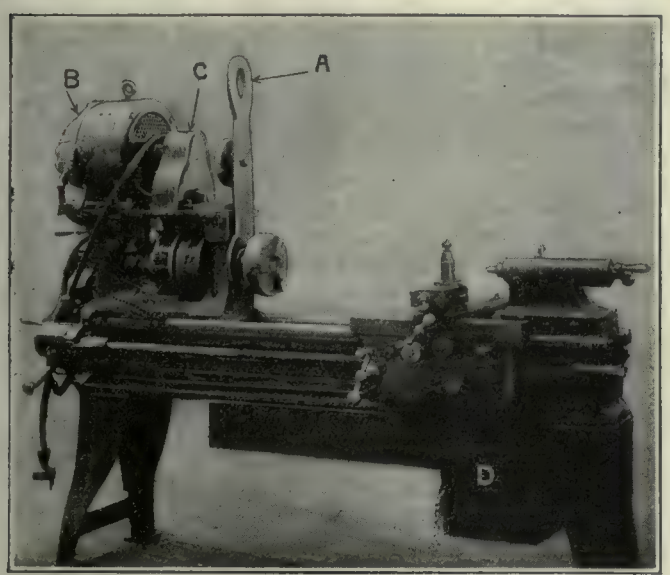
Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

A Portable Lathe

By Henry Barr

A short time ago, while in a railroad shop, I saw the portable lathe shown. They had taken a small size Lodge & Shipley lathe, bolted the eye *A*, to the headstock; mounted the motor *B*, on a bracket bolted to the top of the headstock bearings; connected the motor pinion to the large back gear by means of a gear train



A PORTABLE LATHE

under the guard *C;* and fastened a tool box under the bed at *D*. The whole outfit is carried from place to place by the crane, the hook being inserted in the eye *A*. An electric cable and plug connected to the motor make it easy to couple to the shop power-line almost anywhere. For many small lathe jobs this device beats sending the work to the machine shop.

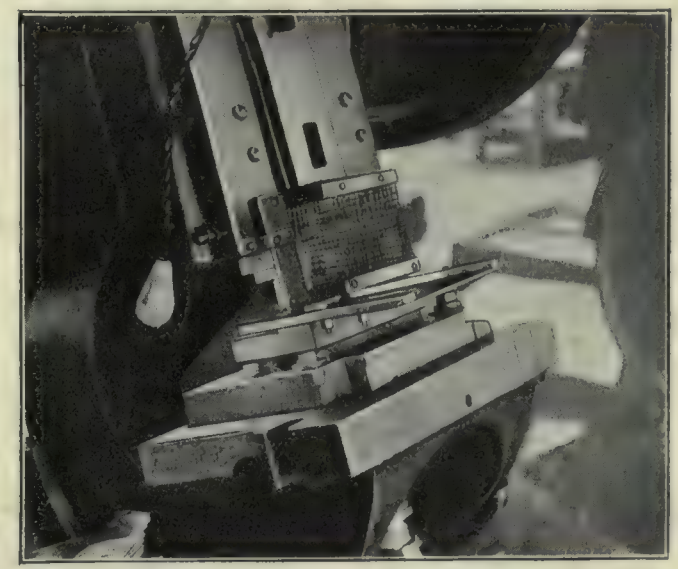
Stationary Guard for a Press

By William Denton

The press shown in the illustration is set up for a forming operation on sheet metal blanks. It is of the inclinable type and formerly stood in an upright position. It was not provided with a guard and the blanks were set in the tools by hand. The possibilities of accident were so great that the superintendent decided to guard the tools, and the means used to accomplish the result are here shown.

A sheet steel runway of suitable shape was made to attach to the top of the die and the press inclined so that when a blank is laid upon the projecting apron it will slide by gravity to its proper position in the die. The wire guard is attached to the gibs, and is stationary.

The operator places a blank on the apron and lets go, when the blank slides into place. The press is then tripped, the blank formed and, upon completion of the stroke, ejected from the back of the tools by a knockout.



A STATIONARY PRESS GUARD

The height of the guard above the apron is such that the operator cannot get his hand under it far enough to endanger his fingers, and if the press should be accidentally tripped while his fingers were under the guard, no harm would be done.

If a blank is displaced in the tools the operator is obliged to right it with a wire hook, or else get up from his position and go around to the back of the press, which he is not likely to do.

Turning Tapers on Old Lathes —Discussion

By J. T. Towlson
London, England

The setting over of the tailstock of a lathe for the purpose of turning tapers is an expedient of ever-present help in time of need, but of very doubtful value when accurate results are desired. Therefore the device described by Donald A. Hampson on page 809, Vol. 58, of the *American Machinist*, has its limitations.

When centers are thrown out of line by setting over the tailstock it may readily be seen that the conical surfaces of the center points no longer present a fair bearing to the work, but that such bearing as remains must necessarily be a line contact. Thus work turned on centers in this position generally requires excessive use of file and straight-edge.

A better way is to use ball-pointed centers and make hemispherical center holes in the work.

A Quick Acting Turret

By R. Delrue

The illustrations show a turret in which one turn of the binder handle to the left releases the stop and indexes the turret, while a fractional revolution of the handle to the right clamps the turret in working position.

The device as shown in Fig. 1, consists of a base *A* mounted on the lathe carriage by means of a dovetail slide on which the turret *B* revolves.

The operation is as follows: The binder handle is turned to the left and after making one fourth revolution, it comes in contact with the lower one of the nuts

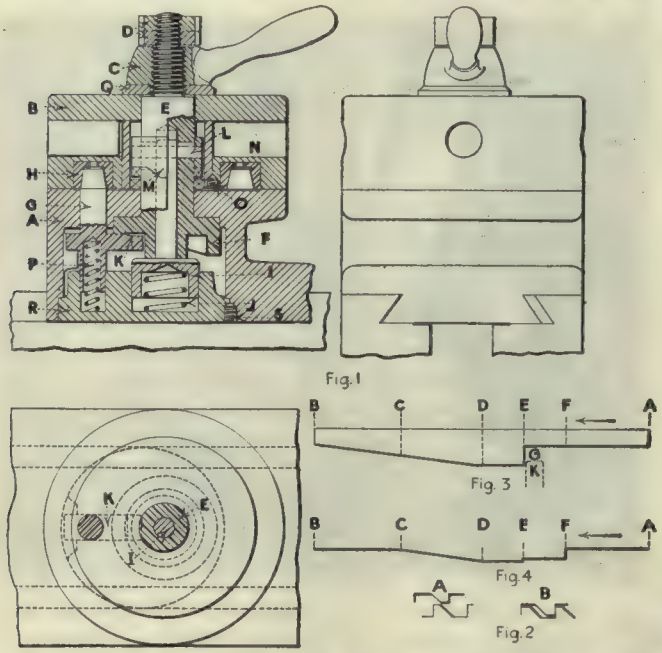


Fig. 1

Fig. 3

Fig. 4

Fig. 2

FIG. 1—QUICK ACTING TURRET. FIG. 2—TEETH IN ENGAGED AND DISENGAGED POSITIONS. FIG. 3—DEVELOPMENT OF THE CAM. FIG. 4—THE CAM PROFILE

D, bringing the stud *E* in rotation. Stud *E* has a cam-shaped flange *F* which acts on the index pin *G* and moves it gradually downward so that it is disengaged from the bushing *H*, leaving the turret free to revolve. To disengage *G*, one-half revolution is needed. The stud *E* is bored out to guide the coupling bar *I*, which is pressed upwards against *E* by means of the spring *J*. When the index pin *G* is brought down (through rotation of the cam *F*) its flange comes in contact with the coupling *I* and presses it down. By the downward motion of *I*, the pin *L* takes along with it the coupling sleeve *M*, in which four teeth are milled, meshing them with corresponding teeth in the bushing *N*. The engaged and disengaged positions of *M* and *N* are shown in Fig. 2 which also shows the form of the teeth and the clearance between them.

When *M* and *N* are in the position shown in Fig. 2, the turret is carried around, following the rotation of the binder handle after stud *E* has revolved 180 deg. When stud *E* has turned 45 deg. further, a sudden drop in the cam profile releases the index pin which is pressed upward by the spring *P*. This upward motion is very slight (about $\frac{1}{32}$ in.) and is not sufficient to disengage the coupling rings *M* and *N*. The pressure of the index pin against the under side of the turret acts as a brake, slowing its motion and assuring the engagement of the pin the moment one of the bushings comes in line with it. On entering the bushing, the index pin releases the coupling rings instantly. The next 45 deg. of revolution of the handle has no effect whatever on the mechanism, owing to the form of the cam *F*. When the stop-pin engages the bushing, the binder handle is turned to the right, clamping the turret firmly in position.

A development of the cam profile is shown in Fig 3. When the turret is in working position, the side *G* of the cam bears against the flange of the index pin as shown. When indexing the turret, the cam is moved in the direction of the arrow, and no action is imparted to the mechanism between points *E* and *A*. At point *B* the cam forces the index pin down and keeps it clear of the turret until point *G* releases it and allows it to press against the turret and act as brake. The index pin is engaged with one of the bushings at point *E*. The path of the cam is shown in Fig. 4. From point *E* to *A* and from point *B* to *C* no movement is imparted to the turret. At point *G* the contact between *M* and *N* takes place and the turret revolves until point *E* is reached. At this point the teeth of the rings come suddenly out of mesh as described above. As soon as this point *E* is passed, the index pin is released and comes in contact with the underside of the turret.

One of the most important points in this fixture is that after each indexing, the binder handle is brought back to its initial position, so that no interference between it and either work or the face is possible.

Turning Vitrified Abrasive Wheels

By William H. Cross

On page 952, Vol. 56, of the *American Machinist*, A. Lambercier of Geneva, Switzerland, tells of turning abrasive wheels with a steel tool. I have recently completed a similar job in much the same way and for the same reason; the bore of the wheels had to be enlarged in order to use them on a certain machine.

The wheels were 20 in. in diameter, $2\frac{1}{2}$ in. face and 7 in. bore, the latter having to be enlarged to 8 in. They were of Norton alundum, grain 24, grade M. I held the wheels for boring in a Cushman 4-jawed chuck, using pieces of heavy cardboard under each jaw to avoid damage to the wheel.

As I could not easily make my lathe run slow enough to follow Mr. Lambercier's method of using a steel tool, I used a "Champion" emery wheel dresser, the handle of which I cut off and welded on again at a right angle to its former position so that I had something like a right-hand boring tool.

Running the lathe at 200 r.p.m. with a feed of $\frac{1}{64}$ in. per revolution of the lathe spindle and taking out $\frac{1}{16}$ in. at a cut, I soon had the hole bored from 7 in. to 8 in. in diameter. As the wheel was $2\frac{1}{2}$ in. thick and my wheel spindle would open only to 2 in. between collars it was necessary to counterbore one side of each wheel to a depth of $\frac{1}{2}$ in. and to a diameter of $11\frac{1}{4}$ in., for which purpose I used a straight dresser of the same kind as that used for the boring.

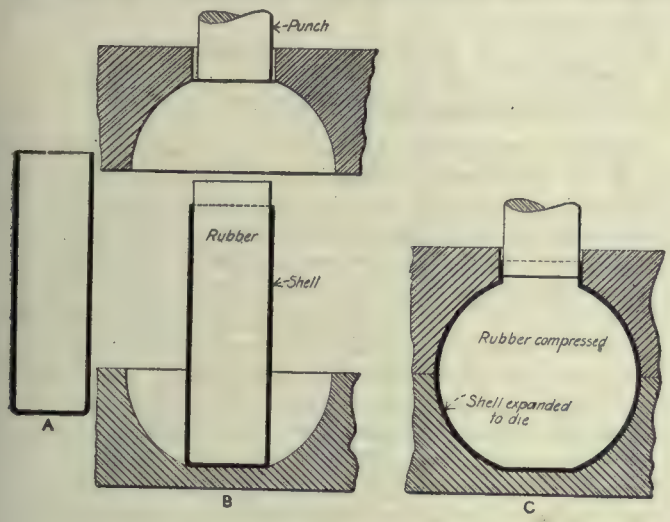
The time of boring and counterboring the wheels was approximately $1\frac{1}{2}$ hr. each, floor to floor. As one set of cutters finished two wheels, I think it was an economical method. It was possible to take out as little material as $\frac{1}{64}$ in. on the finishing cut, and leave a clean, smooth and true hole.

Expanding Light Shells

By L. M. Francis

The making of small shells requiring to be expanded below the neck, sometimes offers difficulties.

I have seen rubber successfully used for the expanding process and have at present in mind the pro-



EXPANDING LIGHT SHELLS

duction of a shell, having the lower part expanded in the shape of a ball about 2½ in. in diameter. The illustrations show the method used.

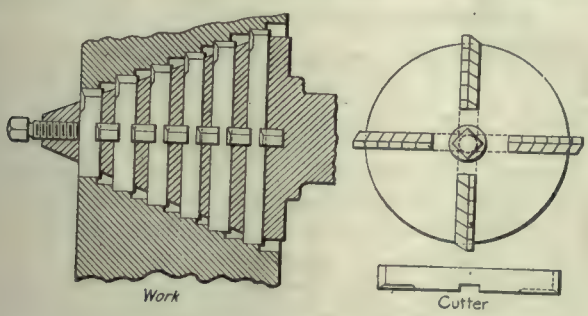
After the shell *A* has been drawn, a stick of live rubber is inserted and the whole placed in a die of the proper shape, as at *B*. In operating the press, the punch distorts the rubber so that it forces the shell to fill the die as shown at *C*. When the pressure is released, the rubber comes back to its original shape and can be withdrawn from the shell. Rubber of the right kind will stand long usage and can be used to expand several thousand shells of thin metal.

Rubber has been used in this way for expanding fairly large work and it would seem possible to employ the method described, to expand shells to irregular shapes and get very clear impressions.

A Taper Roughing Reamer

By Joe V. Romig

Roughing reamers used to break the scale and hog out the metal in cored holes are subject to rough usage and hard wear. On holes which are to be taper reamed,



A ROUGHING REAMER FOR TAPER HOLES

it is customary to first use a built up reamer of the interlocking-blade type for roughing. A head is turned up and slotted, as per sketch, and the cutters are inserted so that each successive cutter locks the one behind it, all being held by a set-screw tightened against the end cutter as shown.

When the cutters become dull, they can all be removed and sharpened. After the sharpening process has been repeated several times and the cutters are so small as to leave the bore with too much metal for the finishing reamer, they are taken out and a new cutter of the largest size is inserted in the proper slot, all the other cutters being advanced one slot toward the front and the smallest cutter discarded. In this manner the economy effected is very marked as most of the steel is actually used up. Because each cutter is rigidly held and well supported, tool breakage is held to a minimum.

Self hardening tool steel of rectangular shape is ideal for the cutters, and the notching in the center can be done with a rubber-bond grinding wheel. The heads are practically indestructable.

Improvising a Small Pulley

By Theo. Kruse

I recently had occasion to set up a slow-running machine that was to be driven directly from the line shaft, and required a pulley only 1 in. larger than the shaft, which was 1⅛ in., to give the desired speed. As it would be inconvenient to make a pulley with a bore so large in proportion to its outer diameter I adopted the expedient of wrapping gummed paper, of the kind used to seal cartons, around the shaft.

Having first scoured the shaft clean with abrasive cloth, I applied the paper by allowing it to run onto the shaft, unwinding from the roll and passing over a moistened sponge. When the desired diameter was reached I laid on a few turns of adhesive tape to secure the paper and to make a slight crown on the improvised "pulley."

The work required but a few moment's time, and the pulley is still running, with perfectly satisfactory results.

This scheme may be of help to others under like circumstances.

Making Piston Rings Round —Discussion

By E. V. Allen

I note on page 224, Vol. 59, of the *American Machinist*, a comment by Leonard A. Gary on my original article under the title given above. The method described by Mr. Gary will not make the rings round. It is common practice, I admit, but it isn't accurate.

If Mr. Gary doubts my statement regarding the roundness of rings produced by his method, let him carefully "Mike" one of his finish-ground rings over the split and then at a right angle to the split. He will find that the ends of the ring "stick up," and it is for this very reason that we bend the ends inward before grinding them, as I described. After bending we use practically the same method outlined by Mr. Gary. Owing to our method of bending, our rings are really round when finished.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors

September 13, 1923

The Machine Tool Builder and the Procrastinating Purchaser

PROCRASTINATION is the thief of other things besides time when it leads an intending purchaser of a machine tool to postpone placing his order until tomorrow, or next month. The first loss, of course, is suffered by the customer himself who loses the profitable productive use of the tool during the time it takes him to bring himself to the point of placing the order.

The second loss is to the community as a whole. A potentially productive machine, idle from whatever cause, represents a certain amount of processed raw material and human intelligence, skill and effort withheld from useful work. While it awaits its opportunity for service, men somewhere are doing the work it was built to do, either laboriously by hand or with some less efficient machine. Dr. Steinmetz predicts that before many years have passed those who do the productive work in our mills and shops will be able to produce all that civilization needs by working four hours daily. He may be right, but that day will never dawn so long as productive machines stand idle in the builder's shop or on the dealer's floor.

But why should there be any finished machines in stock? Simply because it takes from three to four months to complete the average machine tool which, if compared to its best known product, the automobile, is in the Rolls-Royce rather than the Ford class. The builder, therefore, in order to take care of some of his rush order customers and also to keep his working force intact, must build a certain number of machines on speculation. The rush order is the bane of his existence. If it could be eliminated it would be possible for him to plan his production so that overtime would be done away with and the extreme peaks and valleys of the business curve flattened to a considerable extent.

As a matter of fact, the rush order for equipment is practically inexcusable in a modern business. With all the aids to business navigation that now exist ready to the hand of the commercial pilot, there is every reason to believe that a rush order indicates negligence or plain ignorance. It shows either that the purchaser knew he was going to need the machine and procrastinated about placing the order or else that he could not look far enough ahead to foresee the need in time to have it supplied in the regular way. The result of his lack of ability is that the machine tool builder's plans are upset by the last-minute order which he is anxious to fill if possible. There is a natural tendency to give such an order the preference over orders placed ahead without apparent need for hasty fulfillment and thus the interests of the really deserving purchasers suffer.

It takes considerable backbone to put such a purchaser in his place at the end of the order list, particularly if his organization is a large one. Yet it is the only safe thing to do as well as the just one, for the man who places his order early is the one likely to stay in the game longest and it is poor policy to run the risk of losing his business for the sake of pleasing the rush order procrastinator who thus proclaims his inefficiency.

Another Air Mail Achievement

THE introduction of beacons, or land lighthouses, has made possible continuous flying by the air mail pilots, and reduced the time for mail from four and one half days to twenty-eight hours. The service is, to be sure, still an experiment. But its possibility has been clearly demonstrated in a practical way.

There have been so many changes in transportation methods during the past thirty or forty years (the bicycle, the automobile and the airplane) that we do not fully appreciate the advances which have been made. It is hard to realize that, up to one hundred years ago, transportation remained at practically the same point as it had for thousands of years. The horse was still the fastest method of travel so far as mankind was concerned.

In this connection it is of interest to note that the first transcontinental mail service had two features in common with the latest development. The mail carried by the Pony Express was relayed in pouches from horse to horse and from rider to rider, just as the air mail was relayed from plane to plane and pilot to pilot. The striking difference is that the new method saves about twenty-three hours out of the day. In other words the airplane covers in an hour approximately as much distance as the Pony Express did in a day.

Night flying marks a new epoch in aviation. And the Post Office Department once more leads the world in the practical development of commercial flying. There are of course, likely to be occasional delays, as in any kind of transportation. But the mail service has proved that it is not only possible but practicable, and has added fresh laurels to its achievements in this line.

With well lighted air lanes and landing fields, commercial aviation should receive a new impetus. With the growth of aviation, as it is bound to grow, must come more and better airplanes, motors, instruments and other accessories. And all these add to the field for machinery of all kinds.

The Danger of Ultimatums

THERE is more lurking danger in an ultimatum than in anything we know of. It does not matter much whether it is the coal controversy or the Italian-Greek clash, the ultimatum stands in the way of a peaceful settlement. It was Austria's 24-hour ultimatum to Serbia which started the world war, and yet we seem not to have learned that an ultimatum is more dangerous that T.N.T. or poison gas.

Whoever issues an ultimatum gives notice that his case will not stand scrutiny by impartial eyes, so that it becomes almost an admission of unfairness. Abolishing ultimatums would be almost as much of an achievement as disarmament.

News Section

Railway General Foremen Hold Successful Convention

The seventeenth annual convention of the International Railway General Foremen's Association, held at the Hotel Sherman, Chicago, Sept. 4, 5, 6, and 7 was exceptionally well attended and successful from every standponit. The convention was called to order on Tuesday morning by J. B. Wright, the president, and invocation was asked by Rev. Robert O. Cooper of Chicago. President Wright delivered his annual address in which he reviewed the work of the association during the past twelve months and outlined the problems that were facing it during the next year.

On Wednesday, James C. Davis, director general of the railroads delivered an address that was especially interesting and thoroughly enjoyed by the members. Shop efficiency in the locomotive and car departments was the subject of a paper that was read by A. F. A'Hearn and Charles F. Baumann.

INTERESTING PAPERS

On Thursday papers were read by F. J. Spangenberger and W. S. Buntain. The former took as his subject the general repair methods and maintenance of valves, valve gears and power reverse gears and Mr. Buntain read a paper on the topic of general repair methods and maintenance of stokers, coal pushers and air fire doors. Discussions were also held on Thursday on various subjects. G. H. Logan conducted a discussion on shop kinks in the locomotive and car repair departments, while H. T. Cromwell was the chairman in a discussion on the welding of tires, flanges and other similar objects.

A motion picture showing the manufacture and uses of oxy-acetylene gas and equipment was shown on Friday and a talk on the subject was delivered by A. S. Kinsey, professor of shop practice at Stevens Institute of Technology.

The following officers were elected for the ensuing year: George H. Logan, of the Chicago and Northwestern R.R., president; H. E. Warner, of the New York Central R.R., first vice-president; Charles A. Barnes, Belt Railway, Chicago, second vice-president; B. L. Davies, Chesapeake and Ohio R.R., third vice-president; F. M. A'Hearn, Bessemer and Lake Erie R.R., fourth vice-president; William Hall, Chicago and Northwestern R.R., secretary and treasurer.

There were 71 exhibits and the registration showed an attendance of 102 foremen. There were excellent entertainments provided during the evenings and the entire convention was one of the most enjoyable and profitable ever held.

Southern Pacific's Expansion Plans

Improvements recently ordered by the Southern Pacific System will cost when completed $50,000,000, according to representatives of that system. This is in addition to the $40,000,000 that the railroad will spend this year in new equipment, including freight, passenger and refrigerator cars and additional locomotive power. The majority of the new improvements that have been ordered have for their purpose the improvement of the service of the railroad on the Pacific Coast.

Part of the $50,000,000 in new construction will include the building of new classifications and industrial yards, freight terminals, rock crushing plants, station buildings, additional shop equipment, replacement and strengthening of bridges, line changes to eliminate curves, new and heavier ballasting and heavier rails.

Canadian Companies Will Pool Patents

Following the example of a number of manufacturing companies in the United States, a group of electrical companies in Canada have agreed to pool their patents for the common good. Under the arrangement each of the companies agrees to license all the other companies within their natural field. The companies agreeing to the arrangement are the Canadian General Electric Co., the Marconi Wireless Co. of Canada, the Canadian Westinghouse Co., the Bell Telephone Co. of Canada, the Northern Electric Co., and the International Western Electric Co. Under the agreement the Marconi company will have access to all wireless patents, the Bell Telephone Company to all telephone patents, etc. The Canadian agreement is for the life of all existing patents and also covers future patents or application for patents.

Ford Report Shows Record Earnings

The Ford Motor Co. on June 30 last had a total cash balance of $210,293,922, assuming the good will item unchanged at $20,517,986, according to a compilation made public by Dow, Jones & Co. This is the largest sum ever publicly disclosed by the Detroit motor concern and is the largest cash holding ever reported by any industrial concern in the world.

The minimum profits indicated for the four months ended June 30 by a comparison of profit and loss surplus of the company's June 30 report and with a more detailed report filed in Massachusetts, were $54,351,560. Allowing for moderate depreciation, earnings on the Ford capitalization of 172,645 shares of stock are now placed in the "four-figure class." All these profits accrue to the Ford family, in which the entire ownership of the company is vested.

ENORMOUS CAPITAL

Total assets of the Ford company are $597,000,000, compared with less than $100,000 twenty years ago, when it was organized in the state of Michigan. At that time Henry Ford's total capital investment was only $28,000, some of which had been subscribed by friends of the present "giant of the motor industry."

The present surplus account of $414,129,158 compares with $359,777,598 reported on Feb. 28 last, $240,478,736 on the corresponding date of the preceding year, $182,877,696 on April 30, 1921, and $165,679,132 on June 30, 1920.

The Ford company at the present time is contemplating a program of expansion, it is understood, that will involve extensive purchasing of machine tools.

Gain in Machinery Export Total

Exports of metal-working machinery during July, 1923, with revised comparative figures for July, 1922, as compiled from the returns to the Department of Commerce were as follows:

	July 1922 Value	July 1923 Value
Lathes	61,443	96,780
Boring and drilling machines	28,059	67,505
Planers, shapers and slotters	33,881	32,538
Bending and power presses	7,351	19,030
Gear cutters	25,791	20,371
Milling machines	27,597	17,913
Thread cutting and screw machinery	16,756	27,913
Punching and shearing machines	9,222	16,666
Power hammers	8,973	20,005
Rolling machines	129,881	6,010
Sharpening and grinding machines	54,483	87,102
Chucks, centering, lathe, drill and other	17,519	36,504
Reamers, cutters, drills and other parts for machine tools	89,485	220,867
Pneumatic portable tools	41,980	54,946
Foundry and molding machinery	28,467	26,362
Other metal-working machinery and parts of	493,410	392,209
Total metal-working machinery	1,074,299	1,142,721
Automobiles and chassis (total)	5,165,643	9,405,885

Opportunity in Japan's Rebuilding Program

It is understood upon reliable authority that the Department of Commerce is making plans to care for the unusual situation in Japan caused by the recent earthquakes. Rebuilding will no doubt require many American machines and tools, and the representative, who it is expected will be appointed, will be on the ground to care for the interests of American manufacturers.

Railroads Buying in the New York Machine Tool Markets

After a week of extreme quietness, the majority of dealers in the New York district report improved business and a bright outlook. Railroads are the purchasers this week and reports come to the Metropolis that the Pennsylvania, New York Central and New York, New Haven & Hartford railroads are all purchasing rather heavily and that all of them also have important and formidable lists out.

Considerable buying and inquiring is reported from the American Locomotive Co. and from the General Electric Co. Several deals of considerable proportions were reported during the week with these two concerns and it is understood that further purchases will probably be consummated during the month.

Automobile manufacturers are inquiring persistently. One maker of a popular priced car made near New York has been to nearly all dealers in machine tools with a request for catalogs and price lists. Buying is expected within the next week from this source.

Expansion is more noticeable among the general industrials at this time than at any time before this year. One dealer reports that he has recently closed a contract amounting to more than $60,000 for new machine tools to be used by a manufacturer who has recently taken on more space.

The future for business during the Fall months and up to the first of the year is regarded as good with the word "steady" being used to either characterize the hopes or the anticipations of the dealers.

Dealers in used machinery report business as much better than during the months of June or July with industrials doing the buying. Difficulty has been expressed by dealers in these lines in obtaining just what they want in the way of machine tools, especially of the heavier types.

Pittsburgh Trade on Sound Basis

While the midsummer dullness hangs on to a certain extent, the machine tool and equipment market in western Pennsylvania encourages the trade by reason of its soundness, with conditions somewhat improved over that of a few weeks ago, and inquiries becoming more numerous week after week. This is taken to mean that as soon as specifications are approved there will be a lot of orders entered upon the books of the dealers in this district. The Pennsylvania R.R. has a large list of needs for its lines West, and it is expected that purchases will be made this month, as indeed some have already been made, after the necessary tabulation had been attended to at the Philadelphia offices.

As to buying, there is always something doing along this line, involving from two to four machines at a time, those particularly noticed in the past few days being two 28-in. shapers to a Western user; a 60-in. boring mill to a Pittsburgh manufacturer; one each motor-driven lathe and shaper to a coal company across the state border in West Virginia; and a number of small items of machine tool and equipment by the other dealers.

Business More Brisk

There has been a slight impetus given to the machine tool trade by the structural shop and plate working machinery movements, which have accelerated orders in small tools. A local company closed on approximately $40,000 worth last week, and is figuring on increasing this complement. It cannot be said that there are any large lists in new inquiries, yet a better rate of inquiry right now indicates good business for September and October.

There seems to be some shopping around by dealers in used machinery, especially in certain styles of machines that are scarce, one inquiry from the South covering ten small machines. Among the sales of such last week was a 30-in. planer and a vertical boring mill to two Pittsburgh users.

Among the inquiries sent out by the leading steel manufacturers were about fifty items, including cranes for the Carnegie Steel Co. and the Jones & Laughlin Steel Corp. It is believed that the first named concern will be in the market soon for locomotive cranes at its Mingo Junction and Edgar Thomson plants. Several traveling cranes were recently bought and installed by the Railway Steel Spring Co. at Latrobe, Pa., while the Cambria Steel Co. bought tables, shears, etc., from the Mesta Machine Co.

Canadian Trade Is Improving

Business conditions throughout Canada have shown no marked alteration during the last two or three weeks except that unusual midsummer dullness is drawing to a close. For the time being, attention is riveted on western Canada where the situation is better than it was a year ago, and considerably better than two years ago. Harvesting is sufficiently advanced to warrant a prediction with reasonable certainty as to the wheat production of 1923. As crop cutting nears completion and threshing operations advance, estimates as to quantity and quality are more liberal than those founded upon conditions existent three weeks ago.

In manufacturing, the output is being measured by ascertained demand in most lines both as to domestic and export requirements. Canadian automobile plants are reported to be operating at capacity and some manufacturers are expecting an increasing market. Sentiment in the metal market is decidedly hopeful as to the immediate future.

Future Looks Bright

In many instances it is said that the downward trend of prices has been checked at least for the time being. With the readjustment of labor troubles in Cape Breton, the production of iron and steel will be enhanced by the normal output of the British Empire Steel Corp. Improved buying of steel stocks, particularly machine tools is reported by Montreal and Toronto dealers.

The labor situation is now much more favorable and a further small increase in the volume of employment was reported by the Dominion Bureau of Statistics at the beginning of August. Employment in the manufacturing industries on the whole was less active than at the beginning of July.

The temporary outlook for a few months at least is good. Beyond that, uncertainties prevail. Building construction, large railway expenditures, and the spending of high wages throughout the industrial districts, have created an enormous volume of consumption. That this is still going on, the record of freight loadings bears evidence. These for the first seven months of this year were twenty per cent greater than the average for the same period in the preceding four years.

Milwaukee Reports Improvement

A survey of the foundry and machine shop situation in Milwaukee for the first ten days of September reveals evidence of a further improvement in the number and volume of orders being booked. At the same time sales of machine shop equipment of all descriptions have increased, even if in lesser proportion. Tool trade is not yet so active as might be desired, yet it is gratifying in the fact that steady betterment can be noticed. The steady nature of patronage of machine shops is accepted as a forerunner of heavier tool trade in due course.

Automobile shops continue to be the most active buyers of machinery as well as the heaviest buyers patronizing foundries and machine shops. It has been surprising that buying of units, parts and other materials, as well as accessories, should reach the proportions noted in July and August. Manufacturers as a rule have in past years slowed down orders as July 1 approached, and demand did not then again rise until the middle of August, after new production schedules had been outlined for the Fall and Winter season. This year there was hardly a break and local shops have had the benefit of a steady run of orders throughout the year, with every reasonable prospect that there will be no sharp peaks and valleys in the course of demand until at least Dec. 1.

The Railroad Trade

Local machine tool manufacturers have received some orders from railroads for shop equipment, but the principle business traceable to railroad sources has been with manufacturers of railroad supplies and materials. On the whole, the volume of this business has been below expectations, but the hope that it will reach expected proportions has not passed.

General industrial metalworking shops have continued their policy of buying only against bare necessities, and taking used tools as an economy when their condition will bear comparison with new tools. This character of buying prevents volume. It appears that for the present the majority of concerns are satisfied with existing capacity and probably will take no steps to provide further capacity until next

Spring to avoid high costs of buildings and equipment. Only a marked increase in new business, with features pointing to a sustained character of such patronage, can induce substantial enlargement of works during the coming four to six months in the opinion of authorities.

It is to be noted that while the organization of new concerns in the metal trades field is increasing, none of them has the appearance of the magnitude which will mean acquisition of round lots of equipment, or large volume orders for tool concerns. Nevertheless, these enterprises are helping dealers in used equipment to make prompt disposition of considerable numbers of items, which is keeping stocks from reaching an undue and uncomfortable size.

The labor situation has experienced a little relief with respect to ordinary, common workers, but skilled men are still exceedingly scarce. It is said, however, that the excessive turnover noted in the first half of the year and which showed a slight decrease in July, improved further in August.

St. Louis Hopeful of Improvement

A considerable degree of irregularity exists in the machine tool market in St. Louis. The hoped-for improvement has not arrived. There are some shops that are doing a good business, while others have cut the working hours of their forces or have made cuts in the number of men employed. But on every hand there is evidence and belief that business will be better. The railroads of the Southwest report car loadings that surpass all previous records, prospects for large crops are good and the automotive industry has shown no appreciable decline in production.

But when it comes down to buying machine tools it is or seems to be a different matter. The railroads after a little flurry of buying lapsed back into their Summer habit of purchasing practically nothing. The automotive plants are buying some boring tools at present and this seems to be the only line in which there is any active demand.

Money Is Slow

Collections are not what they should be, some firms reporting that they are having difficulty in keeping their collections up to date and only a few bills are being discounted. Even those firms which are in the habit of paying their bills promptly are slow in making remittances, it is stated.

The Federal Reserve Bank statement for the eighth district in regard to iron and steel products reports that, "Some improvement in new buying in this classification took place during late July and the first half of August was marked further betterment. Buyers generally seem more disposed to accept current prices and many heavy consumers who have deferred filling their wants in hopes of more favorable terms are now coming into the market. There was the usual seasonal slowing down in operations at mills, foundries and machine shops, but plans are being made to increase production with the return of cool weather."

Improved Conditions Reported from the Chicago Markets

There is some improvement in sales and inquiries in the Chicago district and dealers anticipate a better market during September. There appears to be a tendency on the part of several concerns whose inquiries have not been closed to make purchases now and dealers hope that the curve has turned upward. They do not, however, expect a rapid upward movement but rather a gradual increase in business until the end of the year. Consumers do not anticipate lower prices of machine tools and the establishment of the eight-hour day in the steel industry appears to have given some reason to believe that if there is any changes in prices it will be upward.

Punch presses seem to be the best sellers this week, but a few lathes have been sold. Railroad buying is quiet. The Pere Marquette Ry. is said to have purchased three 5-ft. radial drills, one rod borer, one 42-in. vertical milling machine, one 53-in. boring and turning mill, one 36-in. slab milling machine, one 44-in. boring and turning mill, one 36-in. planer, one 100-in. tire boring and turning mill, a locomotive axle journal turning lathe, one 1,500-lb. steam hammer, one 2500-lb. steam hammer, one 6,000-lb. steam hammer, three axle lathes, and one plate flanging clamp. The Central R.R. of N. J. is about to issue an inquiry for a number of machine tools. Dealers in second hand machine tools report a fair business with prospects for improvement in the Fall.

Railroad buying of iron and steel rails featured the iron and steel market during the week. Around 80,000 tons were placed by several important carriers and inquiries were in the market for additional tonnages. Production of steel continued to decline, although new orders registered a slight gain. Prices were being well maintained and less talk of advances was noted. Marked advances in old iron and steel were reported in the Chicago district, with dealers speculating freely.

Inquiries Increase in Buffalo

The most hopeful sign of recovery from the dullness that has been so obvious in the Buffalo machinery market since about the first of July, is the large number of inquiries that local distributors have been receiving during the past ten days. While there is a more active interest evident in many lines of manufacturing, few actual orders are being closed and so far as sales are concerned the market might still be said to be at a standstill.

One representative of a large distributing company, however, is quite optimistic. According to this office, if the company can close a fair share of the outstanding inquiries that have come in and on which the company has been working during the past five or six weeks, it will be assured of at least a normal September and October business and if anything beyond this developes these two months promise to be far over normal.

In general, machine shops are quiet, with a few scattering orders for single items, but no large lists out. The automotive field is only fairly active. The recent announcement by a radiator manufacturing concern in the western New York territory that it would immediately begin the erection of an addition to cost $500,000, including machinery, promises to liven things up a bit.

Large machinery sales are dull, one firm stating that an order for a boring mill placed the latter part of June is practically the only piece of heavy machinery they have sold this Summer.

The railroads are buying a little machinery, although mostly light tools.

The crane market would be better if manufacturers could fill their orders. Some firms, however, are now booking for 1924 delivery and local representatives report that it is difficult to close any orders five or six months ahead.

Firms which handle such things as safety valves, gages and other boiler trimmings for house radiation report a fairly steady demand with some very sizeable orders being placed.

Practically no orders are being placed in the Buffalo field by large central stations for motors, generators, transformers, switchboard sets and the like, but as many of these corporations are controlled by interest in New York and Philadelphia, this condition is probably not a true index to actual conditions.

Safety Council Will Meet in October

New York State, through the agency of the State Department of Labor, will play a prominent part in the twelfth annual congress of the National Safety Council, which meets in Buffalo during the first week in October.

Three thousand five hundred industrial safety experts from all parts of the United States, Canada and a number of European countries are expected to participate. The congress, which meets this year in conjunction with the annual safety conference of the New York State Department and the convention of the American Association of Industrial Physicians and Surgeons, will be the most important ever held in this country by agencies which are actively engaged in the effort to reduce the number of accidents and deaths in industry, the State Department of Labor announces.

More Modern Railroads for Japan

The speedy rebuilding of Japanese railroads and the replacement of equipment destroyed by the earthquake by the most modern types, is expected by railroad engineers and executives of locomotive companies in the United States. Among them the belief generally prevails that the credit of Japan is sufficiently sound to provide for the financing of such replacement.

Personals

C. B. WHEELER has been appointed general manager of the Cincinnati Screw Co., Loveland, Ohio, succeeding I. W. PETTINGILL, who has resigned.

H. R. GEIGER has been appointed the New York manager for the Standard Turbine Corp., Wellsville, N. Y. His office is located at 350 Madison Ave.

JOHN G. PANGBORN, F. E. WOLF and H. D. GATES will be in attendance at the booth of the Pangborn Corp., Hagerstown, Md., at the International Steel Exposition to be held in Pittsburgh, Oct. 8 to 12.

WILLIAM HALL, representing Spear & Jackson, Ltd., Sheffield, England, manufacturers of tool steel, hardware lines and tools, is visiting in Toronto. He is making a trip around the world on behalf of his firm, and while in Canada is visiting the customers and representatives.

E. D. SPICER, Wellsville, N. Y., has resigned his position as works manager of the Kerr Turbine Co. to become the general manager of the Standard Turbine Corp., Wellsville, N. Y.

GEORGE WHITE has been appointed superintendent of the Davis Boring Tool Co., St. Louis, Mo.

A. D. STEWART has been appointed branch manager of the Butte, Mont., office of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., succeeding R. J. COBBAN, who has been transferred to the Seattle office where he will give special attention to mining problems.

N. B. NORRIS has been appointed manager of the New Orleans office of the Pawling & Harnischfeger Co., Milwaukee. His headquarters will be in the Whitney-Central Building.

C. M. DAVIS has been appointed manager of the reamer department of the Davis Boring Tool Co., St. Louis, Mo.

J. C. MCELROY, who has been the district manager of the Cleveland district for the Merchant & Evans Co., Philadelphia, has been transferred to the Detroit district as manager.

ROLLA WELLS, the receiver for the United Railways Co., St. Louis, Mo., has been authorized to spend $1,218,806 for equipment, repairs and improvements during the remainder of the year.

L. C. LAMONT has been appointed office manager of the Los Angeles office of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., succeeding J. R. DEERING, who has resigned.

JAMES VAN BUSKIRK has been appointed manager of the Detroit office of the Pawling & Harnischfeger Co., Milwaukee. His office is located at 1124 Book Building.

S. J. CARROLL has been appointed manager of the Cleveland district for the Merchant & Evans Co., Philadelphia. His headquarters are at Champlain Ave. and West Third St.

RALPH H. ACKERMAN, who for nearly two years has been chief of the Latin-American division of the Bureau of Foreign and Domestic Commerce, has been appointed commercial attache at Santiago, Chili, and will leave for that post about Sept. 15.

A. G. CROCKER, formerly special power representative for the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has been appointed manager of the industrial division of the Detroit office, succeeding E. A. WOOTEN, who has been assigned to other work.

N. S. BATES, for many years connected with the Pratt & Whitney Co. in the capacity of superintendent of equipment, has resigned and on Oct. 1 will take up the duties of works manager at the plant of the Hartford Special Machinery Co., of Hartford, Conn.

LEON W. GRAHAM, for the past 13 years paymaster for the Greenfield Tap & Die Corp., Greenfield, Mass., has been elected assistant treasurer of the concern.

GEORGE K. SCHIELDGE, works manager of the Hartford Special Machinery Co., Hartford, Conn., has resigned that position and will devote his entire time to the management of the Stacy Machine Works, Springfield, Mass., of which concern he is part owner.

WILLIAM IVES will be in charge of the recently opened sub-office of the Baltimore branch office of the Westinghouse Electric & Manufacturing Co., at Norfolk, Va.

J. E. HAUSER will be in charge of the newly opened Toledo office of the United States Electrical Tool Co., Cincinnati. The Toledo office will be located at 110 and 112 Eleventh St.

Obituary

JOHN EDWARD SNYDER, senior partner of the firm of J. E. Snyder & Son, Worcester, Mass., died on Aug. 25. Mr. Snyder was one of the early builders of vertical drilling machines and was a well-known figure in the machine tool industry in New England. The business will be continued by his son Milton C. Snyder, the junior member of the firm.

DANIEL BEST, aged 85 years, founder of the Best Manufacturing Co., San Leandro, Calif., died recently in that city.

EDWARD L. MILLS, president of the Mills Iron Works of Los Angeles, Calif., manufacturing oil well tools, died at his home in that city Aug. 20. He was born in Williamsport, Pa., Oct. 29, 1869.

JOSEPH BAKER, aged 77 years, pioneer foundryman of Belleville, Ill., and proprietor of the Baker Stove Works, died in that city following a long illness.

J. M. WOOD, superintendent of the Knoxville Iron Works, Knoxville, Tenn., died recently in that city following an attack of heart disease. Mr. Wood was 64 years of age and had been with the Knoxville Iron Works for several years.

WILLIAM WILLIAMS, general superintendent of the Interstate Iron & Steel Co., of East Chicago, died suddenly when stricken with apoplexy.

Business Items

Bannon & Suit, with general offices located in the Masonic Temple, Raleigh, N. C., is the name of a new company that has recently been formed by George C. Bannon and Arthur M. Suit, to engage in the machinery distribution business, and the general distribution of equipment used by contractors and builders. The company also maintains a warehouse at Raleigh. George C. Bannon for some time has been connected with the Austin Machinery Corp., of Toledo, O., as a sales engineer, while Mr. Suit has been with the same company as assistant to the president.

It has been recently announced by Evan J. Owen, president of the Eureka Foundry Co., of Gadsden, Ala., that the company has decided upon a program of expansion to be carried out this year, the plans including general improvement and enlarging of the plant, its capacity to be materially increased as a result. The investment will amount to several thousand dollars.

Ground is to be broken at once for the new $3,000,000 print paper plant to be built on Ronawanda Island, near Buffalo, by the Daily News Print Corp., allied with the Canadian Paper Co., at Thorold, Ont., Canada. The machine room of the new plant will be 380x93 ft., the beater room 145x130 ft. The main building will be 400x150 ft.

The Detroit office of the New Britain Machine Co., New Britain, Conn., has been moved from the Garfield Building to the General Motors Building.

The Standard Turbine Corp., Wellsville, N. Y., announces that it has appointed the Percy E. Wright Engineering Co., in the L. C. Smith Building, Seattle, Wash., as its Seattle representative.

Plans to merge the Springfield Malleable Iron Co. of Springfield, Mass., with the Arcade Malleable Iron Co. division of the Baldwin Chain Manufacturing Co. of Worcester, Mass., have been announced. The Springfield plant will retain its name, but the main offices will be in Worcester. The concern will take over the foundry end of the Baldwin operations. Capitalization will be increased to more than $1,000,000. Henry P. Blumenauer will continue as president and manager. The Springfield Malleable Iron Co. was formed last Spring, when the foundry of the Harley Co. was bought from the Hendee Manufacturing Co. The plant is devoted to manufacture of brass, bronze, aluminum and malleable iron castings.

Stockholders of the Oneida Motor Truck Co., Green Bay, Wis., have accepted the proposition of L. W. Melcher, formerly its general manager, and his associates, to take over the entire assets on condition that approximately $500,000 of mortgage bonds be cancelled and bondholders accept from 50 to 85 per cent of the face of bonds in stock in a new corporation, according to the classification of their holdings. The Oneida Mfg. Co. already has been incorporated in Wisconsin with $500,000 capital by Mr. Melcher. In addition to continuing the manufacture of motor trucks, the new company will enter the field of gasoline railway coaches and cars, and wood and metal specialties.

The Ford Motor Co. has ordered from the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., four 4,500 kva., 13,200 volt, three phase, 60 cycle, 72 pole, 100 r.p.m. vertical waterwheel generators with thrust bearings and direct-connected exciters. The order was placed through the Stone & Webster Co., Inc., contractors.

The generators will be installed in the hydro-electric station of the Twin City plant of the Ford Motor Co. at St. Paul, Minn. Much of the power from this station will be used for industrial purposes in the Ford plant and the rest will be sold to the public for general utilities.

The Machinery Warehouse Co., Inc., Chicago, is now one of the largest and best equipped machinery warehouses in the country. This company recently leased 225,000 sq.ft. of floor space of Harris Brothers, in the Symington gun plant at 74th St. and Ashland Ave. The entire floor space of the new warehouse is covered by eight overhead traveling cranes with a lifting capacity of from ten to twenty-five tons.

The Quality Grinding Co., Inc., of Springfield, Mass., has taken over the cylinder grinding and motor specialties business of the Charter Oak Machine Co. of Hartford, Conn., and will continue operations at 173 Chestnut St., Springfield. Clifford Loud heads the concern, Harvey S. Godbout is treasurer and Leander Hoppe sales manager.

The prizes offered each year by Alvan T. Simonds, president of the Simonds Saw & Steel Co., Fitchburg, Mass., for the best essays on economic intelligence were this year awarded to John J. Borchardt and Morris Saltzman, both of Brooklyn.

At the annual meeting of the Ontario Steel Products Co., Toronto, the following officers were elected for the year: President, W. Wallace Jones, Toronto; vice-president, W. T. Sampson; secretary-treasurer, Ford Petch; directors, W. Wallace Jones, W. T. Sampson, F. P. Jones, H. M. Jaquays, D. Ford Jones, J. T. Richardson, Kenneth Molson, Capt. N. C. Jones and Dr. C. H. Bird.

A further order for a half million dollars' worth of equipment for the new super-power plant to be erected in Kearney, Ontario, by the Public Service Electric Power Co., has been placed. It includes nine fifteen-retort Riley stokers, to be manufactured by the Sanford-Riley Stoker Co., of Worcester, Mass., and six sixteen-retort Taylor stokers, which will be supplied by the American Engineering Co. of Philadelphia.

The Marvel Equipment Co. of Cleveland, Ohio, has definitely decided to locate its Canadian branch in Belleville, Ontario, and has secured factory space. This company will at first manufacture only its line of gasoline pumps, in Canada, but will later add steel drums for carrying gasoline, oil and alcohol, as well as other allied equipment.

The Ford Motor Co. expects to occupy its new plant in Toronto by the end of September. The factory when completed will be one of the largest in Toronto, the main building covering an area of 5½ acres, while the entire establishment covers an area of 15½ acres. The plant which cost approximately $1,500,000, will be used chiefly for assembling purposes.

Recent Export Achievements Show Conditions Improved

FOR the first time since February, the exports of the United States exceeded the imports during the month of July, according to reports recently issued by the Department of Commerce. For the first seven months of the year, the imports exceed the exports by $115,990,383 which the alarmists take as a sure sign of ruination, but which actually means that conditions are fairly good in this country and that as long as we remain a creditor nation rather than a debtor nation we must expect to receive more goods from other countries than we are able to sell to them.

With the domestic problems well in hand manufacturers in every part of the country are turning their attentions to markets in other parts of the world. It has been pointed out by far-seeing economists that while Germany and France do not offer attractive features for selling at the present time, all the rest of the world is in a receptive mood for goods. England, Spain, the northern countries of Denmark, Sweden and Norway, and Italy are all in the market with good credit and sound currency. Russia has recently been considered a factor in the export business and many manufacturers are watching eagerly the outcome of the Soviet rule in re-establishing commerce. South America is in a much better condition than it has been for some little time and are purchasing all sorts of goods from the United States. The markets are being well developed by the progressive manufacturers of the United States.

Building Good-Will

An interesting note recently in a bulletin of the Department of Commerce stated that in Yucatan there were 10,000 typewriters and all of them of American make. Indeed, 90 per cent of them were one particular make, showing what can be done by building up good-will for your product.

During July the Argentine bought 73,000 rolls of wire from the United States as compared with 1,700 rolls from Germany and 1,300 from all other countries. Six thousand cases of sewing machines were received from the United States, while 639 cases came from Germany and 22 cases from other countries. The United States sold to the Argentine 562 cases of typewriters, Germany sold 109, and all other countries sold 47 cases. These figures show that the United States can lead in most specialties and that the sales are made upon "quality talks" alone, as prices differ considerably with the highest prices being charged by the United States in most instances.

Export houses in New York City have stated that business has been much improved as compared with last year, but that there is still room for improvement in the machine tool line. They state that hardware and hardware specialties have been in big demand this year but that, undoubtedly due to Ruhr Valley occupation, the call for machine tools in Europe has not been as large as was expected.

However, according to the Department of Commerce reports, France seems to be partially recovering from her recent financial illness and to be slowly on the way to recovery.

"The trend of developments in France during the month of July was favorable," states the report, "notwithstanding seasonal calmness and the instability caused by political developments and exchange fluctuations. Government receipts were in excess of the estimates; railroad receipts were above those of last year; agricultural prospects were promising; woolen and cotton textiles normal; the condition of the chemical industry was satisfactory; the production of iron and steel was larger; foreign trade was active; and the index of the cost of living decreased. Unemployment was negligible."

Industrial Census for Switzerland

Switzerland in spite of being commonly called a land of hotel keepers, is essentially an industrial country. Light and heavy machinery, fire arms, automobiles and watches and clocks form a considerable part of its industrial wealth and money of exchange.

The government has announced that there will be carried out shortly a complete census of Swiss industrial plants. The last so issued was in 1911. In view of the events during the world war and the still more potent events of the attempt at a world peace, Switzerland, one of the important buffer states of western Europe, has felt the beating of the political pulse far more tangibly than some of the former belligerants.

Such partial figures as are already available indicate that from 1911 to 1918, covering the war period, Swiss industrial plants increased 19.6 per cent but that from 1918 to 1922, the aftermath of war period, they decreased 18.5 per cent.

At the end of 1922 there were 8,054 industrial plants in Switzerland, a number virtually equal to that of 1911 but a considerable decrease from that of 1918.

Fewer Metal Working Shops

This diminution in the number of active industrial plants varies notably as to their product, the greatest falling off being among the metal working industries, a recorded loss of 314 establishments being noted since 1918. The woodworking industries are in a similar relative position. The clock and watchmaking and jewelry industries note a loss of 249 establishments during the same period. The group accounting for "machinery and instruments" indicates a loss of 119 units.

Those industries the most in default are those that are directly dependent upon raw or semi-raw materials from abroad. Those industries where the raw material is of a less cumbersome or heavy nature and coming from near by sources of supply have suffered the least. Transport costs are considered a factor in producing this situation.

The clock and watch making trade has suffered the most during the past four years, that of Neufchatel having lost 21 per cent of its enterprises, that of Geneva 29.2 per cent and the Vaud 31 per cent.

News of Washington Activities

By Paul Wooton

F. R. Wadleigh, Federal Fuel Distributor, returned to Washington from New York where he conferred with governors and their representatives of the Eastern anthracite - consuming States regarding plans for supplying substitutes in the event of a cessation of anthracite shipments well satisfied with the reception given the plan and the co-operation pledged. He devoted the remainder of the week to quietly perfecting various details of the plan.

The members of the Coal Commission devoted several days during the week to consideration of their report on bituminous coal, which is to be submitted on or before Sept. 22, the date on which the Commission will expire by limitation. Reports from the staff on various phases of the soft coal question were studied.

The Commission made public on Aug. 30 a statement on pyramiding middlemen's profits in anthracite, which was mentioned briefly in its report of July 5. Competition maintains low prices by wholesalers and jobbers in normal times, this report stated, but in periods of panic, or seller's market, there is a tendency for wholesalers to speculate among themselves with hard coal, thus adding several margins to a single shipment. In its inquiry on this subject, the Commission traced 750 carloads of anthracite as handled last year during the strike. More than half passed through the hands of only one wholesaler at margins varying from 20 cents to $3 per gross ton, the majority being 50 cents to $1.25. A number of cars, however, passed through more than one middle transaction, some as many as four, with total margins of 25 cents to $4.75 per ton.

Detailed figures showing the f.o.b. mine price of stove anthracite, including freight, to retail dealers in a number of towns and cities of New York, Pennsylvania, New Jersey, Maryland, Delaware, Ohio, Indiana, Wisconsin and Michigan, and Washington, D. C., as gathered last Spring, were made public by the Commission.

Abolishing Gunmen

A committee representing the United Mine Workers filed with the Coal Commission a statement making charges that gunmen employed by operators in non-union fields had assaulted union sympathizers. The Commission was asked to make a declaration against the armed guard system.

In connection with its request for the check-off in the anthracite field, the United Mine Workers issued in Washington a statement asserting, through a letter written by B. N. Jewell, president of the railway employees department of the American Federation of Labor, that dues are collected by railroad companies which have "company unions" among their employees.

As a step in preparation for eventualities, the Bureau of Mines issued a statement by O. P. Hood, chief mechanical engineer, on the use of substitutes for anthracite coal.

The Federal Fuel Distributor, F. R. Wadleigh, issued the monthly statement of stocks of bituminous coal, prepared by the Geological Survey and the Department of Commerce, which showed that approximately 51,000,000 tons of soft coal were in storage piles on Aug. 1, an increase of 5,000,000 tons as compared with July 1 and higher than at any other date for which records are available, excepting only at the close of the war and just prior to the strike of 1922.

Stocks of anthracite in consumers' bins or dealers' hands as of Aug. 31 were estimated by various governmental agencies as approximately 25,000,000 tons.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb	$0.0337	$0 0337	$0.0285
Cold finished shafting	per lb	0.0433	0.0428	0.0365
Brass rods	per lb	0.17	0.1825	0.17
Solder (½ and ½)	per lb	0.276	0.276	0.225
Cotton waste	per lb	0.1225	0.1231	0.1458
Washers, cast iron (½ in.)	per 100 lb.	4.66	4.66	4.00
Emery, disks, cloth, No. 1, 6 in. dia	per 100	3.08	3.08	2.96
Lard cutting oil	per gal	0.575	0.575	0.575
Machine oil	per gal	0.349	0.349	0.36
Belting, leather, medium	off list	37%	37%	44½%
Machine bolts up to 1x30 in.	off list	49½%	44¼%	53⅛%

Railroad Earnings For Seven Months

Class One railroads of the United States, according to reports from 193 roads representing a total mileage of 235,670 miles, in July earned an annual rate of return of 4.93 per cent on their tentative valuation as fixed by the Interstate Commerce Commission for rate making purposes including additions and betterments up to Jan. 1, 1923.

This rate represented a net operating income for the month of $84,591,400. In the Eastern district the rate earned was 5.60 per cent; the Southern district, 5.26 per cent; and the Western district, 4.05 per cent.

These tabulations are based on reports filed by the carriers with the Interstate Commerce Commission and tabulated by the Bureau of Railway Economics.

In July last year, the same carriers earned a net operating income of $69,321,000, which was at the annual rate of return of 4.12 per cent. In June this year the rate was 5.47 per cent.

In considering the earnings of the Class One carriers in July, account must be taken of the strike of railway shopmen which began on July 1 last year, at which time the coal miners strike was in progress. It was also on July 1 last year that a reduction of about 10 per cent in freight rates went into effect, thus placing on a comparable basis for the first time in months the earnings of the Class One carriers in July this year with those for the same month in 1922.

Twenty-nine Class One railroads in July operated at a loss, of which eight were in the Eastern district, five in the Southern and sixteen in the Western district.

Operating revenues of the carriers in July totaled $535,577,300, an increase of $91,870,000 or 20.7 per cent over the same month last year, while operating expenses amounted to $414,333,300, an increase of $73,377,100, or 21.5 per cent over July last year.

For the first seven months this year the net operating income of the Class One railroads represented an annual rate of return of 5.51 per cent on their tentative valuation amounting in dollars to $528,219,300, compared with $418,394,650 or 4.46 per cent for the same period in 1922, or an increase of $109,824,650 over the first seven months last year. In the Eastern district for the first seven months it was 6.40 per cent or $288,484,000; in the Southern district 6.47 per cent or $77,624,750, and in the Western district 4.17 per cent or $162,110,550.

Will Survey Industrial Eyesight Condition

A nation wide survey of eyesight conditions in American education and industry has been undertaken by the Eye Sight Conservation Council of America, it is announced at the national headquarters of the Council.

As to industry, the aim of the survey, according to Guy A. Henry, general director of the Council, is to disclose the relation between defective vision and the efficiency of the nation's millions of workers. As to education, it is purposed to ascertain what steps have been taken by the schools to measure the extent of poor eye sight.

The Eye Sight Conservation Council's survey, marking the start of the research program recently adopted by the Board of Directors, has set out to reveal the effect of incorrect vision upon production. It has prepared a questionnaire designed to show increase in individual performance, decrease in accidents, increase in production and decrease in spoilage. The extent of color blindness, the number of blind in one eye, the number totally blinded, hours lost due to eye accidents, equivalent wages for lost time, use of goggles, cost of eye protection service, and total number of eye injuries are other objectives.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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WHILE organizing actively and giving lavishly for the relief of the grievously stricken people of Japan, American business men have come to agree with Edmund Vance Cooke that—

A trouble's a ton,
Or a trouble's an ounce,
Or a trouble is what you make it;
And it isn't the fact that you're hurt that counts,
But only how did you take it.

By acting on this sentiment the depression that the Japanese disaster might have caused was averted and the markets are generally firm as the week ends. It is about the clearest case of "mind cure" on record, for the precedents were nearly all against it as pointed out by a distinguished "propheteer" who has been noisily predicting a decline ever since the markets touched bottom last June.

But the fact is that the destruction of property caused by war, fire or earthquake is not a bearish influence if the losers are plucky and have the energy required for reconstruction.

Everything that men make is made to be consumed or used up and when the consumption is rapid or the use intensive we say business is good. An earthquake or a fire only hastens the natural and inevitable disappearance of consumable or usable things and the production of others to take their place.

This explains the prosperity that is the result of war and the accelerated activity that has already followed the earthquake in Japan. The large stock of silk in Yokohama has probably been destroyed and that held in other parts of the world is very much higher and hard to buy at any price. One result has been a greatly augmented demand for artificial silk. Other articles somewhat affected are rice and tea, both of which are firmer. The demand for American rice is expected to increase and it is feared that the supply of Japanese tea will be curtailed.

Since the earthquake the Japanese have been large buyers of American cotton, presumably to replace the stocks destroyed at Yokohama, for the cotton mills of Japan were mostly outside the earthquake zone. Steel, copper, zinc, and tin are all firmer, and it is expected that Japan will buy largely when the work of reconstruction starts, as it is expected to shortly.

By stressing these aspects and probabilities optimism has been encouraged and despite the terrible loss of life the people of Nippon and America have joined hands in a determination to make tomorrow better than yesterday in the land of the Rising Sun. In so far as Occidental capital is concerned the losses it will sustain are chiefly confined to the claims that the marine insurance companies will have to pay. They are said to be large, but not crushing, and the fire companies will lose but little as most of them were protected by the earthquake clause.

Looking elsewhere over seas the view is also more cheerful than it was a week ago. Germany is showing a disposition to climb down, and France, looking at Mussolini is commencing to see herself as others see her. The revelation is not altogether to her liking and there is evidence that Poincare is also becoming a little more reasonable.

Italy and her truculent Premier continues to protest that the League of Nations has no jurisdiction over her private quarrel with Greece, but as England and France take the opposite view and can enforce it by economic coercion it is unlikely that Mussolini will defy them if it comes to a showdown. The fact is that all the nations of Europe except Great Britain got in the habit of aggressive self assertion during the war. It may take them some time to change but as it is plain that none of them really wants to fight, America is ceasing to be alarmed by their bluster.

> "Meantime all the other domestic omens are favorable and it is threshing old straw to report record car loadings, good railroad earnings, increased sales at the department stores and by mail-order houses, and conditions that are reasonably satisfactory everywhere. . . . On the Stock Exchange speculation is still somewhat lethargic, but the undertone is good. Bear raids are ineffective and the probabilities seem to favor a gradual rise in prices."

The foreign situation has been treated at such length because there is nothing at home that calls for notice except the anthracite coal strike.

By the time this is printed that may be settled, for Governor Pinchot really seems to be bringing the men and the operators together. But even if he fails the result will not be serious, for enough bituminous coal and oil are now in sight to keep the whole country comfortable and the anthracite monopolists might see a great light if their product fell into desuetude for one Winter.

Meantime all the other domestic omens are favorable and it is threshing old straw to report record car loadings, good railroad earnings, increased sales at the department stores and by the mail order houses, and conditions that are reasonably satisfactory everywhere. Wheat is firm. Cattle, hogs and hog products are higher; coffee and sugar are steady but featureless, and the only market that has been doing stunts is cotton, in which there is a broadening speculation upon the theory that the last Government crop estimate is correct. If it is much higher prices will probably be recorded before the season ends, but as the market ascends toward thirty cents the altitude becomes dangerous and the adventurous aeronauts should be on the lookout for what they call airholes.

But the cotton goods market is active and advancing. The European spinners, as well as our domestic manufacturers, have got to buy promptly or miss getting their quota out of a small crop, and at or around 25 cents their purchases will probably stop any decline.

On the Stock Exchange speculation is still somewhat lethargic, but the undertone is good. Bear raids are ineffective and the probabilities seem to favor a gradual rise in prices.

The Federal Reserve Banks lost $19,000,000 in gold last week. Just where it went to is not apparent. Probably it was paid out in "yellow backs." Increases of $34,600,000 in the holdings of discounted bills and $32,500,000 in Federal Reserve note circulation reflect the seasonal expansion that is to be expected at harvest time. The reserve ratio is lower at 76.4 per cent as compared with 77.5 last week, but none of the changes are significant. The Federal Reserve Bank Notes, of which there were $53,000,000 in circulation this year, are now down to $509,000.

But the reduction will interest no one but the bankers, and the most important inference to be drawn from the Bank statement is that there is plenty of credit to finance a continued expansion in business.

First Motor Transport Congress in May

Delegates from 114 countries of the world will attend the first International Motor Transport Congress that will be held in Detroit next May, according to announcements just made.

The purpose of the Congress is to provide a better understanding of the economic factors underlying motor transportation in every part of the world. The Congress is under the auspices of the National Automobile Chamber of Commerce. A program for four days is being prepared and it is expected that it will have a wide range of subjects that are of interest to the many different classifications that will be represented at the Congress.

Financial Status of Stevens-Duryea

In a report filed in Superior Court in Springfield, Mass., Sept. 4, by Harry G. Fisk and Frank H. Shaw, receivers for Stevens-Duryea, Inc., the financial condition of the company as of July 31, 1923, is given as follows: Assets as per statement of assets, $469,743.72; cash on hand and in banks, $17,537.74; accounts and notes receivable, $9,050; total assets, $516,322.46. Liabilities: Accounts payable and commitments, $18,410.67; assets taken over from Stevens-Duryea, Inc., May 9, 1922, $387,003.47; net gain from operation, $110,908.32; total liabilities, $516,322.46. The report states that the assets, excluding cash and receivables, carried on the company's books as of May 10, 1922, when the receivership was instituted, aggregating $3,983,212, were valued too high by $1,087,363.

On July 1, 1922, the receivers reported a fair value of $1,243,262 as a going concern and $337,080 as a value under forced litigation. These figures have since been scaled down. Whereas the receivers then assumed, the report says, that the Stevens-Duryea car as then produced was a finished and satisfactory product, it has since learned that further engineering work was needed, and that at least four important units could be purchased complete with more satisfactory results than from those that were being incorporated in the car.

The report tells of large economies made in operating the plant under the receivership. It will be necessary to borrow considerable money to continue the plant in operation, the report says, and unless a sale can be effected in the immediate future the receivers advise that the plant be closed and prepared for liquidation. The receivers' recommendation that the plant be sold for $450,000 will come up in Superior Court Sept. 15.

Gary Holds Meeting of Company Heads

The presidents of the subsidiary manufacturing companies of the United States Steel Corp., held another meeting recently in the offices of Elbert H. Gary, chairman of the board of directors, for the purpose of discussing an equitable adjustment in wages in connection with the elimination of the twelve-hour day. A similar meeting was held last week. Following the meeting Mr. Gary issued the following statement:

"The presidents of the various manufacturing subsidiaries of the United States Steel Corp., held a meeting for the adjustment of wage rates. We have nothing to publish at this time. The readjustment is going on satisfactorily and without serious friction and nothing should be said to disturb our relations with the men."

According to information obtained the conferences are being held for the purpose of adjusting the wages of employes not affected by the increase announced at the time the American Iron and Steel Institute declared that the twelve-hour day would be abolished in the steel industry and that the men whose working hours were reduced from twelve to eight hours a day would receive an increase of 25 per cent in wages. This wage adjustment did not effect the men in other than the "continuous operations plants" whose working hours were reduced from twelve to ten hours, nor did it affect common labor in other plants.

Studebaker Output Record Broken

The Studebaker Corp. broke all production records last month, when 15,700 cars were produced, according to a statement issued yesterday by A. R. Erskine, president of the company. "Production for the eight months ended Aug. 31, 1923, was 110,540 cars," he said, "against 78,369 cars in the same period last year. The production of eight months this year exceeds the production of 109,222 cars for the full calendar year of 1922.

"Sales are absorbing production, totaling about 30,000 cars for the first two months of the current quarter, compared with 30,199 cars for the full third quarter last year. The total stock of cars in dealers' hands is less than it was last May, and the indicated Fall demand is strong. The total sales of the last four months will be all gain as compared with last year. The management expects sales to top 150,000 cars this year, as against 110,269 last year."

Pennsylvania Shows Big Increase

Increases in both net and gross revenues for July as compared with July of last year were shown in the reports of the Pennsylvania System issued recently.

The Pennsylvania System reported total operating revenues of $69,669,185, an increase of $13,649,120. By far the biggest increase was shown in freight revenues, which totaled $46,292,215, or $11,699,252 more than the year before. Expenses also showed an increase over the previous July. In this connection the early work done on shop repairs by the system was an important factor.

Total expenses amounted to $55,552,188, an increase of $8,733,269. Increases of $4,288,274 in maintenance of equipment and $3,445,663 in transportation were the chief items of increase on this side of the ledger. The system's net revenue from operations amounted to $14,116,997, an increase of $4,915,851, and net operating income was $8,712,102, an increase of $3,971,919.

Plan Large Exhibit of Electric Foundries

Over a million dollars worth of equipment will be on display in the Broadway Auditorium, Buffalo, when the Association of Iron and Steel Electrical Engineers holds its steel exposition from Sept. 24 to Sept. 28. A complete electric foundry will be in operation producing finished castings. Business sessions of the association will be held at the Hotel Statler and the program is replete with technical subjects that are of vital interest to men in this line of work.

John F. Kelly is the national secretary of the association with headquarters in the Empire Building, Pittsburgh, Pa. Further and more detailed information may be received from him.

Another Record for Car Loading

Car loadings throughout the United States for the week of Aug. 25, reached 1,069,932, a new high record for all time. This exceeds by 28,888 cars the previous record, which was established during the week ended July 28 last, when 1,041,044 cars were loaded. This also exceeds by 51,393 cars the record of 1,018,539 established in the week of Oct. 14, 1920, and which stood until this year.

Besides a new high record in total cars loaded the number of merchandise and miscellaneous cars loaded reached 606,105, a new record.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Automobile accessories for small-type cars. Lwow, Poland. Purchase and agency. Reference No. 7604.

Automobile accessories. Zagreb, Yugoslavia. Purchase and agency. Reference No. 7626.

Automobile accessories and motors for industrial purposes. Reval, Esthonia. Agency. Reference No. 7587.

Machine shop and foundry equipment and replacements. Riviere du Loup, Canada. Purchase. Reference No. 7605.

Compressed air and vacuum pumps. Antwerp, Belgium. Agency. Reference No. 7577.

Gasoline pumps. Zagreb, Yugoslavia. Purchase. Reference No. 7635.

Steel-working tools. Antwerp, Belgium. Agency. Reference No. 7577.

Wooden pipe-making machinery. Antofogasta, Chile. Purchase. References No. 7611.

Forthcoming Meetings

New Haven Branch of the American Society of Mechanical Engineers. Third annual machine tool exhibit Sept. 18, 19, 20 and 21. Mason Laboratory, New Haven, Conn. A. C. Jewett, chairman.

Association of Iron and Steel Electrical Engineers. Iron and steel exposition, Buffalo, Sept. 24 to 28. John F. Kelly, secretary, Association of Iron & Steel Electrical Engineers, 708 Empire Building, Pittsburgh, Pa.

National Safety Council. Twelfth annual congress at Buffalo, N. Y., Oct. 1 to 5. All meetings will be held at the Statler Hotel. Headquarters, 168 No. Michigan Ave., Chicago, Ill.

American Society for Steel Treating. Annual convention at Pittsburgh in connection with the International Steel Exposition, Oct. 8, 9, 10, 11 and 12. W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio, national secretary.

Society of Automotive Engineers. Production meeting at Cleveland, Ohio, Oct. 25 and 26. Headquarters, 29 West 39th St., New York City.

American Gear Manufacturers Association. Fall meeting. Mountain House, Lake Mohonk, N. Y. Oct. 25, 26 and 27. T. W. Owen, secretary, 2,443 Prospect Ave., Cleveland, Ohio.

American Management Association. October 29, 30, and 31, Hotel Astor, New York City.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8. Headquarters, Grand Central Palace, New York City.

New and Enlarged Shops

Machine Tools Wanted

Md., Cumberland—M. McKaig—grinding machine to cut various sized bits from bar stock, capable of grinding them on surface and angles (new or used).

Mass., Woburn—J. J. Grothe Co., 12 Everett St. (manufacturer of wagons)—wood and metal working machinery for addition to plant.

Mass., Worcester — J. Nagle, Harrison St.—machinery and equipment for proposed machine shop.

Mich., Detroit—Knight Screw Products Co., 6510 Epworth Blvd.—automatic screw machine.

Mich., Highland Park (Detroit P. O.)—C. B. Shepard Co., 89 Moss Ave.—700 to 1,000 ton hydraulic press (used preferred).

Mich., Union City — Ford Garage Co., Engle & Stanton, owners—complete equipment for proposed $75,000 garage and service station.

N. Y., Binghamton—McGill Machine Co., 46 Commercial Ave., C. E. McGill, Purch. Agt.—machinery and equipment.

N. Y., Binghamton—P. J. McManus & J. T. Buckley, 85-87 Henry St.—equipment for service station and garage.

N. Y., Buffalo—M. Minor, 242 Kingsley St.—metal spinning lathe with swing of 28 or 30 in. circle.

N. Y., Jamestown—King Motor Sales Co., West 4th St., H. C. King, Pres.—complete garage and service station equipment, including lathes, turntable, pumps and machine shop equipment (will be in market by Nov.).

N. Y., Jamestown—Telt's Motor Co., 501 Foote Ave., C. G. Telt, Purch. Agt.—equipment for proposed machine shop and automobile service station.

N. Y., New York—Davis Equipment Co., Inc., 50 Church St., W. E. Davis Purch. Agt.—car wheel press, capacity 200 ton or over, 48 in. or over between bars; portable crank pin press with 12 in. stroke or ram, 200 ton capacity, 24 to 56 in. between bars, complete with resistance head with 8 in. open for shaft on axles.

N. Y., New York—Forsberg Electric Mfg. Co., 100 West Houston St.—milling machine.

N. Y., Niagara Falls—T. H. Routh, c/o Walkers Repair Shop, Furgeson and Muir Sts.—machine shop equipment.

N. C., Raleigh—J. W. Evans, East Morgan St.—machinery and equipment for proposed $50,000 automobile and general repair shop.

O., Columbus—Columbus Bolt Co., Water and Chestnut Sts., H. S. Mason, Purch. Agt.—medium size drill press and grinder.

O., Columbus—Martin Krumm Co., 330 South 4th St. (manufacturer of iron fence and gratings), H. L. Krumm, Genl. Mgr.—metal working machinery and one small lathe.

R. I., Providence—H. Fisher, Tribune Bldg.—complete machine shop equipment for automobile repairs.

W. Va., Northfork—Community Garage, S. S. McNeil, Pres.—machinery and equipment for proposed service station.

Wis., Milwaukee—R. Rutzen, 401 Gladstone St.—bench tools, vises and pattern maker's lathe, medium size.

Wis., Neenah—Valley Inn Buick Co., c/o J. O. Kuehl, 108 West Wisconsin Ave.—20 to 22 in. drill press and one emery grinder.

Wis., Racine—M. Lawson, 401 Lake Ave.—automobile repair machinery, gasoline tanks and pumps for proposed garage.

Wis., Sturgeon Bay—Peterson & Egeland Mfg. Co. (manufacturer of electric motors), G. R. Egeland, Purch. Agt.—tool room lathe, small drill press and bench tools.

Que., St. Agathe des Monts—M. Paquette—garage equipment.

Que., St. Angele de Laval—Deshaies & Deshaies—automobile repair shop equipment.

Que., St. Hyacinthe—J. B. Gervais, 59 Cascades St.—automobile repair shop equipment.

Que., St. John's—A. E. Gregoire, 35 Champlain St.—pump and repair equipment for garage.

Que., Ste. Martine—R. Laberge—garage and repair equipment.

Que., Sutton—E. H. Eastman—drill press for automobile repairing.

Que., Yamaska—A. Cartier—lathe, drills, emery wheel, jacks, etc., for garage.

Machinery Wanted

Ark., Marianna—Courier-Index—7 column newspaper folder.

Conn., Vernon—Bd. Educ.—wood and metal working tools and equipment for new high school.

Ia., Dubuque—Adams Co., 295 6th St.—plating outfit.

Kan., Baxter Springs — Baxter Springs Citizen, R. L. Strader, Purch. Agt.—job printing press with Miller feeder, saw trimmer and paper cutter (used preferred).

Kan., Pittsburgh—Hull & Dillon Packing Co.—acetylene welding outfit and cutting machine.

Ky., Lexington—Oil Products Co., Inc., 5th and Jefferson Sts.—3,000 gal. gasoline rotary pump and four 12,000 gal. gasoline tanks.

Md., Baltimore—Standard Electric Mchy. Co., 7-9 East Hill St.—1½ or 2 ton monorail hoist, 3 phase, 60 cycle, 220 volt, with or without trolley.

Md., Frederick—Price Bros.—6 spindle drill and one punch capable of blanking a disc, 4 in. diameter and ⅝ in. thick.

Mass., Boston—W. Carter Co., 77 Summer St. (manufacturer of woolen and cotton cloth)—equipment, scales, furnaces, looms, etc., for proposed additions and replacements for Collier Mills, Barnesville, Ga.

Mass., Brighton (Boston P. O.) — H. Easter, 154 Bigelow St.—two job printing presses, about 10 x 15 in.; also paper cutter, type and cases.

Mich., Manton—Manton Tribune—newspaper folder.

Mich., Menominee — Lloyd Mfg. Co., North State St.—woodworking machinery for proposed $75,000 addition to factory for the manufacture of baby carriages.

Mo., Kansas City—Deaner Institute, 3520 Bway., P. M. Orlopp, Purch. Agt.—Universal woodworking machine.

Mo., Mountain View—J. H. Patten (job printer)—paper cutter.

N. Y., Binghamton—Cutler Ice Co., Front St., I. Thomas, Pres.—equipment for proposed $50,000 ice plant, 30 ton capacity.

N. Y., Binghamton—Klein-Powell Shirt Co., 178-182 Water St., J. C. Klein, Purch. Agt.—machinery and equipment for new plant.

N. Y., Buffalo—Dahlke Stationery & Mfg. Co., 208 Washington St., B. A. Dahlke, Purch. Agt.—stationery and printing equipment for new plant at 102 Carroll St.

N. Y., Buffalo—Jeffrey-Dewitt Insulator Corp., Abbott Rd. and Buffalo River, J. E. Sinclair, Genl. Mgr.—equipment for the manufacture of high tension switches.

N. Y., Buffalo—Niagara Steel Wire Co., Inc., 638 4th St., C. S. Madison, Purch. Agt.—equipment for the manufacture of steel wire for new plant on Lakeview and Porter Aves.

N. Y., Buffalo—Reed Press, 56 Cottage St., H. Reed, Purch. Agt.—printing equipment for plant at 409 Niagara St. to replace that which was destroyed by fire.

N. Y., Cohoes—Little Falls Fibre Co., Northside, M. F. Stack, Supt.—eight sets of cotton cards, one lapper and one condenser.

N. Y., Cincinnatus—Reid Creamery & Ice Cream Plant—$20,000 worth of equipment for proposed plant, to replace that which was destroyed by fire.

N. Y., Jamaica—J. A. McCarthy, 14716 Jamaica Ave.—nickel and copper plating equipment.

N. Y., Johnson City—Ideal Caramel Co., Willow St. and Grand Ave.—machinery and equipment for proposed addition to plant.

N. Y., New York—Hunt Dodge Co., 405 Lexington Ave.—electric drill for cutting concrete.

N. Y., New York—Quick Service Printing Co., 411 East 5th St.—one multicolor press, 12 x 18 in.

N. Y., New York—Universal Can Co., J. F. Montgomery, c/o Nestle Food Co., 130 William St., Purch. Agt.—machinery for the manufacture of specialized milk machinery and dairy products for plant at Hiresdale.

N. Y., Saratoga Springs—Baker Mfg. Co.—equipment, including one 10 ton crane, for proposed $50,000 foundry.

N. C., Lexington—Cascade Mills, Inc., 306 North Main St., A. F. Bruton, Pres.—7,000 spindles and 400 looms for mill at Mooresville.

O., Chillicothe—Buckeye Tile Co., J. E. Hydell, Genl. Mgr.—tile working machinery, including mixer and press.

O., Cleveland—Cleveland Heater Co., Locust Ave. and West 112th St.—one tinners' roll, 60 in. capacity.

O., Cleveland—Cleveland Times, 307 Superior Ave., O. K. Shimansky, Purch. Agt.—model No. 1 linotype.

O., Cleveland—New York, Chicago & St. Louis R.R. Co., Columbia Bldg., W. P. Dittoe, Purch. Agt.—electric hoists, buckets, etc., for proposed coaling station at Conneaut.

O., Columbus—Columbus Coffin Co., Buttles St. and Ingleside Ave., E. Y. Clark, Genl. Mgr.—woodworking machinery to enlarge plant.

O., Girard—Persing Milk Products Co., State and Kline Sts.—ice cream making machinery for proposed $50,000 plant.

O., Toledo—Fame Laundry Co., 2125 Ashland St.—equipment for proposed $41,000 addition to plant.

Okla., Miami—O. T. Dixon—job press and Miller feeder.

Okla., Picher—Picher District Leader—job printing press and Miller feeder.

Pa., Erie—E. Lee—rip saw, bench planer, drilling machine, etc.

Pa., Pittsburgh—Harbison-Walker Refractories Co., Farmers Bldg.—machinery and equipment for proposed $600,000 plant for the manufacture of tile, fire brick and general clay products, at Bessemer, Ala.

R. I., Providence—Textile Finishing & Mchy. Co., 171 Westminster St.—machinery for proposed roll shop and press room.

Tenn., Fayetteville—Bryson Novelty Mfg. Co.—press for printing on wood.

Tenn., Knoxville — Duncan Mchy. Co., Dempster Bldg., 721 North Central Ave., J. G. Duncan, Purch. Agt.—steel derrick, 30 to 50 ton guy type (used); 16, 18 or 20 ft. bull wheel for derrick.

Tex., Archer City—W. C. Young—job printing press, belting, pulleys and shafting (used).

Tex., Austin—Calcasieu Lumber Co., 311 West 2nd St.—7 x 30 in. single planer.

Tex., Dallas—C. C. Pope, 106 Race St.—jointer, planer, bandsaw, shaper and comb saw.

Va., Richmond—Chesapeake & Ohio R.R. Co., 823 East Main St., H. C. Pearce, Dir. Purchases & Stores—20 ton locomotive crane.

Va., Woodstock — H. B. Chapman—machinery for polishing quartz.

Wis., Appleton—S. W. Murphy, 493 College Ave. (manufacturer of paper)—one electric traveling crane, about 65 ft. span.

Wis., Cambria—E. A. Banks—pea canning machinery, hullers, conveyors, belting and shafting for proposed factory at Arlington.

Wis., Cuba—Zinc Hill Mining Co.—mining and milling machinery, also belting and shafting for proposed $50,000 plant.

Wis., Dodgeville—Perkins Bros. (meats and produce)—motor driven refrigeration machinery, several ton capacity.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Iron and Steel—Pig iron prices stiffer owing to slowdown in production. Structural steel demand growing; lessening in car material requirements. Unfilled plate tonnage high. Tank plates and bridge material fairly active. Price of plates and shapes steady at $2.50 per 100 lb., Pittsburgh; premium of $2 per ton required on early deliveries in many instances. Cold-drawn steel demand more active. Bars firm at $2.40, base, with slightly better demand.

Advances—Copper firm; up ¼c. in New York. Tin prices tending upward; advanced ⅜c. in week. Lead steady; no change in price. Foreign zinc market advancing; up 35c. per 100 lb. in New York. Babbitt metal higher in Cleveland, following advances in non-ferrous metals.

Declines—Fabricated brass and copper lower in Cleveland warehouses. Discounts on iron and steel bolts, nuts, screws, washers and rivets, higher in New York. Raw linseed oil, 95c., f.o.b. New York, in 5 bbl. lots, against 96c.; $1.06 in Cleveland, compared with $1.18 per gal. one week ago.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$29.05@$31.05
Northern Basic	28.17
Southern Ohio No. 2	28.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.37
BIRMINGHAM	
No. 2 Foundry	25.00@27.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	29.16
Virginia No. 2	32.17
Basic	26.16
Grey Forge	26.16
CHICAGO	
No. 2 Foundry local	30.61
No. 2 Foundry, Southern (silicon 2.25@2.75)	31.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	28.77
Basic	27.27
Bessemer	28.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5.00@5.50

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.80	4.45	5.05
Nos. 22 and 24.	3.75	4 85	4.50	5.05
Nos. 25 and 26.	3.80	4 90	4.55	5.10
No. 28	3.85	5.00	4.65	5.20
Galvanized	**Pittsburgh**	**New York**	**Cleveland**	**Chicago**
Nos. 10 and 11.	4.00	5.00	4.70	5.35
Nos. 12 and 14.	4.10	5.10	4.80	5.45
Nos. 17 and 21.	4.40	5.40	5.10	5.75
Nos. 22 and 24.	4.55	5.55	5.25	5.90
No. 26	4.70	5.70	5.50	6.05
No. 28	5.00	6.00	5.80	6.35

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	62	50½	⅜ to 1¼	30	13
		LAP WELD			
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	28	13
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	60	49½	¾	28	12
2 and 3	61	50½	1 to 1½	30	14
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.65	3.90	4.55
Cold finished flats, squares	5.15	4.40	5.05
Structural shapes (base)	3.64	3.46	3 40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 5/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.50
Tin, 5-ton lots, New York			42.50
Lead (up to carlots), St. Louis	6.65	New York	7.37½
Zinc (up to carlots), St. Louis	6.60	New York	7.25

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.10	27.00	28.00
Antimony (Chinese), ton spot	8.87½	10.50	8.75
Copper sheets, base	21.25	22.00	23.00
Copper wire (l.c.l.)	16.50	19.25	16.25
Copper bars (l.c.l.)	20.75	22.50	19.50
Copper tubing (l.c.l.)	25.50	27.50	23.00
Brass sheets (l.c.l.)	18.50	23.00	18.75
Brass tubing (l.c.l.)	24.00	28.50	20.50
Brass rods (l. c. l.)	16.75	18.50	15.75
Brass wire (l. c. l.)	19.00	23.00	.....
Zinc sheets (casks)	10.75	10.45	.....
Solder (½ and ½), (case lots)	29.50	27.75	20.00
Babbitt metal (83% tin)	52.00	53.00	38.00
Babbitt metal (35% tin)	25.00	17.00	16.00
Nickel (ingot and shot)	29.00	.....	35 00
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	11.50	12.00
Copper, heavy, and wire	11.50	11.00	11.25
Copper, light, and bottoms	10.00	9.00	10.00
Lead, heavy	5.00	5.00	5.50
Lead, tea	4.00	4.00	4.50
Brass, heavy, yellow	7.50	....	7.00
Brass, heavy, red	9.50	9.50	9.00
Brass, light	6.00	5.00	6.25
No. 1 yellow brass turnings	7.00	6.00	6.75
Zinc	3.75	3.00	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$23.50	$19.50	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.00	17.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	12.60	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13¼x13¼, per lb.	11.00	36.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	.95	1 06	1.14
White lead, dry or in oil	100 lb. kegs	New York, 14.00	
Red lead, dry	100 lb. kegs	New York, 14.00	
Red lead, in oil	100 lb. kegs.	New York, 15.50	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$5.00@5.50	
Coke, prompt foundry, Connellsville	per net ton	6.00@6.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40-10%	50-10%	45-5%
1½ and 1¼x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	25-10%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30-10%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	40-10%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30-10%	45%	40-5%
Bolt ends, with hot pressed nuts	40-10%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, $\frac{9}{16}$ and smaller	60%	.....	....
Semi-finished nuts, $\frac{5}{8}$ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.. ....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, $\frac{5}{8}$ in., per 100 lb. (net)	5.50	4.00	3 50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	0.50	2.75	2.50
Rivets:			
Rivets, $\frac{7}{16}$ in. dia. and smaller	50-10%	50-10%	60%
Rivets, tinned	50-10%	50-10%	4½c. net
Button heads ⅞-in., ¾-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30-10%	30-10%	30-10%
Heavy grade	20-5-2½	30%	20-5-2½%
Rubber and duck:			
First grade	50-10-5%	50-10%	40-10%
Second grade	60-10%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20

Wis., Dodgeville—G. Williams—mining machinery and equipment, including shafting, drills, etc., for proposed zinc mill at New Diggings.

Wis., Evansville—Rock County, c/o M. L. Paulson, Chn. Bldg. Com.—coal handling machinery, etc., for proposed $40,000 boiler house at Janesville.

Wis., Janesville—Glancy Malleable Corp., c/o L. A. Avery, 14 West Milwaukee Ave. (malleable castings)—several moulding machines and furnaces.

Wis., Madison—Piper Bros. Co., c/o S. Piper, 31 North Pinckney St. — laundry equipment, dryers and ironers; also refrigeration equipment, ice machinery and dish washing machinery for proposed $1,000,000 hotel.

Wis., Madison—W. Swenson, 7 West Main St.—gasoline storage tanks and pumps for proposed filling station.

Wis., Manitowoc—E. R. Herman, 1402 Hamilton St.—ash hoists and ash handling machinery.

Wis., Marshfield—Roddis Lumber & Veneer Co.—belt driven conveying machinery.

Wis., Milwaukee—Banner Iron & Wire Wks., 928 Winnebago St., C. J. Klinka, Purch. Agt.—hack saw (used).

Wis., Milwaukee—E. M. Buchrach, 1684 11th St. (millwork)—one large belt sander.

Wis., Milwaukee — O. J. Hassler, 5707 Washington Blvd. (carpentry and millwork)—one 6 to 10 in. sticker.

Wis., Milwaukee—B. C. Wait, 101 South Water St. (steel castings)—one large electric furnace.

Wis., North Milwaukee—W. Scholtka, 36th St. and Wallace Ave. (woodwork)—one rip saw to rip up to 2 in. material.

Wis., Pewaukee—Pewaukee Press—job press.

Wis., Platteville—R. Karrman & E. Richards Co.—rock crushing machinery, including crushers, rollers, screens, hoist, drills, elevator machinery and bucket conveyors.

Wis., Spooner—D. W. Caldwell (creamery)—churn, cream separator, weighing machine, tester, belting and shafting.

Wis., Watertown—Perfection Table Slide Co., 603 Clyman St., W. C. Schultz, Mgr.—finger jointing machine, grooving machine and conveyors.

Alta., Calgary — Highwood Petroleum & Natural Gas Co., Ltd., H. G. Nolan, Purch. Agt.—pumping, assaying, refining, distilling and extracting machinery.

Man., Winnipeg—Western Steel Products, Ltd., Desautels St. Bon St. along tracks of Canadian National Ry., H. C. McMartin, Purch. Agt.—machinery for the manufacture of metal products.

N. B., Sackville—Enterprise Fdry. Co., Ltd. (stoves, etc.)—equipment.

Ont., Brantford—Dustless Sifters, Ltd., I. Lunenfeld, Purch. Agt.—machinery for the manufacture of ash sifters, fuel saving devices, hardware, etc.

Ont., Chesley—W. and C. Window Regulator Co., R. J. Ranney, Mgr.—machinery and equipment for proposed $100,000 plant for the manufacture of patent window regulator.

Ont., Ford—Ford Motor Co. of Canada—special equipment for proposed $500,000 heat treating plant.

Ont., Kirkland Lake—Lake Shore Mines, Ltd., R. C. Coffey, Mgr.—mill, 300 ton daily capacity.

Ont., Kirkland Lake—Teck-Hughes Gold Mines, Ltd., D. L. H. Forbes, Mgr.—mill.

Ont., Porcupine — Goldale Mines, Ltd., A. H. Britton, Secy.—hoisting equipment (new).

Ont., Thorold—Daily News Print Corp., W. Curtis, Purch. Agt.—equipment for proposed $3,000,000 paper plant at North Tonawanda, N. Y.

Ont., Toronto — Canadian Westinghouse Co., Traders Bank Bldg.—forges and equipment for proposed $300,000 foundry at Hamilton.

Ont., Toronto—Castle Tretheway Mines, Ltd., Standard Bank Bldg., H. G. Laut, Secy.—equipment, including mill, for Gowganda mine.

Ont., Vineland—S. T. Wayman—crushers, mixers, molds, etc., for proposed $50,000 cement and stone products plant.

Que., Hudson—Laval Shoe Mfg. Co., Ltd., W. H. Cote, Purch. Agt.—machinery for canning, dyeing and manufacturing shoes, harness, traveling bags, etc.

Que., Montreal—Lachapelle Eng. Co., 137 McGill St. (electrical mechanical appliances and supplies)—air hammer drill complete with 4 drills.

Que., Montreal—E. B. Myers Co., Ltd., c/o F. Callaghan, 222 St. James St.—machinery for the manufacture of radio equipment.

Que., St. Hyacinthe—L. P. Morin & Fils, 2 St. Joseph St.— woodworking equipment.

Que., St. Hyacinthe — A. Parent, St. Liboive St. (woodworking)—moulder and equipment.

Que., St. Hyacinthe—L. Robert, 35 Concorde St.—automatic compressor, etc., for garage.

Que., St. John's—Latour & Dupuis—equipment for sash and door factory.

Que., St. Luc—A. D. Girard—forge and other equipment for blacksmith shop.

Que., St. Pierre—E. Daunais—blacksmith shop equipment.

Que., St. Timothee—R. Montpetit—equipment for blacksmith shop.

Metal Working Shops

Calif., Los Angeles—The Baldwin Motor Co., 1201 South Figueroa St., is having plans prepared for the construction of a 4 story, 75 x 200 ft. garage. W. D. Lee, Sun Drug Bldg., Los Angeles, Archt.

Calif., Los Angeles — The Los Angeles Motor Bus Co., Railway Bldg., has had plans prepared for the construction of a 2 story garage and office building on North Virgil St. Estimated cost $60,000. Private plans.

Calif., Los Angeles — L. R. Lurie, 315 Montgomery St., San Francisco, is having plans prepared for the construction of a 2 story auto stage terminal on Los Angeles and 6th Sts., here. Estimated cost $200,000. O'Brien Bros., Inc., 315 Montgomery St., San Francisco, Archts. Pickwick Auto Stage Co., 683 Market St., San Francisco, lessee.

Calif., Oakland—The California Wire Cloth Co., 1001 22nd Ave., awarded the contract for the construction of a 1 story factory. Cost will exceed $40,000.

Calif., Oakland—The Chevrolet Motor Co. of California, Foothill Blvd. and 69th Ave., is having plans prepared for the construction of a 1 story addition to its plant. Cost will exceed $150,000. Private plans.

Calif., Oakland—J. R. Kaelin, 1933 5th Ave., awarded the contract for the construction of a 1 story garage, laundry and boiler house on 23rd Ave. and Boehmer St. Estimated cost $56,125.

Calif., San Francisco — J. Pasqualetti, Humboldt Bank Bldg., awarded the contract for the construction of a 2 story garage on Market St. near 15th St. Estimated cost $40,000. Noted Sept. 6.

Calif., San Francisco—W. M. Schlaes, c/o Cahill Bros., contractors, 110 Sutter St., awarded the contract for the construction of a 2 story (ultimately 4 story) garage on Ellis St. near Mason St. Estimated cost $75,000.

Md., Baltimore—The Gas & Electric Co., Constitution and Monument Sts., plans to build a 1 story, 118 x 169 ft. general repair shop for machinery, automobiles, etc. Estimated cost $69,590.

Mass., Woburn—J. J. Grothe Co., 12 Everett St. (manufacturer of wagons), plans to build a 1 story, 100 x 200 ft. machine and woodworking shop, an addition to present plant.

Mass., Worcester—J. Nagle, Harrison St., plans to build a 1 story, 30 x 40 ft. machine shop.

Mich., Detroit — The Caughey-Jossman Co., 5075 Grand River Ave., awarded the contract for the construction of an 80 x 286 ft. garage and service building, also a 100 x 115 ft. sales room on Grand River Ave. near Warren Ave. International Motor Truck Co., lessee.

Mich., Union City—The Ford Garage Co. plans to build a garage and service station. Estimated cost $75,000. Engle & Stanton, owners.

Miss., Vicksburg—The Alabama & Vicksburg R.R. awarded the contract for the construction of a 64 x 208 ft. car repair shop on Cherry St. Estimated cost $57,000.

Mo., St. Louis—C. Ickenroth, 1012 Yale Ave., awarded the contract for the construction of a 1 story, 40 x 98 ft. garage at 6806-8 Clayton Ave. Estimated cost $25,000.

N. Y., Jamestown—The King Motor Sales Co., West 4th St., plans to build a garage and service station. Estimated cost $125,000. H. C. King, Pres.

N. Y., North Tonawanda — The Daily News Print Corp., Thorold, Ont., is having plans prepared for the construction of a paper plant, including a 93 x 380 ft. machine room, a 130 x 145 ft. beater room and a 150 x 400 ft. main building, here. Estimated cost $3,000,000. Private plans.

N. Y., Tottenville—The Nassau Smelting & Refining Wks., Ltd., 603 West 29th St., New York, awarded the contract for a group of plant buildings, here. Estimated cost $100,000.

O., Cleveland—The Brush Garage Co., c/o Watson Co., Archts., 4614 Prospect Ave., awarded the contract for the construction of a 2 story, 110 x 110 ft. garage on Prospect Ave. near East 55th St. Estimated cost $100,000. Noted Sept. 6.

O., Cleveland—The Cleveland Cap Screw Co., 2921 East 79th St. awarded the contract for the construction of a 2 story, 66 x 95 ft addition to its factory. Estimated cost $40,000.

O., Cleveland—H. D. Koblitz, Osborn Bldg., has had plans prepared for the construction of a 1 story, 89 x 116 ft. garage and commercial building on East 55th St. and Cedar Ave. Estimated cost $50,000. R. M. Hulett, 1104 Prospect Ave., Cleveland, Archt.

O., Cleveland—I. G. Kohn, 640 Guardian Bldg., has had plans prepared for the construction of a 1 and 2 story, 60 x 126 ft. garage and commercial building at 2027 East 105th St. Estimated cost $50,000. Lehman & Schmidt, Electric Bldg., Cleveland, Archts. Noted Aug. 2.

O., Cleveland—Thorsell Bros., Mayfield and Sheffield Rds., awarded the contract for the construction of a 1 story, 50 x 100 ft. garage and repair shop. Estimated cost $40,000.

O., Toledo — Baker Bros., Post St., awarded the contract for the construction of a 2 story, 80 x 112 ft. machine shop. Estimated cost $40,000.

O., Toledo—The Page Dairy Co., Wade and Knapp Sts., is receiving bids for the construction of a 1 story, 80 x 100 ft. garage on Wade and Williams Sts. Estimated cost $50,000 Mills, Rhines & Bellman, 1234 Ohio Ave., Toledo, Engrs. and Archts.

R. I., Providence—Lockwood, Greene & Co., Engrs. and Archts., 24 Federal St., Boston, will soon award the contract for the construction of a 2 story, 61 x 110 ft. roll shop and a 1 story, 76 x 121 ft. press room for the Textile Finishing Mchy. Co., 171 Westminster St., here. Estimated cost $200,000.

S. C., Greenville—J. E. Sirrine & Co., Engrs., are receiving bids for the construction of a 60 x 120 ft. factory for the manufacture of reeds, loom harness, drop wires, etc., for the Steele-Heddle Mfg. Co.

W. Va., Northfork—The Community Garage is having plans prepared for the construction of a 2 story, 106 x 106 ft. sales and service building. S. S. McNeil, Pres. L. P. Richards, Crumpler, Archt.

Wis., Cuba—The Zinc Hill Mining Co. will build a 1 story, 75 x 120 ft. milling plant. Estimated cost $50,000.

Wis., Elkhorn—H. Wheeler plans to build a 2 story garage and repair shop. Estimated cost $40,000. Engineer or architect not selected.

Wis., Manitowoc—The Grimm Aluminum Casting Co., South 21st St., awarded the contract for the construction of a 1 story, 50 x 84 ft. foundry on 21st and Franklin Sts. Estimated cost $40,000. Noted Aug. 16.

Wis., Milwaukee—The Boston Store, 319 Grand Ave., plans to build a 1 story garage on Virginia St. Estimated cost $50,000. N. Stone, Pres. Engineer or architect not selected.

Wis., Milwaukee—The Luick Ice Cream Co., 183 Ogden Ave., is having plans prepared for the construction of a 4 story, 120 x 120 ft. garage on Van Buren St. Leenhouts & Guthrie, 424 Jefferson St., Milwaukee, Archts.

Ont., Chesley—The W. and C. Window Regulator Co. plans to build a plant for the manufacture of a patent window regulator for automobiles, boats, street cars, railway cars, etc. Estimated cost $100,000. R. J. Ranney, Mgr.

Ont., Collingwood—The Canadian Postal Lock Nut & Bolt Co., awarded the contract for the construction of a factory. Estimated cost $60,000. F. A. Bassett, Pres. Noted Dec. 14, 1922.

Ont., Ford—The Ford Motor Co. of Canada awarded the contract for the construction of a 1 story, 144 x 200 ft. heat treating plant. Estimated cost $500,000. Noted July 26.

Ont., Hamilton—The Canadian Westinghouse Co., Traders' Bank Bldg., Toronto, is having plans prepared for the construction of a 1 story, 205 x 550 ft. foundry on Aberdeen St., W., here. Estimated cost $300,000. B. H. Prack, 50 Bay St., Toronto Archt.

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An Improved Automatic Chucking Machine

BY FRANK E. BARDROF
Associate Editor, *American Machinist*

A 6x6¾-in. automatic chucking machine with important features —Comparatively small and compact design—Small turret feed cam and unique threading device—Adjustable individual spindle speeds

A RECENTLY developed automatic machine for turning, boring, facing, threading and reaming operations on work up to 6 in. in diam. and 6¾ in. long has many features of interest and a wide range of usefulness. The machine is now being manufactured by the Goss & DeLeeuw Machine Co., New Britain, Conn.

Broadly speaking, the machine consists of a bed, cast integral with the headstock in which are journaled the working spindles, four in number. At the other end of the bed, a work turret is mounted in a housing which is carried to and from the tools by the action of a cam. The turret is indexed by an automatic mechanism, and a wide range of speeds, on individual spindles, and feeds, without changing the cam, are available through change gears. The parts of the machine are so placed in relation to each other that the operator has an unobstructed view of all tools while the machine is in operation and the controls are conveniently located at the front of the machine. Fig. 1 shows the front of the machine with headstock at the left and turret at the right. A single 12-in. belt pulley for a 2-in. belt drives the machine and runs at 500 r.p.m. The pulley may be driven from a countershaft or by a motor mounted on a special base at the rear. When motor driven, a 5-hp. motor is recommended.

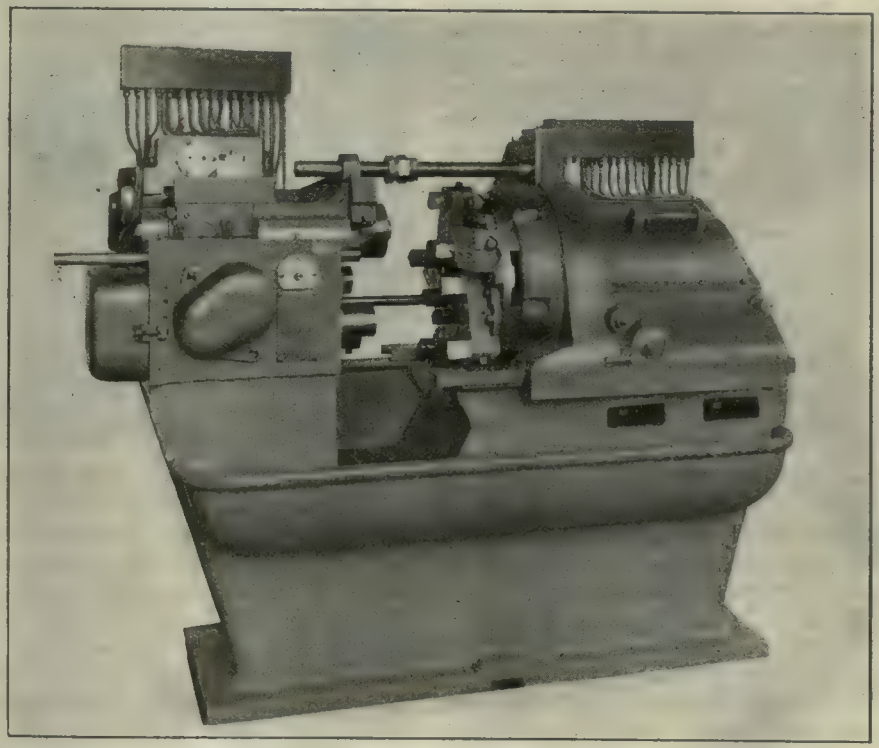


FIG. 1—GOSS & DE LEEUW AUTOMATIC CHUCKING MACHINE

The feed shaft is driven through spur and bevel gears from the drive shaft, runs at 300 r.p.m., and is pinned in the turret housing, to one driving member of a double throw clutch. The other driving member of the clutch runs loose on this shaft and is geared to the hand feed shaft. The sliding member of the clutch also runs loose and has a gear cut on its circumference which meshes with a wide-faced gear on a shaft of the indexing and cam driving mechanism, so that this mechanism is operated by hand or power according to which side of the clutch is in engagement. The clutch is shifted by a hand lever at the front of the machine. This arrangement makes it easy to shift from power to hand feed, but makes it impossible to have both in mesh at the same time. The position of feed shaft and drive shaft are shown in Fig. 2, which is the rear view of the machine. The feed cam is only 9 in. in diam., the dimension being small by virtue of the fact that the cam is stationary during the turret

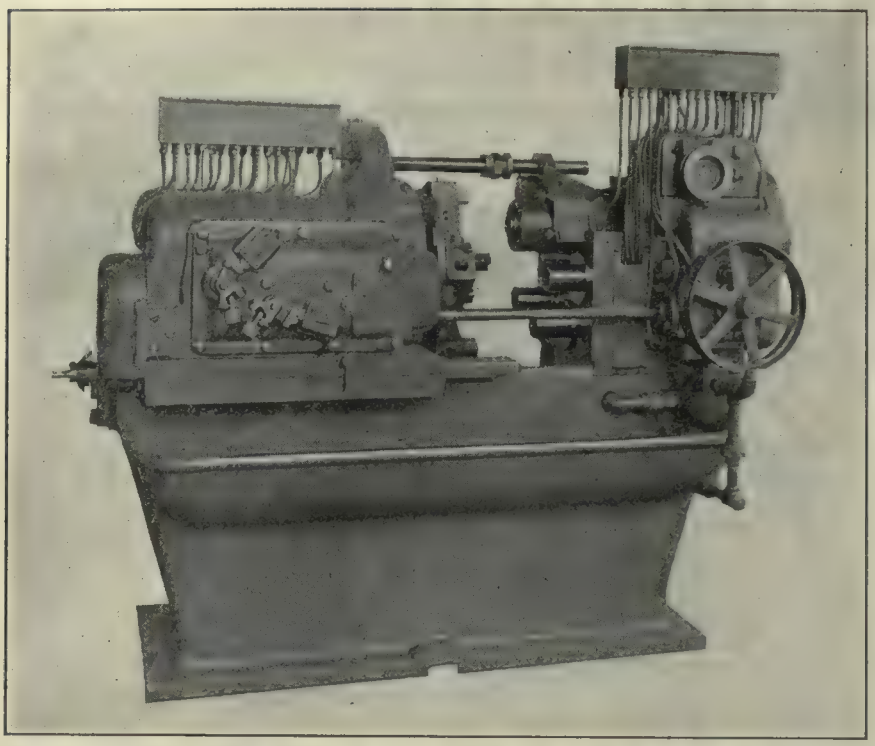


FIG. 2—REAR VIEW OF AUTOMATIC CHUCKING MACHINE

indexing period, and the feeding section of the cam is therefore able to occupy all but one inch of the circumference. The cam rotates freely on the turret spindle and is driven by a worm and wheel, the worm wheel being bolted to the drum. The cam housing has a removable cover and Fig. 3 shows the arrangement of the cam in the housing and one section of the cam being removed.

The cam track is machined in two half-cylindrical cast-iron sections which are bolted to the drum. These sections are interchangeable and a number of specially adapted cams may be kept on hand for jobs that recur regularly, although it is possible to do any job in the range of the machine with one cam. The cam roller is mounted on a slide between the ways on which the housing slides. The roller slide is locked firmly to the bed during operation but may be positioned accurately by means of the micrometer-head screw shown in Fig. 4. This adjustment serves to determine the farthest point of the turret movement and thus the depth of the cut.

The Turret Cycle

The cycle of the turret mechanism is made up of four periods as follows:

1—Indexing period in which the feed cam is stationary.

2—Quick traverse in which the work is brought up to the cutting tools and the cam revolves at the high speed.

3—Feed period in which the machining is done and the cam revolves at a slow speed.

4—Quick return in which the turret is returned to its original position, the cam revolving at the higher speed.

The mechanism which automatically controls this cycle is of sufficient interest to warrant a detailed description and is shown diagrammatically in Fig. 5. A feature of the action is that the feeding periods and the indexing periods cannot overlap, since the feed is thrown in by the indexing device as it stops, and the indexing motion is started by the cam as the quick return is completed.

Shaft *A* is driven from the feed shaft clutch as explained above and the arrangement of the other parts will be evident from the diagram. At the beginning of the cycle clutch *N* is in mesh with gear 3 having been left there at the completion of the preceding operations. Clutch *M* is thrown out of mesh with gear 1 and into mesh with gear 2, thus stopping the cam, and shaft *A* then drives the indexing shaft causing the turret to rotate to its next position.

At this point a safety feature of the machine should be noted. All clutches are thrown by a lost motion device by means of which the latter part of the movement is completed by a spring under compression. These devices are shown on the turret housing in Fig. 2. The indexing action is started through the movement of clutch *M* by a lug on the cam which can be seen in Fig. 3, but before the clutch is in mesh with gear 2 it meets a movable stop and is held under spring pressure, ready to engage when the stop is removed. This stop is moved by a knob at the front of the machine and it is evident that the knob must be pulled before indexing can commence. The position of the knob can also be noted in Fig. 3 at the right-hand end of the housing.

As soon as the operator completes the placing of the work in the chuck, therefore, he pulls the knob and the indexing can start when the return of the slide is completed. The knob may be pulled at any time as soon as the work is placed, and the machine will not stop unless the operator has consumed more time than allowed by the cycle. This arrangement gives safety and confidence

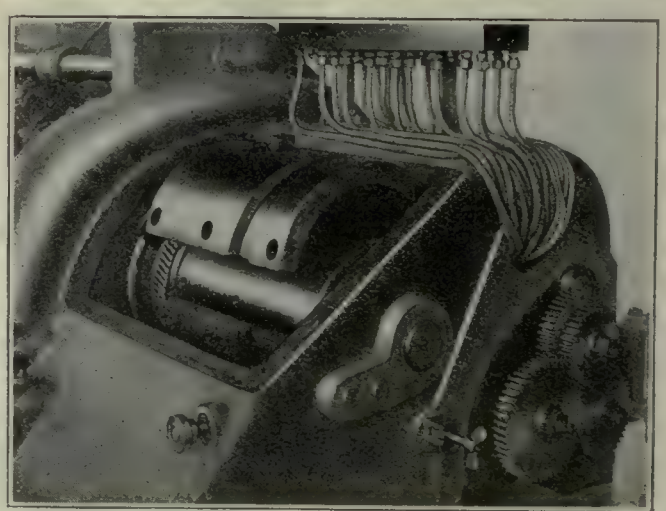


FIG. 3—CAM HOUSING COVER REMOVED SHOWING CAM DRUM AND TRACK SECTIONS

to the operator as the machine will not index until he is ready and, in cases where the operation will permit, more than one machine may be handled by one operator.

Coming back to the feed driving mechanism, the indexing motion is now in operation. A dog on the Geneva crank arm, at the conclusion of indexing, throws clutch *M* into mesh with gear 1 and the drive is from shaft *A* to shaft *B*, through gears 1 and 3, and then by bevel gears to the cam worm and wheel. This is the high speed motion.

As the work approaches the tools, clutch *N* is disengaged from gear 3 and goes into mesh with 4, so that the cam is driven from shaft *A* through the reduction gear train at the right of the diagram. Change gears are in this train and make possible a variety of feeds with a given cam. The change gears are located under the cover, shown in Fig. 4 at the end of the machine.

When the machining operations have been completed, the clutch *N* is again meshed with gear 3 and the turret is quickly returned to its starting position ready for indexing. It will be noted from the above that but one clutch is shifted at a time and that the quick traverse and return speed is constant.

The turret is mounted on a heavy shaft, on which the

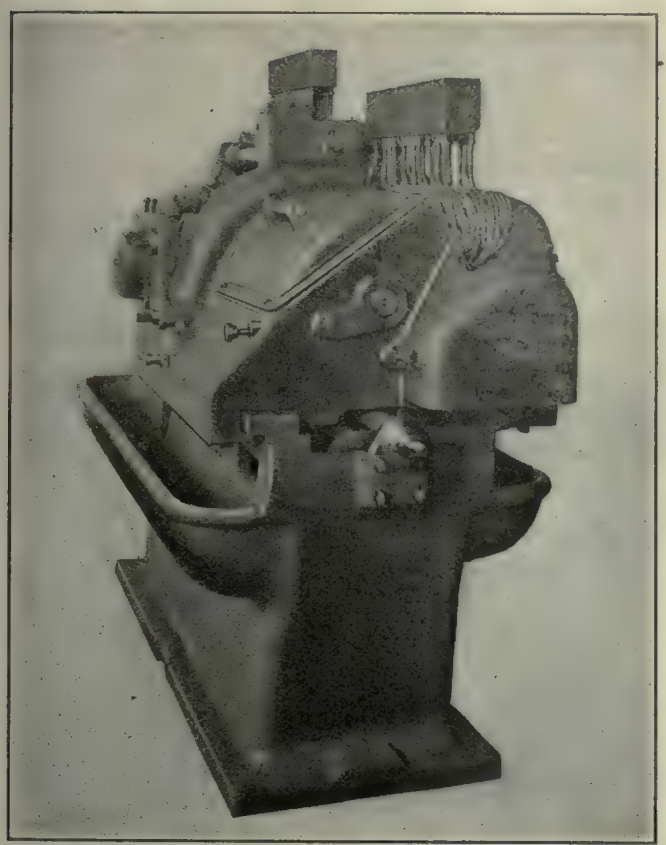


FIG. 4—TURRET END VIEW SHOWING CONTROLS AND FEED ADJUSTMENT

feed cam also rotates as mentioned above, and is indexed by a Geneva-stop motion located in the housing and directly back of the main bearing. This arrangement decreases the twist in the shaft, and the fact that the index wheel is larger than the diameter of the circle on which the work is located causes accurate indexing. The turret body has a circular beveled plate on its back next to the housing, and against a similar plate attached to the housing itself. The beveled edges of these two plates form a circular V-section clamping surface which is surrounded by a split-ring which fits over the V. When this ring is tightened, the turret is held stationary against turning and at the same time the wedging action in the V tightens the turret body squarely against the housing. A lock bolt is also arranged to enter notches in the circumference of the Geneva plate. The clamping ring is operated by the cam shown on the indexing shaft in Fig. 5, the lock bolt being withdrawn by the Geneva roller and re-entering the notch under spring pressure. The turret shaft extends through a bearing at the end of the housing.

The chucks are of special design and are one of the features of the machine, since the slots through which

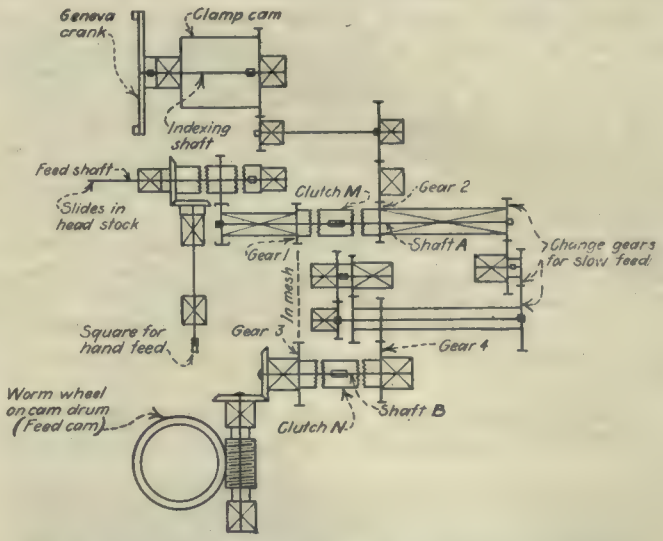


FIG. 5—DIAGRAM ILLUSTRATING ACTION OF TURRET INDEXING AND FEED MECHANISM

the jaws project do not extend across the whole face of the chuck. The threaded portions of the jaws are circular in cross-section and fit accurately in the hole in the chuck body. The face of the chuck body is, therefore, solid at the center and there is practically no give to the jaws as they are tightened on the work. The chucks have a wide bearing on the turret and the bolt holes in the plate have hardened removable bushings.

The machine drive shaft extends through to the front of the headstock and drives the gear, at the center of the circle on which the spindles are spaced, through a set of change gears and bevels. By substituting various change gears the speed of all the spindles may be changed at once, and change gears between the spindle

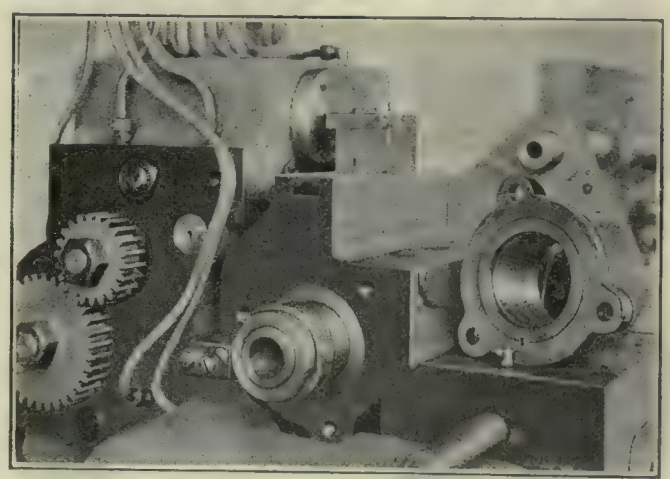


FIG. 6—THREADING SPINDLE LEAD SCREW, NUT AND CHANGE GEARS

drive gear and the spindles make the speeds of the individual spindles adjustable with respect to the others. All of the spindles are continually in gear with the exception of the threading spindle which is driven through a clutch.

The threading mechanism of this machine is of especial interest since the taps and dies do not draw

themselves into the work, but are fed in by lead screws of the same pitch as the thread being cut. Both inside and outside threads may be cut at the same time and of the same or different pitches.

The threading spindle carries the tap at the front end and has a master or lead screw fastened at the rear end. The lead nut is bolted to the threading slide in which the spindle is mounted, and different screws and nuts may be easily put in place for various pitches. The arrangement of the threading spindle and lead screw is shown in Fig. 6. A sleeve is feather-keyed to the spindle and carries the die for outside threading. This sleeve also carries a lead screw which is threaded into a nut, which can be seen in Fig. 2, on the front face of the slide, and a gear which meshes with a long pinion. This pinion is driven through a double-throw clutch which is thrown into mesh to start the rotation of sleeve and spindle.

A device, geared to the spindle, disengages the clutch and throws it to the reversing position when the required number of turns of the spindle have been made. This device consists of a cam disk with adjustable dogs and appears above the driving pulley in Fig. 2. The reverse action causes the threading tools to be withdrawn from the work, and when the spindle has reached its original position, the clutch is again disengaged. The connection between cam and clutch is similar to that for shifting the turret clutches and, in a similar way, a stop or detent holds the clutch out of engagement under spring pressure when the spindle stops. To start the threading action of the spindle and sleeve it is only necessary to release the detent.

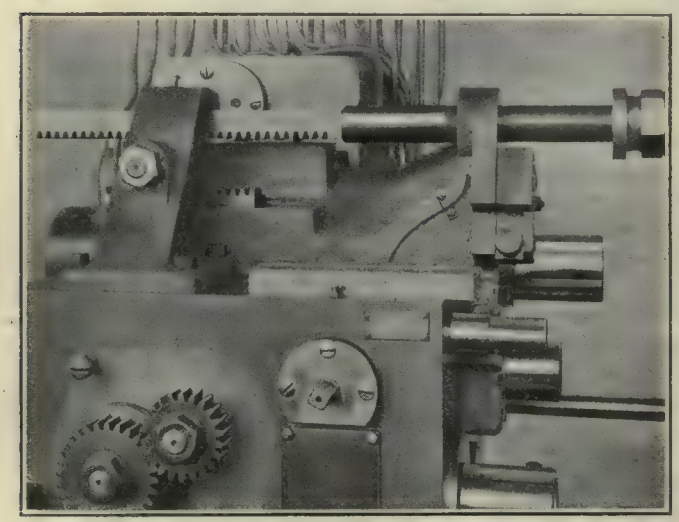


FIG. 7—THREADING SPINDLE DRIVE FOR REAMING OPERATION

Action of Spindle and Sleeve

It will be noted that the driving mechanism of the spindle and sleeve causes them to start from a state of rest, make a predetermined number of revolutions during which they travel forward under the influence of the lead screws, reverse themselves, return to their original positions and stop. This action, in order to be available for cutting threads on work held in the turret chucks, could not be applied if the spindle lead nuts remained stationary as the turret approached. It is for this reason that the spindle, sleeve and nuts are mounted on the slide mentioned above.

This slide is pushed along, as the turret feeds toward the work, by a nut on a threaded rod attached to the turret housing as shown in Fig. 1. The nut is so set that, just before the work meets the threading tool, the nut strikes the threading slide and causes the slide with all its mechanism to move at the same speed as the work. In addition, a lock on the slide snaps into the groove in the nut so that the turret and the threading slide are positively locked together throughout the threading operation. When the turret moves back, the threading slide also moves to its original position where the lock is disengaged and the turret continues to its indexing position.

Threading by Lead Screws

The major advantages of this threading mechanism are the use of lead screws, so that the tools do not draw themselves into the work, and the reversing action of the spindle. The latter is important because with this machine the operator can throw out the feed at any time, even during the threading operation, without doing any damage to the machine or the tap. The threading device will simply complete its operation, reverse, draw out and stop.

The threading spindle can also be used for reaming, in which case the mechanism is arranged as shown in Fig. 7. The spindle reversing clutch and lead screws are disconnected and a rack and pinion device is installed. This device causes the slide to be driven toward the work at twice the speed of the turret feed. The reamer is mounted in the spindle which can be given a slow speed by change gears, and the quick feed combined with slow rotation gives a good reaming action.

Provisions for Lubrication

The cutting lubricant reservoir is located in the base of the machine and the pump is mounted at the back of the headstock, directly under the drive shaft, as shown in Fig. 2. The lubrication of all bearings and other moving parts is taken care of by the two oil reservoirs, shown mounted above the headstock and turret in the illustrations.

Both slides have full-length taper gibs for adjustment and are accurately machined. The important gears are made of chrome-nickel steel and heat-treated.

The compactness and availability of the machine are well illustrated by the fact that its over-all length is but 68 in. and the cycle time adjustment is from 7 to 56 sec. Especial attention has been paid in the design to simplicity of control, accuracy of operation and a wider range of adjustment than is usually possible on high-production machines.

Electrical Exports Show Increase

United States exports of electrical materials during July of this year exceeded the shipments made in the same month of 1922 by almost $1,700,000, bringing the average for this year up to a point well in advance of the 1922 figures, according to *Commerce Reports*, published by the Department of Commerce. A substantial increase was also shown over the June exports of electrical goods. Heavy power machinery, together with radio apparatus and bare copper wire, showed the largest gain during July. Unusually heavy shipments of large motors and electric locomotives were also made. Decreases as compared with the previous month were mainly in appliance lines and supplies.

Automotive Service Methods and Equipment

By HOWARD CAMPBELL
Western Editor, *American Machinist*

Twentieth article—Re-grinding pistons—Broaching wrist-pin bushings—A home-made cylinder honing tool—Boring main bearings—A number of useful ideas

THAT adequate service facilities must be maintained if an automobile is to be marketed successfully is becoming more evident every day. The unusual success of the Vesper-Buick Motor Co., St. Louis, Mo., is credited by that firm to the use of the good tools and equipment described here.

The Franklin valve-grinding machine is a familiar object in the well-equipped repair shop, but the use of the same machine for grinding pistons is not so common. A piston in process of regrinding is shown in Fig. 1. To the front of the machine is attached an auxiliary table that can be fed longitudinally or across, using the handwheels shown. Two brackets that are bolted to the table support a shaft which carries two adjustable arms, one of which carries an ordinary center, the other carrying a bearing for a small shaft. On one end of the shaft is a bull-center and on the other end is a pulley that is driven from the motor through the medium of a countershaft. A double pulley on the motor makes it possible to drive the countershaft and the grinding wheel at the same time. The piston is held between the small center at the closed end and the bull-center in the open end, the bull-center serving to drive the piston when power is applied. The wheel used is a 6x½-in. Norton 6660-M. Pistons that have been turned oversize but not ground are kept in stock for use with cylinders that have been re-reamed oversize. A set of pistons can be ground to size in from 45 min. to 1½ hours.

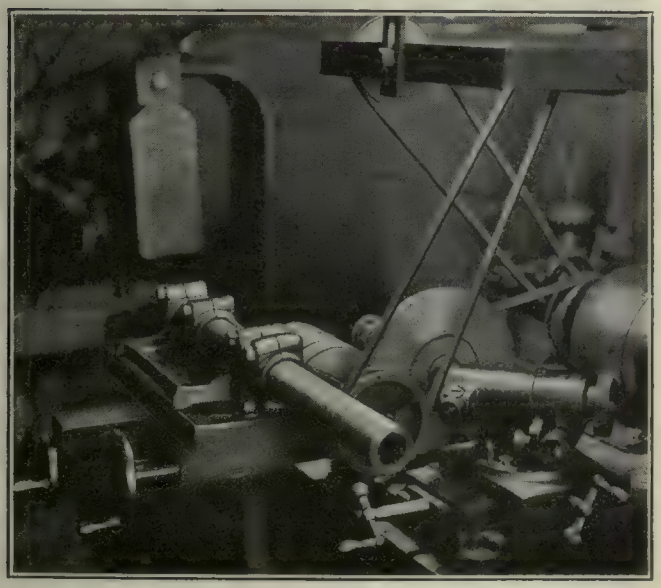


FIG. 1—REGRINDING A PISTON ON A VALVE GRINDER

The operator shown in Fig. 2 is re-seating a valve cage, using the machine described above. The tool is located on a vertical shaft that is driven from the motor shaft through a pair of bevel gears. The vertical shaft is long enough to project up through the valve stem hole in the cage, thus holding the cage true with the tool so that the valve seat will be true with the seat on the valve head. The seats in a set of valve cages can be re-reamed and the valves ground complete in approximately 40 minutes.

The task of assembling the plates of a disk clutch is not easy unless one has the proper equipment, such as the clamping arrangement shown in Fig. 3. To the bench is bolted an iron plate, on which the parts of the clutch are assembled.

A foot lever is hinged to the back of the bench at a point near the floor so that it will extend to the front

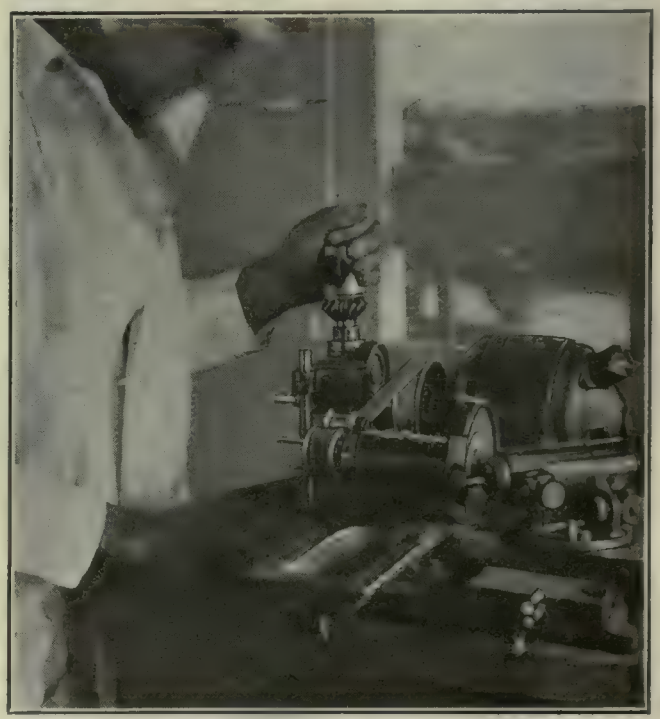


FIG. 2—RESEATING A VALVE-CAGE



FIG. 3—FIXTURE FOR ASSEMBLING A DISK CLUTCH

of the bench, crossing under the center of the plate. An iron rod is hinged to the foot lever, the rod being long enough to project vertically through the plate and a set of disks, with room for a U-clamp and a nut on the upper end. When the disks and spring are in position, the U-clamp and nut are put on the rod and the foot lever is forced down, thus compressing the spring and holding it so that the nuts can be assembled to the bolts without difficulty. A clutch can be assembled in five minutes with this apparatus.

A tool for use in assembling valve springs to valve

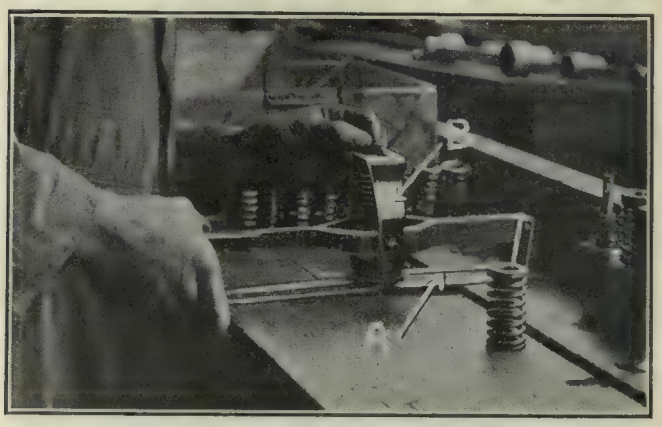


FIG. 4—COMPRESSING A VALVE SPRING

cages is shown in Fig. 4. It consists of a bottom plate *A* in which is a locating seat for the cage and a top lever to which is attached a U-shaped section *B* that slips over the valve cage and valve spring. A slot in the top of the U-section allows the end of the valve stem to protrude. Bearing down on the top lever compresses the spring and allows the operator to insert the cotter-pin into its hole in the valve-stem without difficulty.

The operator shown in Fig. 5 is broaching the hole in a piston pin bushing that has just been pressed into the small end of a connecting rod, using a machine and set of broaches made by the Sheldon Machine Co., 401 East 29th St., Chicago, Ill. The teeth at the lower end of the broach are small enough so that they will enter the hole in the bushing, each succeeding tooth being a few thousandths of an inch larger. The top teeth bring the hole nearly to size and then the smooth straight section at the upper end of the tool expands and burnishes the hole to size. This method of finishing holes is in accord with the most modern shop practice and produces excellent results. With the outfit shown the operator can broach the bushings in six rods and fit the pistons to the rods in approximately 20 minutes. The illustration, Fig. 6, shows a set of Sheldon broaches, which includes tools for broaching the holes in piston pins, spring eyes, rocker arm bushings, connecting rod main bearings, and king bolt holes in axles. A set of tools like this should pay for itself many times over in a short time.

The operation of broaching the wristpin bushings in a piston is illustrated in Fig. 7. The piston is held in

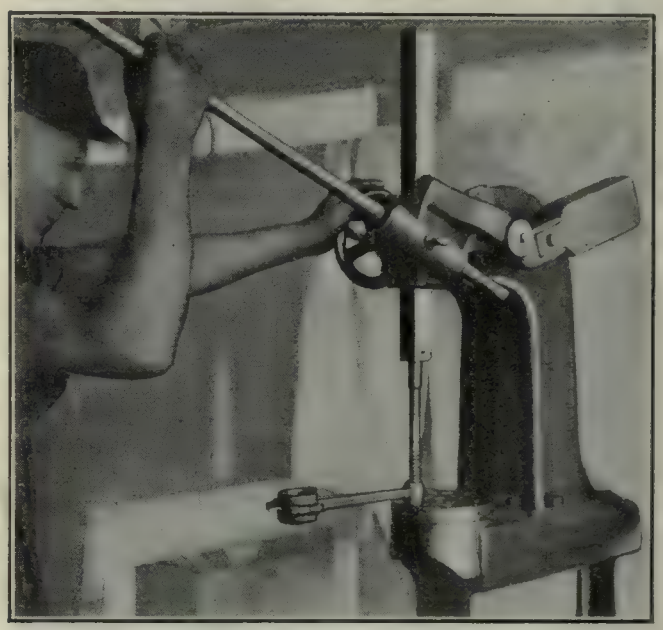


FIG. 5—BROACHING A WRIST-PIN BUSHING

a jig which closes about the entire outside surface of the piston, thus precluding the possibility of the piston's being distorted while the operation is in process. The pin hole is aligned with the hole in the jig so that the broach can be started, then the clamping screw is

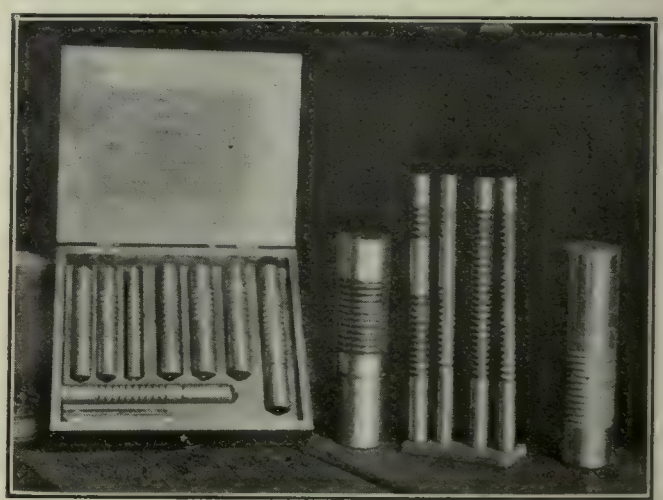


FIG. 6—SET OF SHELDON BROACHES

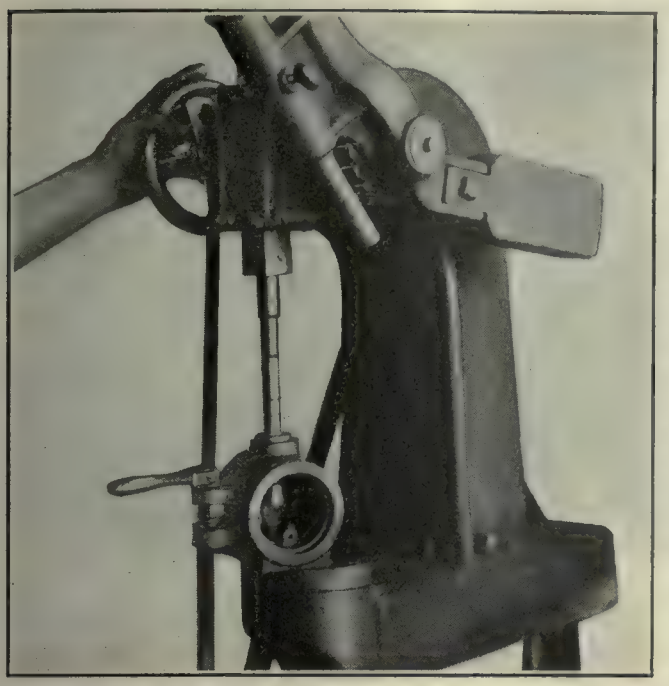


FIG. 7—BROACHING WRIST-PIN HOLE IN PISTON

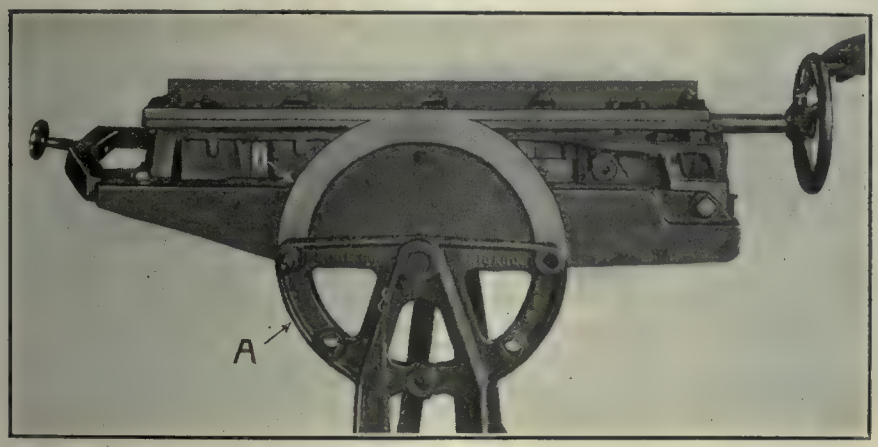


FIG. 8—MOTOR STAND AND ALIGN-BORING TOOL

tightened down and the broaching operation proceeds.

A crankcase in position to have the main bearings reamed is shown in Fig. 8. The case is held in a motor stand that is built especially for Buick motors by the Service Station Equipment Co., Chicago, Ill. The stand is designed to take all models of Buick motors with four and six-cylinders, and a motor can be completely disassembled and assembled without removing it from the stand. The section to which the case is bolted is held in position by a plug which slips through one of the holes in the circular section *A* and into a corresponding hole in the section *B*. The five holes in section *A* make it possible to hold the case at practically any angle.

The boring fixture consists of an iron frame that carries the boring bar and a shaft that slips through the camshaft bearings. Locating from the camshaft hole insures that the cam and crank gears will be the correct distance apart, and that the crankshaft will be perfectly aligned. The boring bar has a 32-P thread on the opposite end from the handwheel and a split, hinged nut is attached to the frame so that it can be locked around the thread on the bar. Thus turning the handwheel feeds the bar $\frac{1}{32}$ in. per revolution. A boring tool, made of a bit of $\frac{3}{8}$ round high-speed steel protrudes from a hole in the bar at each bearing. Adjusting and clamping screws hold the tool-bit in position. When the tool is in position, turning the handwheel feeds the bar through and bores out the bearings. With this tool a case can be align-bored, "floor to floor," in from $1\frac{1}{2}$ to 2 hours.

The set-up for honing out a cylinder bore, using a home-made honing tool, is shown in Fig. 9. The tool, Fig. 10, is made of maple-wood with five slots milled in the sides for a set of abrasive stones. Three $\frac{3}{8}$x$\frac{3}{4}$-in. coil springs under each stone force the stones against the wall of the cylinder. The tool is turned smaller in diameter at one end, a wire about the tool at this point holding the stones to the tool when not in use. In the upper end of the tool is a short section of steel shaft that has been split and pinned to a similar section so as to form a universal joint. The tool is held in a chuck in a drill press spindle as shown and worked up and down in the cylinder bore while revolving. High spots, rough spots and taper up to 0.005 in. are removed with the tool, the time required averaging about 6 min. per cylinder. The cylinders are tested with a Walker Microgage after honing.



FIG. 10—HOME-MADE HONING TOOL

The operator shown in Fig. 11 is

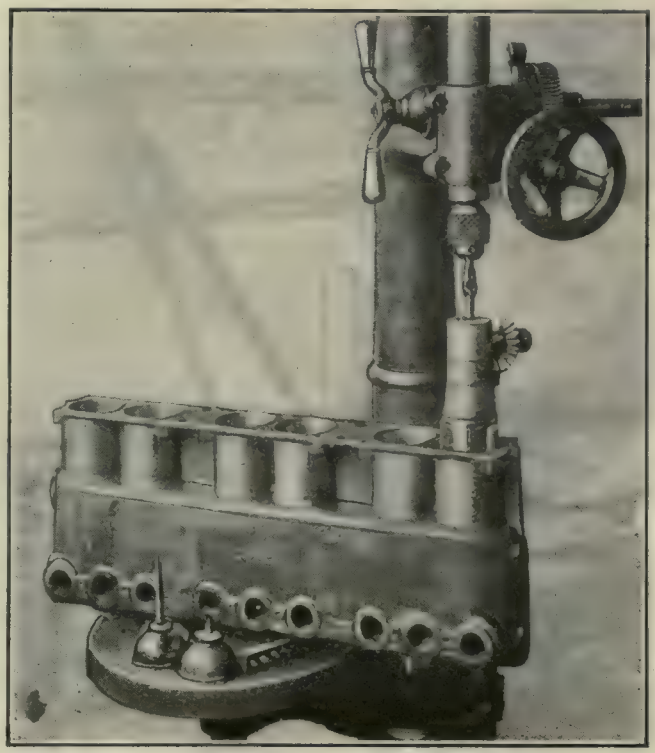


FIG. 9—HONING A CYLINDER BORE

working on an axle that is held in a "Dixie" axle-stand, made by the Service Station Equipment Co., Chicago, Ill. The stand can be used for either front or rear axles, the extension framework serving to support the propeller shaft. The stand is equipped with two vises, one tipping to the side to make the axle housing accessible for the removal of the roller-bearing sleeve, and the other turning on a spindle to facilitate the removal of the differential and axle shaft. A heavy cast-iron removable pan is provided to catch the grease and oil from the differential. The extension framework can be folded when not in use.

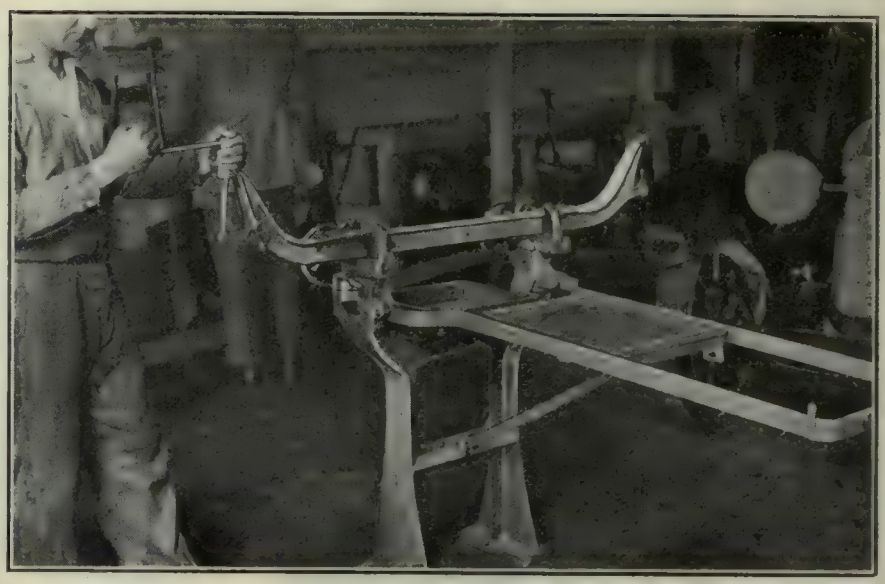


FIG. 11—USING THE "DIXIE" AXLE-STAND

In a former article a carbon-burning outfit was described that included a storage battery to supply the spark for ignition. A similar idea is illustrated in Fig. 12, except that no battery is

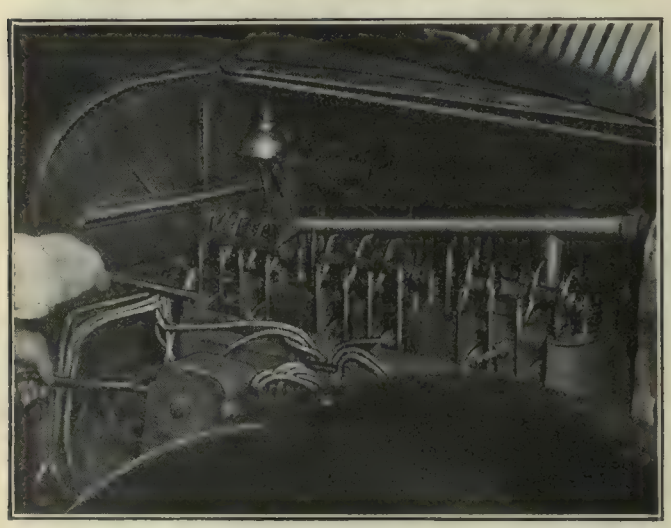


FIG. 12—IGNITING GAS FROM BATTERY STRAP

used. The left-hand of the operator is holding a worn out hacksaw blade that is connected by 30 in. of wire to the rear end of the gas torch. When the operator is ready to begin, he inserts the torch into the spark-plug hole, turns on the gas, then touches the hacksaw blade to the strap between the battery and the generator. Rubbing the end of the nozzle on the threads in the hole will cause sparks to fly and the gas will be ignited.

The Four Hour Day

BY ENTROPY

It seems that we are all to work on as little as a four hour day in 2023. To some of us who have put in quite a little time on this earth that seems a long time to wait. Why not have it now? Then again, on second thought, haven't we it now?

Every little while I go somewhere and see people who are working, that is, they draw wages, salaries and so on. Sometimes I see them working, sometimes they seem to be resting, at other times there are indications that they are thinking.

In this building there is a gang of men who are altering it, and they represent all the building trades. They are said to draw wages that a few years ago would have been considered princely. They work indoors, they are sheltered from the weather, they get in full time day after day and week after week. They are present forty hours a week, but if they were docked for all the time they spend making remarks about passers-by, borrowing a match and the makings, and knotting their brows in despair over blueprints, they would draw no more money than their predecessors of thirty years ago.

I go into a machine shop occasionally where the same thing prevails, only I think they think they work a nine hour day, but if they were paid for the time they keep their machines running, which is all the time they are producing, they likewise would have small pay envelopes.

Much observation makes me believe that we struck the four hour day, except in a limited number of cases, some years ago. Where there are piece-work hogs, who would work away up to ten hours a day if they were allowed to do it, there is considerable activity, but the day or hour workers seem to have adopted a standard of their own that is not far from the four hours which Dr. Steinmetz suggests for a century to come.

Even my professional friends delight in conferences. A conference, so far as I am able to discover from attending them most of my waking hours for several years, is a place where from three to thirty men smoke, tell stories, have a sociable time and ultimately do what one man decided they would do before the conference was called. A conference is a sop to a sort of responsibility-sharing complex which keeps us from being willing to take the bull by the horns and solve our own problems. The average working day for us conference attenders averages about one hour.

Now, why not all hands join at once in throwing off the camouflage, and admit that we do not work much and then cut the real working day in halves. We do not need tell our families what we have done. We will work, and work like real workers every morning, and then in the afternoon we will play. We will get a great deal more done than we do now mixing the two.

Of course there will be an occasional work-hog that will work with the rest of us mornings and cut the afternoon session and go run a business of his own, but that has always happened, and they are welcome to their hard earned profits. The rest of us don't need the money. We make enough the way it is.

The Worker's First Training

By O. C. Richards

USUALLY we think of the worker's training as starting when he is hired into the shop and placed under the supervision of an instructor. The object is, of course, to obtain an efficient and reliable worker who will be likely to continue in our service a reasonable length of time. After using all the care possible in instruction, the results shown in different instances vary so much that we are daily impressed with the importance to us of the training that the boys have received in the home and school.

Not long since I was asked to assist in obtaining a job for a young man of my acquaintance. I have known this boy and his home surroundings and training all his life, and I flatly refused to speak a good word to any prospective employer. I am positive that he will not stick with any job. He has never learned self control and has been taught to think that he has very unusual natural ability, which is not at all according to the facts in the case.

There are many such boys coming under the observation of all of us. It will take a good many hard knocks to teach them the value of dilligence and hard work, and many of them will learn it too late to be of the greatest value to them. As I look about me in the shop I cannot help being impressed with the questionable fitness of many of the parents I see, for the responsibility of training children in the proper ideals of citizenship.

The hopelessly ignorant man is at a big disadvantage, and it seems that there is surely no excuse at this day for parents allowing a child to grow up without at least the rudiments of an education. Such a man is the prey for all the propaganda of the unscrupulous, and it is astonishing what ideas such people sometimes get. During the recent hard times a man of middle age came to me one evening at quitting time, white and trembling with anger, to tell me that he was leaving. Some one had jokingly said to him "You are a jinx. You are helping to bring hard times." He had taken all this in dead earnest and, it had so preyed on his mind that he thought all the boys were against him and wanted him to quit. I found it very difficult to disabuse his mind of this trouble. The ignorant and uneducated man can never be more than what the Scripture calls a "hewer of wood and a drawer of water," and the responsibility rests very largely with the parents who failed to give him the advantages he should have had.

Need Courtesy and Cheerfulness

Just plain lack of courtesy is exceedingly annoying to contend with. Many times I see a workman step up to his foreman when the latter is in the midst of a conversation, and interrupt him in regard to some trivial matter. Whenever I witness such an occurrence I feel that I have had a good glimpse of that man's real character. There are thousands of opportunities for the display of courtesy in our life about the shop, and it does much to keep us all happy when our associates treat us with consideration.

The grouch is a regular institution in all our shops. He cannot seem to get the idea of what he is missing by rubbing people the wrong way. I have a very good friend who is of that type. He is a shop foreman, and is an interesting conversationalist on account of his wit and his fondness for a joke. When he reaches the shop his disposition changes entirely, and his men see the grouchy side of his character.

Another man is a lathe operator on a particular line of work. If he is assigned a job that is a little different and out of his line, he immediately starts to find trouble with the job so that he can get it placed on day work or given to another operator. Under these circumstances he worries the foreman nearly distracted, yet he claims to be a very expert workman.

A political or religious fanatic makes a deal of trouble some times. He is never content to think his own way and let others think theirs, but must constantly antagonize his associates and pour into their ears his distorted ideas of life. Such a man is often really anarchistic in his views and does a great deal of harm among a certain class. I once had such a man as an instructor. He had been given the job through somebody's poor judgment, as a reward for service. It proved that his complainings against the shop conditions were the direct cause of many new men leaving. They did not know that his complaints were just as bitter against almost any existing condition in the entire country. He is now where his long experience is of value to the company, while his tongue can do very little damage.

Character the Main Consideration

Honesty is an old fashioned virtue and should be much more common than it is in some places. There seems to be a sort of a double standard existing in many people's minds. A man was recently overpaid nearly thirty dollars and said nothing about it until the office found the mistake. The same man has been known to quibble about a time allowance that others accept without comment. It is not hard to connect some of these things with the parent insisting to the conductor that Johnny is only nine years old, but large for his age.

There is the man who is anxious to have the boss think that he cannot handle a certain class of work. He will even sometimes spoil a piece purposely to help out his argument. This action he hopes will result in his being kept on the simpler work that he is used to, and which does not require the mental effort. Also, he thinks that if he is considered capable of handling the more difficult work, he may have occasional special work with time allowances not as yet set. I know many of this type, both male and female. I have in my library a book entitled "Poor Boys Who Became Famous," I sometimes wonder how such actions would appear to the heroes of these tales.

A boy of eighteen walked up to his foreman and said, "Fire me. I want to get my money so that I can go to another city." When told that he would have to get his money on the regular pay day or give the customary number of days notice before quitting, he was very much put out. Lighting a cigaratte, he blew the smoke in the foreman's face and said, "Now I guess you will fire me, all right." Reputation means nothing to such a man. The good opinion of others seem to be of absolutely no value in his estimation.

In the few instances and types described, it is easy to see the part that early training has played in the habits and character of our associates in the shop. The child reared in a good home and taught the essentials of good character, has a big start toward success. I am always delighted when I can get hold of a young man or woman whose early training I know to be good.

A few months ago it was necessary to pick a foreman for a certain department. There were several who

were familiar with the work and possessed many of the qualifications needed. The choice fell along the lines of character. The man appointed did not have as wide experience as some other candidates, but was of such obvious strength of character as to overbalance some other weaknesses. His courtesy, honesty and self control had not been acquired in his mature years, but had been diligently taught in childhood by those responsible for the training of the child. Whatever our children are to engage in when grown, the finest thing we can do for them and for our country, is to teach them the principles of real character, as well as give them the best educational advantages circumstances will permit.

Promoting American Machinery Sales Abroad

By W. H. Rastall
Chief, Industrial Machinery Division, Department of Commerce

NO CAMPAIGN for foreign business should be started until the necessary domestic organization has been developed. Instances have been known where firms have actively advertised in foreign countries and later, when confronted with an export order, did not know how to execute it. Such methods are inexcusable and discredit the manufacturer at home and abroad. Export business is good business and worth sustained effort. Some large American firms depend almost entirely upon their foreign business. It has been shown that the average American machinery manufacturer exports 17 per cent of his product. Also this business can be secured on terms that are clean and attractive, but to sell without proper preparation is only to sell trouble.

Neglect of foreign customers, bungling methods, in fact all of the long list of export sins accumulate "bad will" against the day when a serious effort is to be made. Also these failures create a handicap for other Americans who are overseas. Manufacturers should keep out of foreign trade until prepared to handle it properly. These remarks should not be interpreted to mean that foreign trade is difficult, for properly approached, it is easily handled and clean business, and Americans can handle the trade as well as anyone else, as is demonstrated by the volume of our machinery sales abroad.

It is important that a definite foreign sales policy be established. This policy may not be the same for the varying conditions of different territories, but in each case it should be definitely decided whether the manufacturer will quote only f. o. b. works, f. a. s. New York (or other port), or c. i. f. destination; whether he will open a branch, send his own salesman, grant an exclusive agency, or operate in an open market, etc.

Selecting a Representative

Unquestionably the best way to select an agent is to gather all possible information in the United States and then visit the foreign country, investigating the matter and coming to an agreement on the spot. When conditions justify, this should be done, but if attempted it should be done properly. It is a great mistake to feel that it is possible to rush into a foreign country, acquire the necessary information, make a decision, and hurry on in a short time. Furthermore, each country has its own peculiarities, so that it is scarcely safe to draw conclusions from one with respect to another. Each constitutes a separate sales problem.

The matter of covering the territory adequately is very important. Many of our people use the political boundaries, thinking that they mark out the business districts. This is a great, though common, mistake. The fact that a firm has an office in Shanghai is no proof that it can cover properly the Hongkong or the Peking districts. In point of time Peking is as far from Shanghai as Salt Lake City is from New York. Very often a Calcutta firm is not prepare to cover either Burma or Bombay.

When arranging for the appointment of an agent, the manufacturer should also arrange for such supervision of this agent as is necessary to protect and promote the interests of the manufacturer. There are many ways by which this can be done. More and more the better merchants and manufacturers are arranging to have a qualified salesman (really sales manager) join the staff of the agent in each important foreign office. The details of the arrangement vary a great deal, but the plan is very effective where circumstances make it practical, and it overcomes many difficulties. An alternative method is to have this man travel to supervise a number of offices—an arrangement that has been used a good deal in the automobile trade.

Choosing the Man to Send

If a man is to be sent abroad, extreme care should be exercised in making the selection. A good man can accomplish a great deal. A poor selection is very expensive, not only because of the way the representative spends money but also in the effect upon the reputation of his company.

In foreign countries a special representative of a manufacturer occupies a position of real importance, corresponding somewhat to that of a branch-office manager at home, except that he has greater responsibilities. He is in competition with the whole world. He is thrown into intimate contact with all sorts of people and must maintain his position and adequately represent the interests of his principals at all times. He must be equal to any emergency. If anyone makes a mistake, whether in the home office, in the factory, or on the 5,000 or 10,000 mile line to the ultimate buyer, this man must "absorb the shock," rise above all complications, and handle the matter in a creditable way. He is a "business ambassador" and should not be sent unless he knows his business, his line, and is loyal to the interests of his principals, with confidence in their products and organization. The American engineering salesman abroad sells more than an individual machine or even a complete factory. He sells the American way of doing things; his machines will not prove to be a real success unless they are operated in the American way, and the American way differs from the way most familiar to Europeans, natives, etc.

Of what value is automatic machinery unless it produces a standardized product? Why have a standardized product unless interchangeability is important? Through quantity production, inventiveness, and clear thinking American engineering has been raised to a position that is in advance of all others, and it requires men who are thoroughly familiar with these American methods and ideas to properly represent American goods abroad.

Excerpts from Trade Information Bulletin No. 138, Department of Commerce.

It Pays to Replace—

How a Shop Saved by Replacing Old Shop Equipment with New Equipment

These articles won honorable mention

By W. DeWitt Leinbach
Milton Machine Works, Milton, Pa.

THERE is no spot in the whole realm of machine shop activity where replacement would better pay, if judiciously carried out, than in the general jobbing shop. Yet strange to say, such shops are the very institutions where it is the hardest to make the management see why a replacement pays in real dollars and cents.

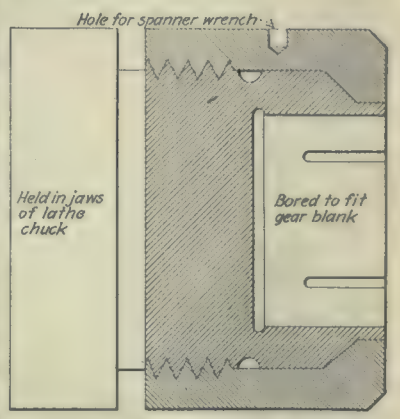
An improved machine may be O. K. and its special features may meet with approval, but the "straw that breaks the camel's back" is generally the query, "Why should I replace the old machine with a new one when the old one answers the purpose? True, the old machine has no quick change gears, no compound rest, no power cross feed, but why do I need them? This is a jobbing shop. Suppose a job does take fifteen minutes longer without these conveniences? I get paid for that time anyway and the customer doesn't feel it, so why should I invest $1,500 to $2,000 in a new machine."

It is because the writer has heard such an argument advanced, and knows the result, that this article is written especially about replacement in a job shop.

War Brings Business

During the war period everybody was rushed to capacity. All the silk mills, woolen factories and brick plants, that generally had their jobbing done in larger shops, started swinging things our way, as the larger shops were tied up with government contracts. One bright morning in May, a salesman talked to the boss about lathes. The boss knew we needed another lathe, but had figured on purchasing a second-hand one. It happened that I was called in the office that particular morning and I could see the boss was partly sold on the proposition but couldn't be convinced of the investment. When, however, the salesman made an offer of liberal time payments, I pushed on the accelerator and before noon an order was signed for a 16-in. swing 12-ft. bed, up-to-date Rockford Economy lathe with all attachments. When the machine arrived, I don't believe any father could have been prouder over the arrival of a new born son, than was the boss when the crating was removed and the new lathe shone forth in all its glory, through its copious coating of grease. One of the workmen jestingly remarked that he would have to wear kid gloves if he wanted to work on it and hold his job. "Oh, yes," the boss remarked when I quizzed him about his new purchase, "It's a nice machine all right but now comes the paying for it. I'll say yet, I could have bought one like that" (pointing to a lathe, in fair condition, but old style; no compound rest; no taper attachment or power cross-feed) "and be $1,000 in pocket. It would do all our work and I'd have that $1,000 to invest in something else."

The new lathe was installed in due time in one of the best locations in the shop, and it was decreed from headquarters that only the very best of work was to be done thereon. The first few months it was kept busy on such work as making brass bushings for electric motors, boring boxes for the transit company's journals, truing and balancing wood working planer heads, and all of the finer and more accurate type of work to be found in a jobbing shop. Quite a saving of time was noted, but not enough to overcome the prejudice to the investment on one tool.



CHUCK FOR HOLDING GEAR BLANKS

Up to this time our shop had been almost completely confined to strictly jobbing work but occasionally some of the larger plants around our section would throw in our way the overflow of their shops, which was always done on an hourly rate. Several requests came for larger orders, but these required piece work bidding, and that the boss was afraid to tackle.

About four months after the new lathe was installed, the local silk company came to us with a request to make one hundred and fifty steel pinions, 10 D. P., 18 teeth; 1¼ in. width of face; hole tapering from ⅞ to ¾ in.; 7/16 in. keyway ⅛ in. deep, but they wanted a quotation beforehand. Here was a new state of affairs for the boss. He wanted the business, for he knew he now had the cream of all the silk company's work. They had never complained as to price on our other work and he knew, wisely enough, if they went elsewhere for this little order, it might be the beginning of the end of a perfect day.

At my suggestion he wrote a large concern in the gear business for a quotation, with the expectation of placing the order and furnishing the gears to the silk company at actual cost to us. The quotation came in due time at $1.20 each, but shipment could not be made short of 60 days.

We notified the silk company, only to find that they, too, evidently had written elsewhere with similar results. Time was more of a factor to them than money, as 150 large looms were tied up until they secured these gears.

Overnight I did some tall thinking and planning. Next morning, I went to the boss with the proposition that if he would let me have my own way, give me the use of the apprentice boy and the new lathe, I would have all the gears ready for cutting; at least half of them cut, and perhaps all, by the end of that week. It was then Tuesday and we didn't work Saturday afternoon. After a little deliberation it was agreed that I go ahead if our bid was accepted. What quotation was made I do not know, but we got the business and the silk company had the new looms running the following Monday.

Putting the New Lathe to Work

Here comes the part the new lathe had in the affair. I started just as soon as the order was confirmed Tuesday afternoon. I got shafting from the stock room the exact outside diameter for the blanks, and started the apprentice boy cutting it up into proper lengths on an Atkin's "Kwik-Kut" power hacksaw, which did the work with remarkable speed and accuracy. The drill press was right near the saw, so I got him to rough drill the blanks and run the saw at the same time. Meanwhile, I used the new lathe to make the chuck shown in the illustration, also a taper plug gage and a mandrel for cutting the gears on our antiquated milling machine.

By the time I had this special equipment made, the boy had a goodly number of blanks for me to bore and face. The boring and facing was a pleasure on that lathe. By use of the chuck, a blank was brought true by simply tightening the sleeve with a spanner wrench.

A blank was placed far enough in the chuck so, that by the time one side was faced, it was flush with the edge of the chuck. This brought each blank in the same relation to the taper attachment. Then, with the taper attachment properly set, the taper hole was bored to fit the plug gage accurately. The new lathe, with its attachments and graduated dial on cross tool feed, enabled me to do accurate work at a tremendous saving of time. After I had been well started on boring and facing the blanks, the apprentice boy was ready for something else to do, so I got him started on the keyseating operation, which, due to lack of proper equipment, consumed more time than should have been necessary. After keyseating, it was only necessary to face the other side of the blanks and they were ready for cutting. The apprentice boy did all the cutting which consumed several days' time.

Savings on the Job

In rating the apprentice boy's time and my time at the charges then made on general job work, I found we were producing these gears about 8 cents cheaper each than the quotation from the larger shop in which gear making was a specialty. Had we been equipped with more modern machinery the price would have been materially reduced.

When the job was finished and the gears delivered and paid for, the boss dropped the remark that he wished we could get more of that kind of work. Then was my time to strike home an argument for new tools to replace some of the old ones so we could bid on such work and make out well on it. In due course of time a new milling machine was purchased and now the little shop is doing a neat side line of manufacturing which works in admirably well with the jobbing business and tends to stabilize our working force.

By Albert Reich

Efficiency Engineer, Nash Motors Co., Kenosha, Wis.

THIS particular analysis pertains to labor costs on some of the operations on a crankshaft for a six-cylinder motor.

For convenience the operations have been grouped as follows:

1. Finish turn outside diameter of flange. Face flange. Finish turn oil sling.
2. Drill 1-in. hole. Drill 1⅝-in. hole.
3. Bore, ream and center.
4. Finish face gear end. Turn grooves and cut to length. Re-center and cut threads.

All operations were done on ordinary engine lathes, 8 lathes being required. The labor cost per hundred shafts was as follows:

Operation 1, $6. Operation 2, $3.50. Operation 3, $5.50. Operation 4, $7.50. A total of $22.50.

Operations 1, 2, and 3, as shown in Fig. 1, are now

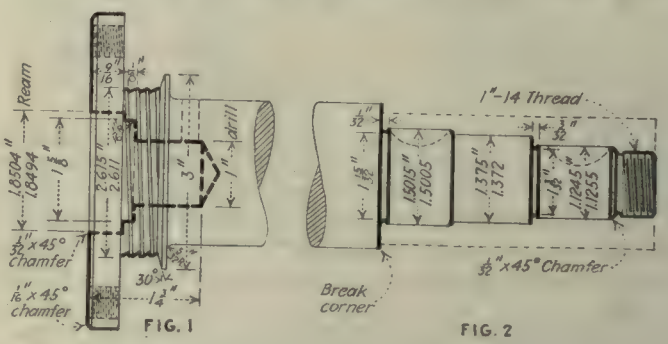


FIG. 1—OPERATIONS 1, 2 AND 3. FIG. 2—OPERATION 4.

done on three Warner & Swasey special heavy-duty turret lathes, equipped with constant-speed motor drives and special tooling. The labor cost is $12 as against $15 by the old method.

Operation 4, as shown in Fig. 2, is now done on the same kind and make of machine equipped with special tools and a Landis die for threading. The labor cost is $4.50 as against $7.50 by the old method.

It will be seen that four improved machines are doing the same work as eight old ones at a saving in labor cost of $6 per hundred shafts or a saving of 26⅔ per cent. Besides saving in labor paid for actual machine work, there is a saving in handling the shafts, in floor space, and maintenance that is well worth the attention of a management which understands the value of many small savings.

By W. F. Johnson

Asst. Foreman Repair Shop The Helderberg Cement Co., Howes Cave, N. Y.

IN A REPAIR shop for a portland cement company we have about 6,000 running ft. of boiler iron to cut per year for repairs. The thickness runs from ¼ to ⅝ in. While making a repair on the shell of a kiln, it means that production is stopped on the kiln, a matter of 1,700 bbl. per 24 hr. or about 70 bbl. per hour. To cut a patch for the shell of a kiln 5 ft. long, takes four men with cold chisels and sledges 2 hr. or a total time of 8 hr. To cut the same patch with an oxy-acetylene outfit, with Davis-Bournonville cutting torch and one man, takes 15 min. This is just one illustration of the saving that can be made by the use of modern equipment.

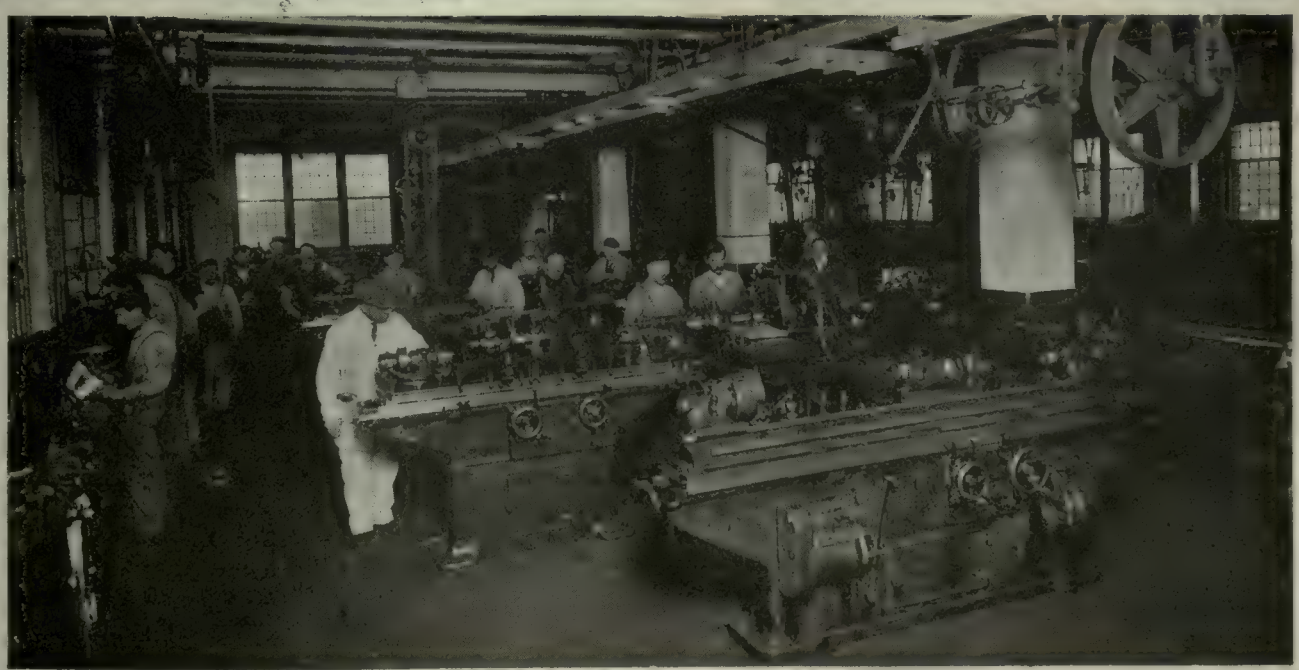


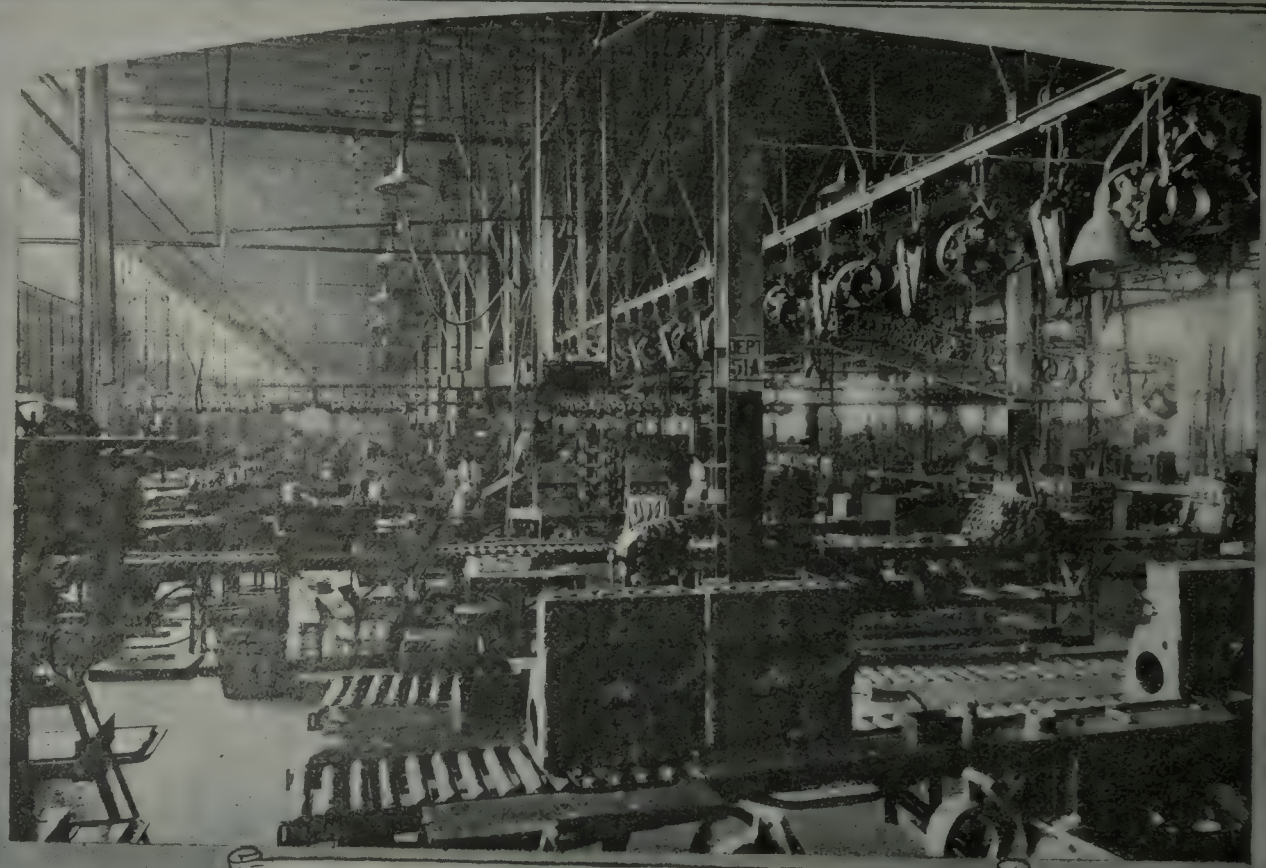
Where Machine Tools Are Made

Brown & Sharpe Manufacturing Company

Founded 1833







Accelerating automobile assembly



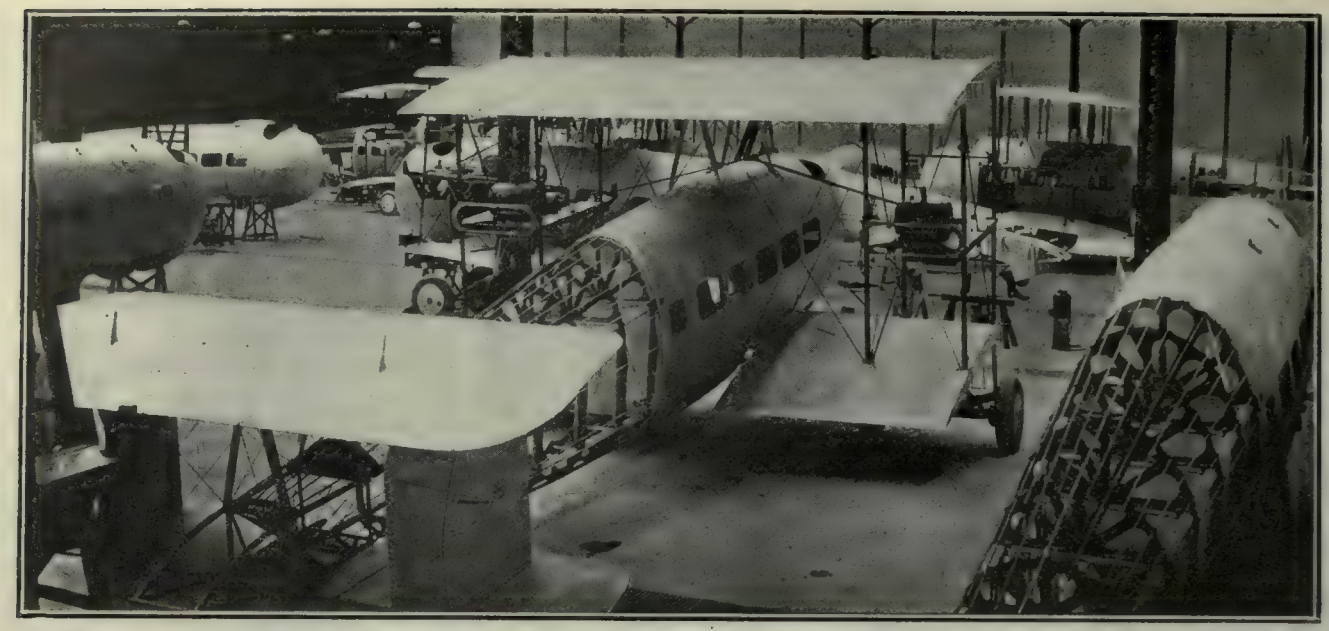
Rollers and monorails above, chain track below



Methods of various shops



Side rail jacks and rotating suspended carriers





Machinery of the Air

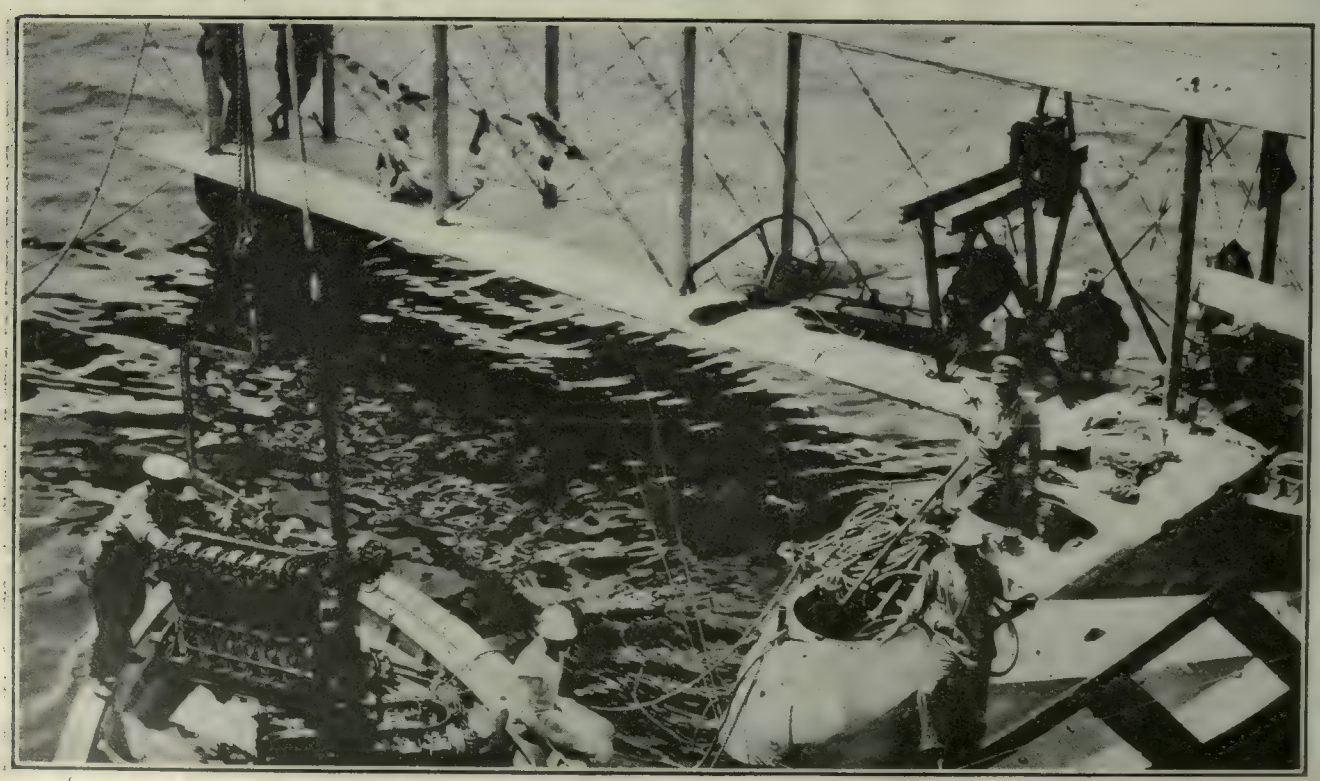
Will it be the occasion for the next boom in the machine tool field?

Above—Building commercial airplanes for China at the Vickers Works in England

Left—A homemade rescue sled for seaplanes. It draws 8 inches

Below—Transferring a Liberty motor at sea

Photos by Kadel & Herbert, N. Y.



The New Screw Thread Standard—III

By RALPH E. FLANDERS
General Manager, Jones & Lamson Machine Co.

Discussion of report on screw thread standards adopted by the A.E.S.C.—Fine and coarse-thread series—Numbered and fractional sizes of screws—Elimination of unnecessary threads

CONTINUING the report on screw thread standards recently made by the American Engineering Standards Committee, we come next to the section entitled:

III—THREAD SERIES ADOPTED

Two thread series are adopted—a coarse and a fine. The Coarse-Thread Series is the present "United States Standard" supplemented in the sizes below ¼ in. by the standard established by the American Society of Mechanical Engineers (A.S.M.E.). The Fine-Thread Series (¼ to 1½ in., inclusive) is in accordance with the present "Regular Screw-Thread Series of the S.A.E. Standard for Screw Threads" established by the Society of Automotive Engineers (S.A.E.), supplemented in sizes below ¼ in. by the Fine-Thread Series established by the American Society of Mechanical Engineers. (A.S.M.E.)

These two series are specified in Table I.

The only points which need to be raised here in connection with the thread series relate to the numbered sizes. Until the work of the Machine Screw Standard Committee of the A.S.M.E. these threads were in unutterable confusion. There was diagreement as to the basic pitch diameter of a given size. There were usually three and sometimes more pitches for each diameter. This fact, combined with the wide variety of heads and lengths, ran the number of varieties which had to be carried in stock up into the thousands. The reduction of the pitch diameter to a standard, the standardization on two thread series now accomplished, and the straightening out of the head-form situation now in progress by another A.E.S.C. Sectional Committee, will greatly reduce these thousands of varieties, with a corresponding advantage to the consumer in quality, uniformity, price and promptness of delivery.

The first pitch series set by the A.S.M.E. Committee was the present Fine-Thread Series for the numbered sizes. This standard failed of universal adoption owing to its being finer than the average range of work in common use. A second step was therefore taken in the selection of a number of alternative coarser pitches as permissive where the fine pitches were not considered practical. This plan was found to be unsatisfactory, however, as the majority of threaded products was scattered over this wide range, resulting in a condition that was not standardization in any sense. The final and necessary step was then taken of selecting a definite coarse-thread range, which is that here given for the numbered sizes.

At only one point does this series depart from what was found to be the average of commercial practice. This exception is in the case of the No. 4 thread in the coarse series, where 36 was the pitch most commonly used. But, since the larger No. 5 thread was commonly given a finer pitch—40—practice in this respect seemed to be quite illogical and practically at fault, so that there was no hesitation in calling for a radical change in this particular, giving the No. 4 thread a pitch of 40 also.

These two thread series have been approved by the leading machine screw manufacturers of the country. Their approval carries with it the further change of discontinuing the numbered sizes larger than No. 12,

TABLE I—THE TWO THREAD SERIES ADOPTED

1	2	3	4
Identification	Basic Major Diameter	Fine Series. Threads per Inch	Coarse Series. Threads per Inch
0	0.060	80	..
1	0.073	72	64
2	0.086	64	56
3	0.099	56	48
4	0.112	48	40
5	0.125	44	40
6	0.138	40	32
8	0.164	36	32
10	0.190	32	24
12	0.216	28	24
¼	0.2500	28	20
5/16	0.3125	24	18
⅜	0.3750	24	16
7/16	0.4375	20	14
½	0.5000	20	13
9/16	0.5625	18	12
⅝	0.6250	18	11
¾	0.7500	16	10
⅞	0.8750	14	9
1	1.0000	14	8
1⅛	1.125	12	7
1¼	1.250	12	7
1½	1.500	12	6
1¾	1.750	12*	5
2	2.000	12*	4½
2¼	2.250	12*	4½
2½	2.500	12*	4
2¾	2.750	12*	4
3	3.000	10*	4

* Note:—These pitches are suitable for work requiring short engagement where it is not practical to specify tolerances for all conditions. They are not therefore included in the succeeding tables.

and following the fractional sizes from and including ¼ in., as given in the table.

While screws of both series are listed by all machine screw manufacturers and both series are carried in stock by most of them, the greater demand in the numbered sizes is for the coarse-thread series. No. 10-32 is the most used of the fine series.

The diagram given in Fig. 8 shows the degree of smoothness and continuity in the two series through the numbered sizes and up to ¾ in. in the fractional

sizes. The diagram is so made that if the pitches were in strict proportion to the diameter, the line for a thread series would be a straight line radiating from point *O*. There are obvious reasons for making the pitches coarser in proportion as the size diminishes, as will be touched on with more particularity later on. This is evidently done for the sizes above ¼ in., where the general direction of the lines for both series is toward a point considerably above point *O*. The series for the numbered sizes give pitches more nearly proportional to the diameter, and the lines in this part of the diagram tend to converge on point *O*. Thus, there are

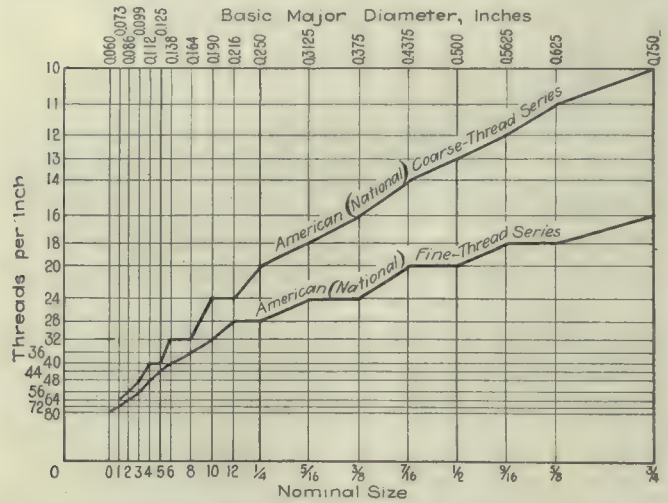


FIG. 8—DIAGRAM OF COARSE- AND FINE-THREAD SERIES ADOPTED IN A.E.S.C. REPORT

really two separate thread series, separately developed, which coincide at the ¼-in. size. There is no real objection to this situation, since both series in both the numbered and fractionel sizes have been proved satisfactory in practice, and the diagram indicates that there is no abrupt break.

The note at the foot of Table I, applying to the Fine-Thread Series for 1¾ in. and larger, should be carefully observed. The Sectional Committee took the ground that their report should apply to "standard screw threads for bolts, machine screws, nuts, commercial tapped holes, etc." In other words, it applies specifically to work in which the length of engagement will probably equal the diameter. If the Fine-Thread Series is to be used for this length of engagement throughout its range, the pitch should be proportionately increased above 1½ in. instead of remaining unchanged up to 3 in., as it now does. The close tolerances applying to this fine 12-pitch do not allow leeway enough for inevitable lead variations on the long engagements demanded by standard bolt and nut work. Hence the reservation given in the note.

The fine pitches above 1½ in. are, of course, available for special short-engagement work, such as thin retaining nuts, bearing cups and hub caps. The pitches are therefore given for reference. But if in the future it becomes advisable to extend the Fine-Thread Series for standard bolt and nut work, the pitches for diameters above 1½ in. will have to be reconsidered.

Another feature was a result of thus confining the standard. The original U.S.S. thread provided sizes by ⅛-in. steps up to 2 in., by ¼-in. up to 4 in., and by ½-in. up to 6 in. General practice has eliminated many of these sizes, more recent tables showing sizes by ⅛-in. steps up to 1 in. and by ¼-in. steps from there to 2 in. A still further reduction has been made in this report, eliminating the 1⅛, 1⅜, 1⅝, 1⅞, 1⅝ and 1⅞ in. sizes.

For miscellaneous threaded parts these omitted sizes might be required; but for standard bolt, screw and nut work the sizes retained would seem to give satisfactory gradations and range. This simplification will permit a considerable reduction in bolts, screws and nuts carried in stock, as well as in stock taps, dies, gages and the like.

This article is the last of the introductory chapters. The next installment will contain the tables of dimensions and tolerances which define the new standard.

Old Hay Press with Hand-Cut Wooden Screw—Discussion

By John James Grant

The article by H. E. Crawford, under the title given above, on page 706, Vol. 58, of the *American Machinist*, reminds me of an old wooden screw I found in 1864. I was making some repairs at a factory in East Hampton, Mass., and during a stroll one evening, I found under a shed an old press that had lain there many years. Upon inquiry I found that the press was about 70 years old and had been built for pressing cheese.

I bought it for ten dollars, delivered to my shop in Northampton, and used it for pressing the plastic material into molds for making solid emery wheels. I had received the right to make the Marshall emery wheels, one of the first solid emery wheels invented and afterwards made by the Northampton Emery Wheel Co., Leeds, Massachusetts.

The man from whom I bought the press told me he had seen it made and had watched the process of making the screw and nut very closely.

The press, including the screw and nut, was made of beech wood and was a fine piece of workmanship. The screw was about 6 ft. long and 6 in. in diameter. The head was about 12 in. in diameter and 8 in. long and was reduced to about 11 in. in diameter at each end to receive two bands of iron 2 in. wide, and two holes were bored through at right angles to each other to receive the bars for operating the screw. The lead of the screw was 2 in. and the threads had an included angle of about 90 deg. and were flatted to about ⅛ in. on top.

A fine line was marked around the screw blank while it was in the lathe, at the point where the threads were to start. Then a piece of heavy paper, of a length equal to the circumference of the screw, was cut diagonally from 2 in. at one end to a point at the other end. A line scribed against the diagonal edge of the paper furnished a guide for the lead of the screw. A set of carpenter's tools and good workmanship did the rest for the screw.

Making the nut was easy as it was a cut and try job. It was made in halves and by running the halves back and forth on the screw, the threads, both on the screw and in the nut, were corrected to a great extent.

No attention was paid to the face of the nut until after the threads were finished. Then the halves were bolted together and faced off square, after which the nut was fastened to the bottom of the cross bar of the press.

The lubricant used was mutton tallow, but there certainly was more than that in the head of the man who made the screw.

The Elements of Production Grinding

By ELLSWORTH SHELDON
New England Editor, *American Machinist*

The sixth article — Two main classes of grinding machines — Sub-divisions of each class — Machines for every grinding purpose — Various makes of machines

THE MACHINERY for production grinding may be divided into two main classes: Cylindrical and surface grinding machines. Each class may then be sub-divided, the first into external and internal and the second into reciprocating and rotary grinding machines. Of both the rotary and the reciprocating surface grinding machines there are again two classes, those that have a horizontal wheel spindle and carry a disk wheel that grinds upon its periphery, and machines having a vertical spindle to carry a cup or cylinder wheel.

The so-called universal grinding machine grinds cylindrical work and, by means of an attachment, it may grind internal as well as external surfaces. There is still another machine, perhaps even more entitled to the term "universal," that is capable of grinding flat as well as round work.

Besides the above there are various types of machines that do not properly belong under any of the foregoing designations. Of these, the most widely used is the "floor grinder" or "wheel stand," that in some one of its many forms is used for all kinds of free-hand grinding, ranging from the snagging of castings in the foundry to the sharpening of tools in the toolroom. Cutter grinding machines, as their name implies, are used for sharpening the teeth of the many forms of milling cutters. Spline grinders shape the splined shafts commonly used on automobile transmissions. Form grinders use a formed wheel with which to turn out work of special shape, very much as a formed milling cutter would do, and are made both as cylindrical and surface grinding machines. Face grinding machines differ little in principle from regular surface grinding machines, but carry a cup wheel that grinds with the face instead of the periphery. Disk grinding machines are "floor stands" with disks of cast iron on opposite ends of the wheel spindle, to which are affixed circular sheets of abrasive cloth.

The plain cylindrical grinding machine, examples of which are shown in Figs. 31 and 32, may be considered to be in a measure supplementary to the lathe, though the range of its operations is very much more restricted. When a rough piece of material, as a forging, is to be reduced to a finished condition in the lathe, it is the finishing operations that require more than half of the time and nearly all of the operator's skill. The plain grinding machine is designed to take over these latter operations and put the finishing touches on the work in much less time and to a far greater degree of accuracy than could be expected of the lathe.

In producing straight, parallel pieces without shoulders from semi-finished stock, when there is but little material to be removed, the lathe may be dispensed with entirely and all of the work done in the grinding machine. Especially upon long slender pieces of work where roundness and parallelism are of extreme importance, and very difficult of attainment with the single cutting point of the lathe tool, the grinding machine possesses incalculable advantages.

ALTHOUGH production grinding could never have reached its present proportions and extensive application without artificial abrasives, the principles embodied in the grinding machines themselves are not new. In fact we had all of them when all grinding wheels were "emery" wheels. The changes in the last twenty-five years have all been in the direction of strength, rigidity, power, and singleness of purpose. Though the machinery has been diversified and improved, the main difference between the old art and the new, lies in our understanding of its possibilities.

The universal grinding machine, shown in Fig. 33, has a much wider range of application than the plain machine. Though it may be classed as a production machine and is capable of turning out work within its capacity quite as rapidly as the plain machine, its real field of usefulness is demonstrated upon smaller and lighter work or in operations for which the heavier machine is not fitted. This class of work includes small tools and tool-steel parts that are hardened and therefore must necessarily be finished by grinding.

The universal grinding machine grinds cylindrical surfaces, parallel or tapered, internal or external and is also capable of face grinding or beveling at any angle. In short, the universal machine approaches more nearly to the versatility of the lathe but, by reason of its being a multi-purpose machine, it cannot be expected to compete in speed of any single operation with a machine that is designed for that operation alone.

The internal grinding machine, one of the many types of which is shown in Fig. 34, is designed for the sole purpose of grinding holes. Like the plain and universal machines it is provided with means for holding and rotating the work, for feeding the wheel transversely to the axis of the work (corresponding to the cross-slide of a lathe) and for reciprocating either the wheel or the work head.

The traversing movement in a direction parallel (or.

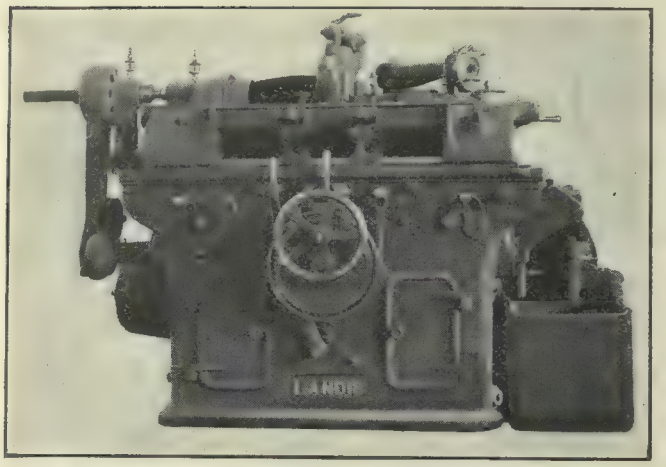


FIG. 31—LANDIS PLAIN GRINDING MACHINE

in the case of tapered work, at an angle) to the axis of the work, common to the plain, universal and internal machines, has an important bearing upon the quantity and quality of production. In all of the above machines the rate of traverse may be varied from a very slow movement to a rate approaching 50 ft. per min. in the latest machines. In general, it may be said that the rate of traverse should be determined by the width of

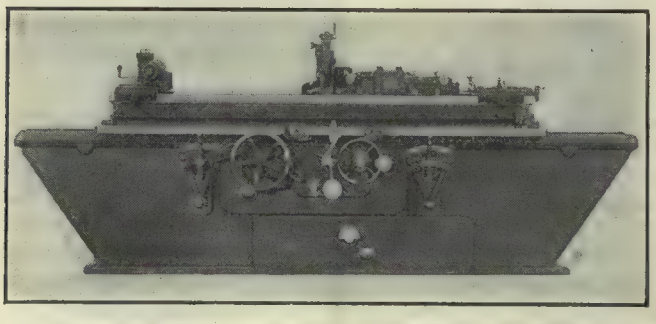


FIG. 32—NORTON PLAIN GRINDING MACHINE

the grinding wheel and that it should be so adjusted in relation to the rotative speed of the work that the latter will advance during the time of one revolution, a distance that is slightly less than the width of the wheel.

It will be seen, therefore, that the rate of traverse is dependent upon two factors; width of wheel and rotative speed of work and that any change in either will necessitate a corresponding readjustment in the

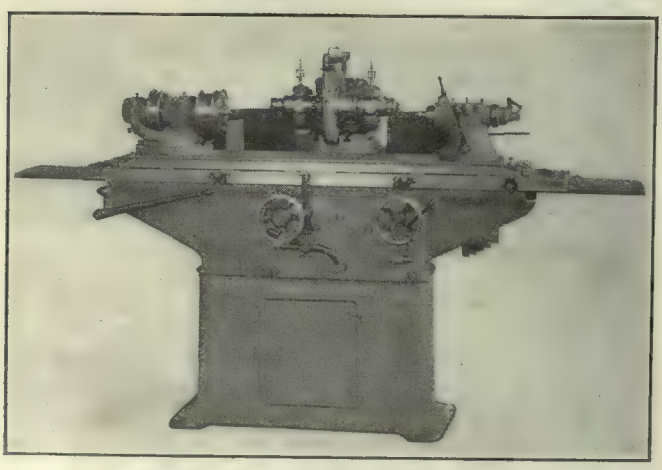


FIG. 33—BROWN & SHARPE UNIVERSAL GRINDING MACHINE

other. In the majority of machines this movement is driven by gearing and the adjustment is through a series of arbitrary steps or increments governed by the gear ratios. There are, however, upon the market a number of machines in which the traverse is operated by a hydraulic cylinder and piston, and any speed between the minimum and maximum is instantly available. This latter condition is also obtained in some types of machines by means of friction-disk drives.

As has previously been stated, the traversing movement is applied by some makers to the table and by

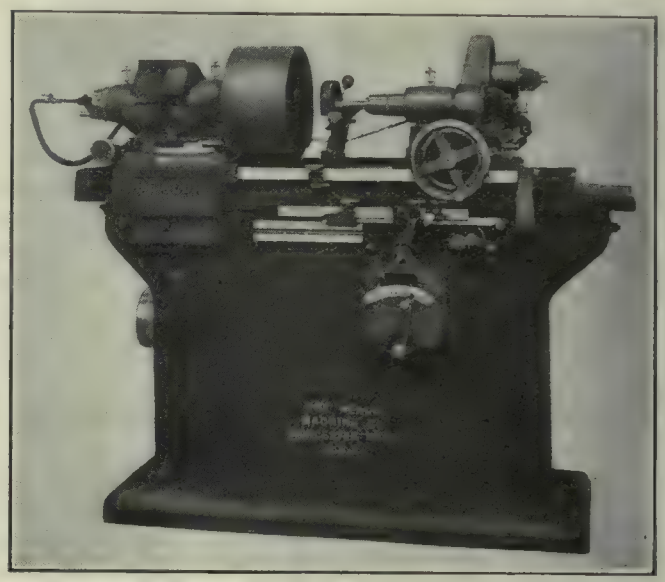


FIG. 34—HEALD INTERNAL GRINDING MACHINE

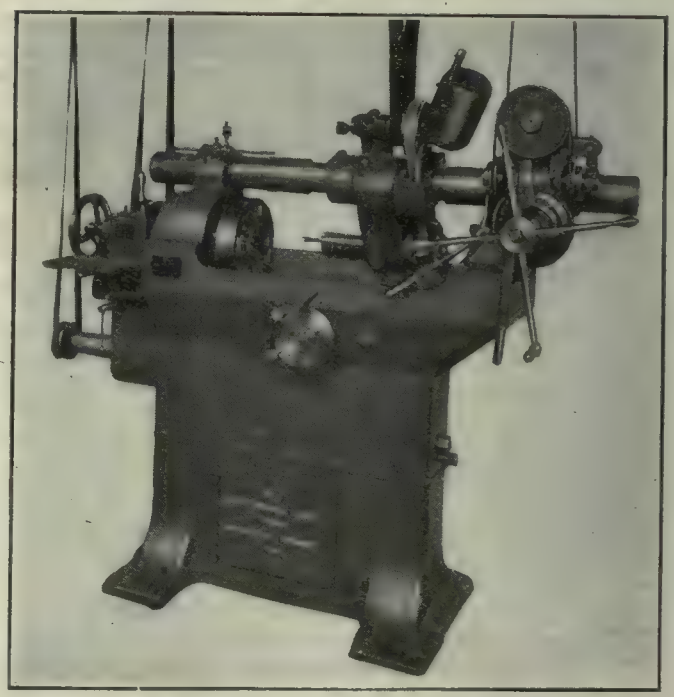


FIG. 35—BRYANT CHUCKING GRINDER

others to the wheel head. The machine illustrated in Fig. 32 has a reciprocating table, while in that shown in Fig. 31 it is the wheel head that moves. The necessary movement is entirely relative and so far as the work is concerned, it makes no difference to which member it is applied.

The latter statement applies to the universal and internal as well as to the plain machines and also, as

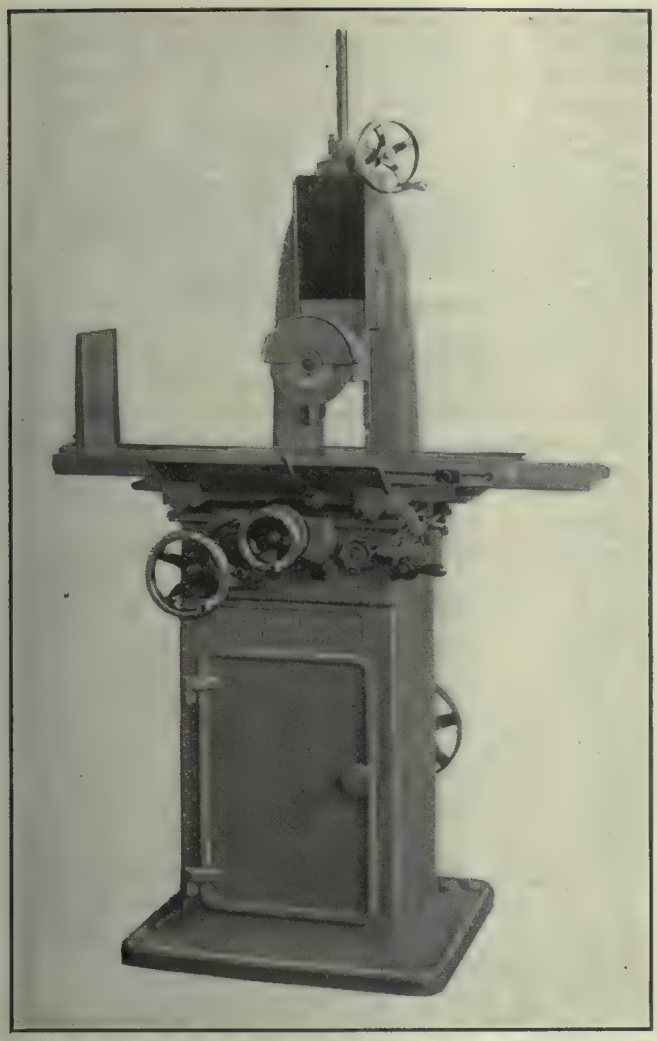


FIG. 36—BROWN & SHARPE SURFACE GRINDING MACHINE

will be explained later, to the surface grinding machines. An example of the traversing wheel-head internal machine is shown in Fig. 35, which machine is technically known as the "bar" type for the reason that the sliding surface is a round bar moving within adjustable bushings. The feed movement is applied by swinging the wheel head upon the bar and thus the cross-sliding head of the other machines is eliminated.

A standard type of surface grinding machine with reciprocating table and horizontal wheel-spindle is shown in Fig. 36. In this type of machine the reciprocating movement is usually imparted to the table by means of gearing but, unlike the corresponding movement of the cylindrical machine, there is no provision for changing the speed. There is a logical reason for this and it is that the reciprocating movement of the surface grinding machine is analogous, not to the traverse, but to the rotative speed of the work. The actual traversing movement of the wheel is accomplished by the feed and this is adjustable within a wide range.

A reciprocating surface grinding machine with a vertical spindle and cup or cylinder wheel is shown in Fig. 37. This machine is not provided with means of traversing the wheel across the work, for the reason that the wheel grinds upon its face and its diameter is such as to cover the entire width of work of which the machine is capable. The feed in this case is endwise of the wheel spindle, directly downward upon the work and takes place in very small increments at either or both ends of the table stroke.

In Fig. 38 is shown a rotary surface grinding machine with a horizontal wheel spindle. The spindle is carried in a ram similar to that of a shaper and has a reciprocating movement somewhat greater than one-half the diameter of the work-holding faceplate or chuck. Machines of this type are especially adapted to the facing of circular work, and by reason of the possible angular adjustment of the vertical work-holding spindle, are suited to the grinding of cutters, saws, and similar tools, the thickness of which must be slightly less at the center than at the periphery. They are not confined exclusively to such work, however, but are available for surfacing large numbers of small pieces, as many as the chuck will hold being operated upon simultaneously.

The movement of the ram in this type of machine is strictly a traversing one, corresponding to the traverse of the cylindrical machine, and may be adjusted to secure the proper relative speed according to the width of the wheel. In the machine shown in Fig. 38, the ram is gear driven but similar machines with hydraulically operated rams are upon the market.

The cylinder grinding machine, Fig. 39, is a strictly single-purpose internal cylindrical grinding machine, developed for the sole purpose of grinding the bores of automotive-engine cylinders, though, of course, it may be applied to the grinding of any cylinder bore within

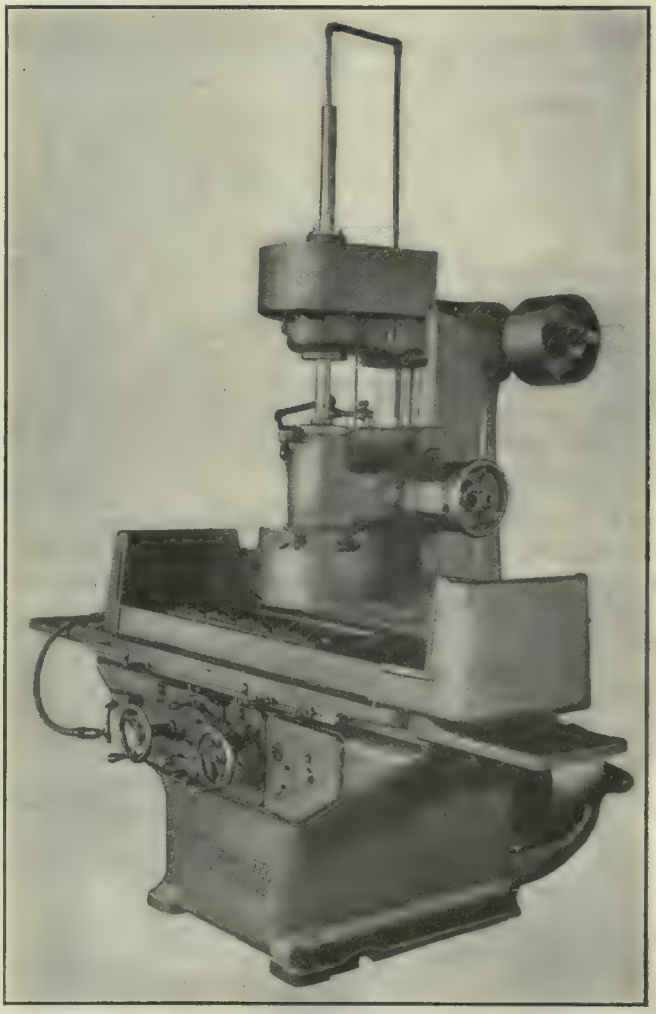


FIG. 37—PRATT & WHITNEY VERTICAL-SPINDLE SURFACE GRINDING MACHINE

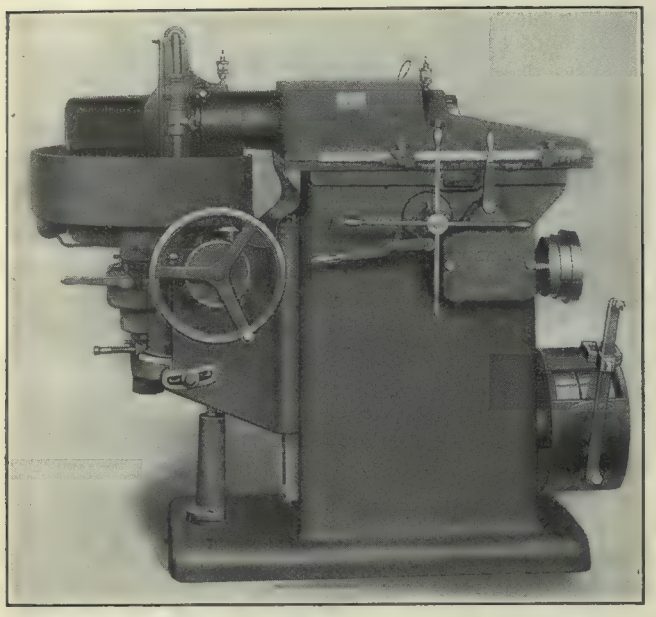


FIG. 38—PERSONS-ARTER ROTARY, SURFACE GRINDING MACHINE

its range. It has all the movements of the regular internal grinding machine and in addition thereto the wheel spindle is mounted in double-eccentric revolving bearings that impart to the wheel a gyratory movement, the amplitude of which is at all times under control of the operator. Any diameter of grinding wheel smaller than the diameter of the bore to be ground may be used and the amplitude of the movement so adjusted that the periphery of the wheel travels in a circle equal to that of the bore.

Feeding is accomplished by gradually increasing the amplitude of the gyratory movement, for which it is not necessary to stop the machine. The feed can be controlled as accurately and certainly as if the spindle were stationary. The traversing movement is applied to the table, and machines are made with either gear or hydraulic mechanisms.

The "single-stroke" grinding machine is applicable to the same class of work as the previously described rotary surface grinding machines but has a vertical wheel spindle with a cup or cylinder wheel covering half the diameter of the revolving work-table. While the feed of the previously described machines is applied by raising the entire head that carries the work spindle, in this case it is effected by a vertical movement of the wheel head. The machine is designed to finish the work upon the chuck by a single downward movement of the wheel, under control of the operator by means of a hand lever, hence the designation "single-stroke."

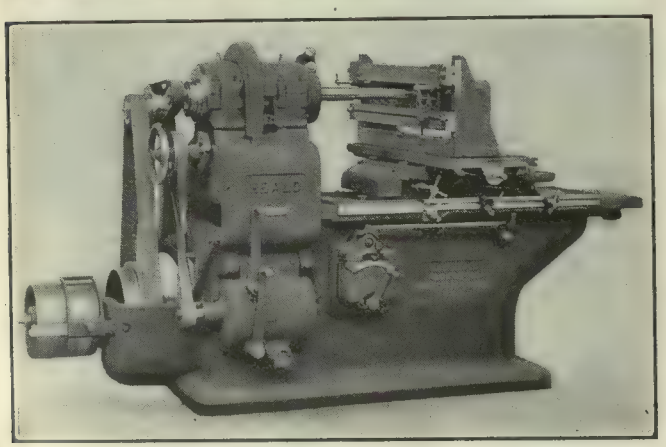


FIG. 39—HEALD CYLINDER GRINDING MACHINE

Another machine of the rotating-table, vertical-spindle type is shown in Fig. 40. In this machine the wheel head contains the driving motor, the rotor of which is one piece with the wheel spindle, and thus all belts and gearing are dispensed with in the drive. The rotary movement of the table is driven by a separate motor, which also operates the feeds. As in the single-stroke machine, the cylindrical wheel covers somewhat more than half the diameter of the chuck or work-table and grinds the entire surface of the work thereon without traverse. The feed in this machine is automatic and is accomplished by a single downward movement of the head by finely graduated increments and may be set to throw out at a predetermined point.

The cutter grinding machine, as its name implies, is designed solely for the purpose of grinding and sharpening cutters and is not a production machine in the sense we have heretofore used that term, except as it is applied to this particular class of work. It is built in many forms and is necessarily "universal" in its

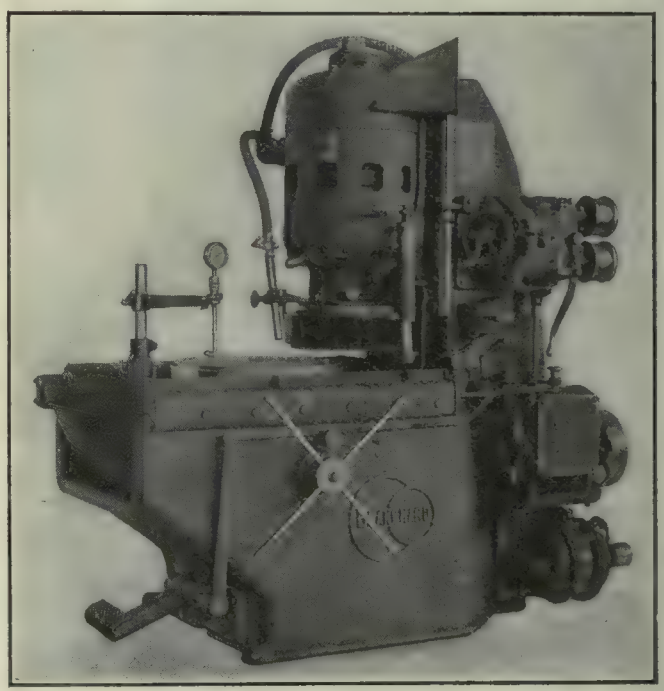


FIG. 40—THE BLANCHARD GRINDING MACHINE

movements, in that the grinding wheel may be brought into action in any conceivable position. It is, however, almost entirely a hand-operated machine and usually has no power-operated movements other than the rotative one of the wheel. A representative machine is shown in Fig. 41.

As has previously been stated, the universal, the reciprocating, surface and the cutter grinding machines were all very much in evidence long before the days of artificial abrasives but it is safe to say that the productive capacity and application of each has been vastly increased by the use of modern grinding wheels. On the other hand, though any of the other machines thus far described *might* have been made and used with "emery wheels," none of them were and their development may be regarded as a result of the possibilities disclosed by the advent of silicon-carbide and aluminous-oxide abrasives. In the succeeding par-

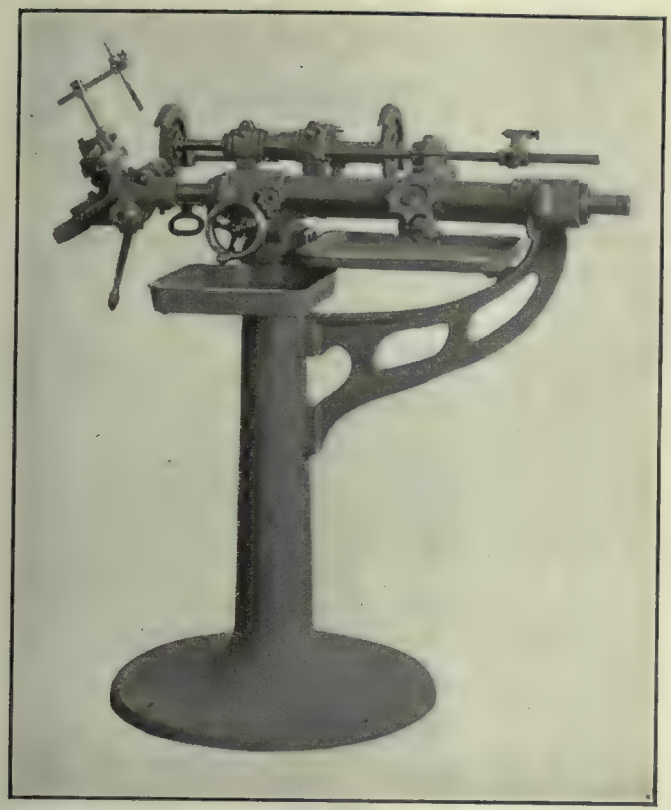


FIG. 41—BROWN & SHARPE CUTTER GRINDING MACHINE

agraphs a machine that could not have existed without the latter is briefly described.

The form grinding machine, Fig. 42, is designed for the purpose of finishing pieces of work having one or more shoulders; parallel, tapered, or of irregular form. It uses what is sometimes called a "set" wheel, that is, the wheel has no traverse but is fed straight in toward the axis of the work and finishes it to size and shape in one movement.

None but grinding wheels of artificial abrasive and of known and dependable quality of bond could be expected to withstand such treatment but with this machine, a wheel may be depended upon to reproduce its form on the work many times and the redressing to shape when necessary may be done in a very few seconds.

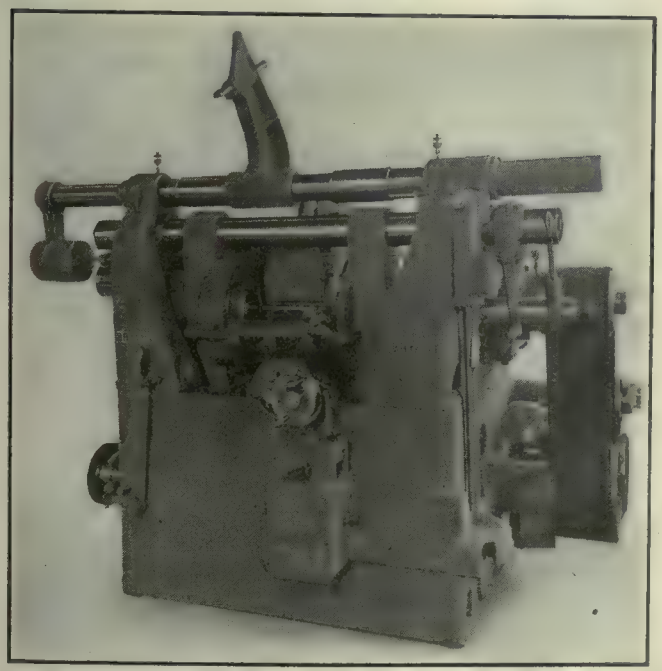


FIG. 42—BRYANT FORM GRINDING MACHINE

The form grinding machine is strictly a production machine and would be valueless except for producing duplicate pieces in large quantities. In the first place a "master" must be provided, having a carefully calculated contour the exact reproduction of that of the work to be ground, though not necessarily round. The machine is of the bar type with the work centers, instead of the wheel head, suspended from the bar. A second bar above the one upon which the work carrier is swung, carries a diamond that may be swung down and traversed before the wheel and in contact with it, being guided in its movements by the master.

The limitations of this machine are that it can not grind work longer than the width of the wheel; it can not be expected to stand up if called upon to remove more than a few thousandths of material and it can not grind square shoulders. In grinding shouldered work, the pieces must be prepared with ample wheel clearances so that the corners of the wheel need not touch the work.

The spline grinding machine involves the same principle as that for form grinding but is more of the nature of a surface than a cylindrical machine. It, too, is a development depending upon modern grinding wheels and designed for the purpose of grinding hardened, splined shafts used principally in automobile transmissions. The work is held upon centers but is rotated only intermittently by means of an indexing mechanism and never while in contact with the wheel, which grinds lengthwise of the work between the splines.

New Optical Strain Gage for the Bureau of Standards

A new and exceedingly sensitive optical strain gage for measuring the stretching of steel or other material under load has recently been perfected by the Bureau of Standards of the Department of Commerce. The device will measure a change of length as small as 1/250,000 in. The part of the instrument which goes on the material is only 2 in. long and is very light, so that it can be used for testing thin sheets of metal.

The gage itself has two knife edges which are set into the material under test. One is fixed in position, while the other can turn through a small angle to allow for the change in length of the material between the two edges. To the movable knife edge is attached a mirror, which is one of a set of mirrors which reflect back to the eyepiece the image of an illuminated mark contained therein. This mark is projected on the scale in the eyepiece, and before the load is applied the gage is adjusted to make this mark coincide with the zero on the scale. Thereafter the scale reads directly the extension of the material to which the gage is fastened.

The eyepiece which is used for reading the gage consists of an instrument something like a telescope in appearance and containing lenses, a scale, and a lamp for illuminating the scale. The optical system is of such a nature that the instrument will read correctly to within a tenth of one per cent if it is pointed within two and a half degrees of the perpendicular to the gage. It gives an unmistakable indication of whether or not it is pointed correctly.

Let Your Tools Save Your Brain

By D. L. Munster

THE result obtained by a mechanic who undertakes a job of machine or tool work is the sum of two factors: the personal—which comprises his individual brain and skill—and the tool factor, made up of the brains and skill of others as represented by the equipment provided for his use. The higher the sum of the two factors the better the quality of the work, and if one of the two be of relatively low value the other must be proportionately high to maintain a high average.

That a majority of mechanics recognize this to a considerable degree is evidenced by their cumulative investment in tools intended to enhance their skill of hand or precision of eye; yet the same men will operate machine tools day after day, making use of none but the basic elements of such tools and ignoring all the special labor and brain saving devices provided by the builder thereof for the purpose of increasing the productive capacity of the operator, while making his burden lighter and the quality of his work better.

Go into any shop or toolroom and any mechanic you may accost will know every tool he has in his kit. He can tell you without hesitation whether or not it contains a certain tool, or a tool that will serve any definite purpose, but not one man in ten can tell you in complete detail of the equipment provided by his employers for his use. The majority can tell you that the shop contains so many lathes, planers, milling machines, etc., but it is only the exceptional man that is familiar with all the uses and adaptations of the various tools and can explain how they may be employed to save useless expenditure of gray matter and time. Of special attachments, such as micrometer stops, measuring screws, indicating dials and the like, you will find that the average mechanic knows little, and is often unaware of their existence.

Standard Tools Superior to Homemade

A mechanic should know that the product of any maker of standard machine tools represents in its design and appointments immeasurably more thought and experience on the class of work for which each is intended than he could ever bring to bear upon his individual tasks, even though the quality of his brain and skill should compare favorably with those of the men upon the builder's engineering staff. Having convinced himself of this, he should be able to realize the benefit to himself of knowing the equipment with which he has to work as well and in as intimate detail as he knows his own tool kit, and be prepared to avail himself to the full of every device that has been put into his hands.

It must about break the heart of a machine tool builder to go into a shop and see how some of the pet features of his machines are unused and uncared for. But a few days ago the writer was in a toolroom where a fairly accurate class of work is done and for which a very good equipment is provided. Here are a few of the things he noticed:

On one of the Hendey lathes the cross-slide stop-rods were lost; probably thrown in the scrap box in some clean-up campaign without the scavenger even knowing their use or appreciating their value. On the same lathe a part of the micrometer stop of the carriage had been broken and never repaired, yet the Hendey lathe is strong on thread cutting, of which this stop had its fair share, and both these parts are of inestimable value on such work.

A mechanic was drilling a number of holes, all of the same depth, in a jig casting. The drill-press he was using was equipped with a graduated spindle-sleeve and adjustable depth stop, but they were beyond the range of his mental vision and he was drilling these holes to a depth gage, cutting and trying for depth on each one.

A man was working on a jig for drilling the flange holes in a gear case. The holes were in a circle but not equally spaced. He was laying off these holes with divider and prick-punch, and he went about his references so peculiarly that I took a slant at the drawing as I passed him and noticed that the holes were located by chordal dimensions, the distance from horizontal and vertical center-lines being given in each instance.

It was instantly apparent to me that whoever made that drawing was aware that the shop possessed a very good milling machine and had anticipated the use of it on this particular job. This man, however, worked for several hours at locating and center-punching those holes to his satisfaction; then prick-punched a ring around each in the most orthodox manner and proceeded to drill and ream them.

Trouble Develops

When he came to check up there was trouble. Adjacent sets of holes, symmetrically located, were not equidistant, and the foreman was brought into conference. More time was wasted while the foreman considered the case. The job was finally mounted on an angle plate in the milling machine and the holes rebored for oversize bushings; locating them for the purpose by using the horizontal and vertical measuring screws with their micrometer dials and working to the measurements on the drawing—exactly as the engineer had intended the job should be done in the first place. Everybody was all smiles when the job came out with no more than 0.001 in. as the greatest variation and seemed to think it a wonderful performance.

Whether this was good work or not, it is a fact, beyond argument that the degree of accuracy attainable by using the screws of a good milling machine is much beyond the skill of any mechanic, unless he has the ability to "button up" the job and the time to waste in doing it. To tackle such a job as above described in any other way than the one intended by the engineer simply means the setting out to do an inferior job when all the requisites for a better one are right at hand.

Know your equipment and its uses—that is the point. Employ it to save your brains and add to your skill. One method is to use your eyes and your common-sense; look over each machine, note its special and unusual features, dig around until you find its attachments and then try to reason out their uses and upon what sort of jobs you can use them to advantage.

Write to the makers of the machines you use for catalogs and books of instructions, and familiarize yourself with the special features and attachments of each. All makers of standard machines now publish information for the operators of their machines and welcome the opportunity to put such information in your hands. No investment in small tools or mental equipment can add more to your skill or enhance your earning power to greater extent than the little time and observation required to make yourself 100 per cent in knowledge of the possibilities of the machines you use.

Industrial Cost Accounting for Executives

By PAUL M. ATKINS

The twenty-second article—The machine rate method of allocating burden—Methods of handling the various factors —Determining the normal number of operating hours

IN THE preceding article it was seen that there were some rather important limitations on the use of a percentage on direct labor charges or hours as a method of distributing the earned burden to the product. It will be remembered that one of these important limitations was due to the difference in the cost of operating the several machines for the effort should always be made to apportion the burden in the same ratio as the service rendered. In order to permit the accurate distribution of the earned burden when there is a variety of machines within a single department, particularly when there is a constant changing of the kind of work which passes through them, the machine rate method of burden distribution with its correlative process method has been developed. These methods not only provide for burden allocation with a comparatively high degree of accuracy under such complex conditions, but they also make possible a valuable comparison of the relative cost of production by different processes and on different kinds of equipment which is very valuable as a guide to the best manufacturing methods.

The Fundamental Idea of the Machine Rate

The fundamental idea of the machine rate method of burden distribution is to consider all indirect costs as the costs of operating the various machines or production centers. The term "production center" is used to include not only machines but also work benches, erection places on the assembly floor, tanks, ovens and furnaces, where work on the goods is performed.

It may readily be seen that there are a number of factors which are essential to the operation of a production center. In the first place there is the production center itself, with its attendant costs—fixed charges, maintenance and sometimes cost of tools and fixtures. Then there is always a building factor to be considered for the production center must necessarily occupy some space. The costs of this factor are evidently the fixed charges on the building, its maintenance, and the cost of lighting, heating, and sometimes of ventilating it. If the production center is a machine there is the power factor to consider and its cost is either that of the purchased current or the cost of operation of the power department. Then there is the departmental factor whose cost is principally that of supervision, but which often includes the expense of moving material to and from the center, of inspecting it when the operation is completed, of giving instruction to the worker who is operating the center, of the liability insurance on the men who perform these tasks and of supplies consumed at the center for the benefit of the department as a whole. Finally, there are the remaining factors which do not touch the production center directly and which do not exist within the department but without which, nevertheless, it would be quite impossible for the center to operate—such factors as the purchase and storing of materials, the setting of manufacturing standards, the planning, scheduling, and dispatching of the orders through the factory and the design, manufacture, and storing of tools, all of which involve costs which have already been discussed under the head of departmental expenses.

The Machine Rate Sheet

When we have once grasped the idea that all of these can be treated as costs of operating the several production centers, the next step to consider is the means of so aggregating them that they may be embodied in the form of a rate, and made assignable to the product. The way in which this is done is by means of a machine rate sheet which is illustrated in Fig. 51. On this sheet are assembled all the costs of the various factors which enter into the operation of the production centers. It is essentially a working sheet for only the results which are obtained thereon enter into the composition of the cost accounts. It will be noted that many of the figures which are employed are estimates, but it should be remembered that they are based so far as possible on past experience with an intelligent evaluation of the future, so far as that may be done. They very often represent a truer measure of actual conditions than current figures which are sometimes affected by insignificant causes which result in wide fluctuations from the standards set.

As the sheet is commonly laid out one line is reserved for each production center or group of production centers which are alike from the point of view of operating cost, even though they may differ in other respects. In other words, the age of a particular machine which may have peculiar significance in some instances does not need to have any effect here. The rate of depreciation will be the same whether it is old or new though the amount of the reserve for depreciation set up for it would vary according to its age. On the other hand, special attachments may be sufficient to cause a difference in operating cost, and hence in the rate, and so serve to mark off two production centers from each other which in other respects may be exactly alike and of the same age.

It will sometimes be found when the rates have been calculated that two of them for entirely different production centers may come out exactly the same. This is

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simply a coincidence and does not at all mean that the next time the rate is figured the two production centers can be grouped together. The rate for a planer and milling machine may be the same in amount, but the various elements which serve to make up the totals are often quite dissimilar in amount. The cost of floor space for one may be greater than for the other, a figure which quite possibly is offset by the cost of power, for example, or the amount of depreciation. The effort should be made to arrange the production centers on the machine rate sheet in such a way as to make every step in the development of the rate clear and yet at the same time reduce to a minimum the labor of preparing the sheet.

It will usually be found convenient to use the plant register in dealing with the various production centers

MACHINE

Production Center	P.C. No.	Value	Fixed Charges			Maintenance		Tool Costs		Auxiliary			
			Dep.	Ins.	Tax.	Maint.	Maint. Dept.	Tools	Tool Dept.	No.	Value	Dep.	Ins.

RATE SHEET

Equipment		Building Factor		Power Factor		Departmental Factor			Purch.-Stores Factor	Plan.-Stand. Factor	Admin. Factor	Total	Hours	Rate per Hour
Tax.	Maint.	Sq. Ft.	Amount	K.W.	Amount	Supplies	Ind. Labor	Misc.						

FIG. 51—THE MACHINE RATE SHEET FOR ASSEMBLING THE COSTS OF THE VARIOUS FACTORS

because a large part of the information which is needed may be obtained directly therefrom or be calculated from the data there recorded. As a means of identifying each production center its number should be listed, and if a group of centers are handled together the numbers of all of them should be entered on the sheet. The numbers can, of course, be obtained from the plant register. So also can the amount of the fixed charges appertaining to the center and the amount of depreciation, insurance and taxes. This total for the period of a year should be entered against the production in the column headed "fixed charges." The next figure involves a calculation. The cost of the important repairs are commonly listed in the plant register and with this information it is usually not difficult to forecast what they will amount to for the coming year. It must not be forgotten, however, that this is not all of the cost of maintenance. To it must be added a share of the daily and weekly upkeep. The expense accounts of the previous period are the source of information on which the estimate of the periodic upkeep is based. When the maintenance costs of the center for an entire department have been forecasted the total for all the centers may be checked against the departmental machinery maintenance account in order to catch any serious mistakes.

The cost of tools is another item which is often very important, sometimes being the largest single element in the machine rate. The plant register sometimes shows the tools which are used with the center, particularly in the case of special tools. The list serves as a basis for estimating the cost of the tools used on the machine during the year. The total cost for the entire department should be checked against the tool maintenance account in order to note any conspicuous discrepancies. Accompanying this question of the cost of tool maintenance is that of the allocation of the expense of the tool manufacturing department. This is the expense of operating the department and not the cost of the labor and material used directly on tool orders which is, of course, charged directly to the orders themselves. The best way, usually, is to apportion this expense to the direct manufacturing departments in proportion to the tools made and repaired for each. In turn, this charge may be conveniently allocated to each production center according to the amount of tool expense chargeable to each in the preparation of the machine rate. We have substantially the same kind of problem in the case of the expense of the maintenance department which is distributed on the basis of the amount of maintenance work done for the several departments and which then may be assigned to the various production centers in a like manner. Columns are reserved for each of these charges against the production centers.

Auxiliary Equipment

It often happens that there is what may be called "auxiliary equipment" attached to a production center. Individual motors or cranes are examples of what is meant by this kind of thing. It is usually optional whether or not such auxiliary equipment should be used. It is a matter of choice, for example, whether group or individual drive for a machine shall be employed. In this respect auxiliary equipment differs from tools and attachments which form an integral part of the machine itself. It also differs in that it is customarily relatively permanent, and essentially a machine itself, this condition being recognized in the form of an individual card in the plant register for each unit of such equipment.

In case auxiliary equipment exists it is necessary to have columns in which its cost may be recorded against the production centers. The first of these columns is for a record of the motor equipment for purposes of identification, as in the case of the production center itself. In the second should be entered the fixed charges, and in the third, the maintenance costs, all in substantially the same way as was done for the center itself. In this case it is usually necessary to add the total of the maintenance costs of the auxiliary equipment to that of the production centers in order to be able to check

with the departmental machinery maintenance expense account for the costs of both are commonly recorded in the same expense account.

The building factor and its expenses require some calculations before the figure for the several production centers can be found. It is usually convenient to make use of a supplemental sheet for this purpose. The first step is to ascertain the number of square feet occupied by each production center. This means not only the actual physical space on which the center stands, but also such aditional space as may be needed for the operator, the operation of the center under all conditions, and the storage of the normal quantity of incoming and outgoing material. The total floor space of the department to be employed in making calculations in this connection is simply the sum of the areas of the production centers just described. This eliminates all such calculations as for aisle space.

The second step is to ascertain the costs of the use and occupancy of the department. The fixed charges and the maintenance are the principal items here, though sometimes the cost of heating, lighting and ventilation is sufficiently large to make it necessary to consider it also. In addition to these charges which are purely departmental in their character there must be added the cost of the general building upkeep from which the department in question, together with all others, benefit. Roofs, foundations, passage-ways, elevators and stairways are examples of this class of building subdivision. When such charges have been ascertained they may be estimated against the several direct manufacturing departments on the basis of floor space with substantial accuracy. The costs of locker and toilet rooms, however, should be kept separate, and subdivided on the basis of the number of employees in each department since the use of these parts of the building have no relation to the physical size of the departments but to the number of employees working therein. The departmental total should then be calculated and divided by the total floor space to give a rate per square foot for the occupied area. Fig. 52 shows a convenient way for organizing the necessary data.

The data are then ready to be entered on the machine rate sheet. The area occupied by the production center should be entered in a separate column against the center in question. The rate taken from the building factor sheet should then be placed at the head of the adjacent "amount" column and the extension of the area by the rate gives the amount of the building factor charge to be allocated against the production center.

The Power Factor

The power factor charge should be handled in substantially the same way except that it is much simpler as a large part of the work has already been done. The total power cost is represented by the budgeted expenses of the power department. It is sometimes necessary to deduct a certain part of this amount to represent the cost of heat and light, but the remainder in all cases is the estimated cost of normal power production. The normal total power consumption should be ascertained by summing up the power consumption of the various production centers. It should be remembered that it often happens that a machine does not utilize at all or for only a small part of the time its rated power consuming capacity. The aid of the engineer should be sought in obtaining this information. Having obtained the total power consumption and its cost, the cost per unit—horsepower or kilowatt—can be calculated. With this information in hand the cost of the power factor for each production center may easily be ascertained and entered on the machine rate sheet.

The departmental factor usually does not present any serious difficulties. When the various elements which

BUILDING FACTOR SHEET

Dept.	Fix. Chgs.	Maint.	Heat-Light	Gen. Bldg. Chgs.	Locker	Total	Sq. Ft.	Rate

FIG. 52—THE BUILDING FACTOR SHEET

make up its cost are totaled the result is simply divided equally among all the production centers. The same procedure is usually followed for the purchase-stores, planning-standards, and administration factors. Under special conditions other methods may be employed which yield greater accuracy without an excessive increase in the labor involved.

The next step is to sum up all the costs of the various production centers which have been allocated against them. All these costs should be worked out on the basis of a year in most cases, though sometimes a six months' period proves to be more satisfactory, so that now the cost of operating the several centers for a year is at hand. To reduce this cost to an hourly rate, one more bit of information is needed—the number of hours which the production centers can be expected to work under normal conditions.

The Normal Number of Operating Hours

This may seen like a very simple calculation, once the number of hours per day which the factory is expected to work has been determined. It is not always quite as simple as it seems at first glance, however. Everyone who has had any experience in a factory knows that it is quite impossible to keep the machines or work places operating 100 per cent of the working hours. In some cases, when the production centers are simply work-benches, for example, it is possible to approximate the number of hours very closely, provided men, material, and orders are at hand. A certain amount of time must be allowed for those unexpected breakdowns which are sure to occur from time to time in spite of all that may be done to anticipate them, for inability to arrange schedules so as always to prevent gaps, for failure of workers to come as usual, and for other unforeseen contingencies.

It is usually wise to take as the normal working time, the time which the planning department uses in scheduling production, an average probably about 80 to 85 per cent of the theoretically possible working time. One other condition needs to be thought of also when discussing the question of hours. It sometimes happens that some production center is not expected to work all of the time which might reasonably be expected from the capacity of the machine. This state of affairs occurs when a center has such a rapid rate of production that working only a small part of the time is sufficient to keep up with the other centers which operate with it on the same orders. It is necessary under such circumstances to employ the number of hours which it is expected the center will normally

operate, even though its capacity is very much larger.

Having entered the normal number of working hours against the production centers, it is a very easy task to obtain the hourly rate by dividing the total normal yearly cost by the normal yearly hours. The machine rates so obtained should be entered on cards, sheets or some of the modern labor saving devices in such a way as to be readily available for use in applying the burden to the product.

The actual application of the machine rate is quite simple. The time tickets for the workers should be so arranged as to show the production center at which the work is performed. If this is done the earned burden can be allocated to the product by extending the time shown on the ticket by the rate which can be easily found when the production center number is known. The burden is then carried against the order by the same voucher which carries the direct labor charge.

The Process Rate

It sometimes happens that an extension of the machine rate is very helpful. It will be remembered that it was pointed out in an early article that occasionally labor which was expended directly on the product could not be charged to it conveniently. The enameling of metal parts, the operation of automatic lathes, or cotton or woolen looms of certain kinds are examples of this kind of thing. When such conditions exist it is often convenient to include the labor of operating the production center as a part of the burden rate which is then commonly called a "process rate." It is quite as easy to forecast the cost of labor for the operation of the production center as it is to estimate many of the other costs which go to make up the rate, and so it becomes one of the many items going into the makeup of the rate. In other respects there is no difference between the two forms of the rate.

The records to be made in the controlling accounts are not complex though the preparation of some of the entries involves more detail than is required for the direct labor hour or charge methods. It is usually desirable to employ a burden journal—a book very similar in its ruling to the stores journal—in which should be recorded each day the amount of the earned burden ascertained by summing up the burden charges on the time tickets. The total of this journal at the end of the month gives the credit to the manufacturing burden account and the distribution column totals give the debits to the worked material and merchandise in process accounts and any others to which earned burden may be charged. If the process rate is used, care must be exercised to see that the direct labor which forms a part of the process rate is charged to the manufacturing burden account and not directly to the "in process" accounts as failure to do this would make it impossible to check up the distribution of the direct labor. At the end of each period the distribution of the earned burden to the several orders should be checked with the controlling account entries and any serious discrepancies located and corrected.

Ordinarily a rate once set may be used for a year. If business conditions are rapidly fluctuating, however, it may be necessary to change the rate every six months and when the method is first employed, perhaps even more often. Experience is a good teacher in this matter and each time a rate is reset it should be estimated with ever increasing accuracy.

The description given of the development of these rates makes them appear cumbersome and difficult to use. Their actual day by day employment causes little difficulty and only slightly more clerical labor. At the same time they provide a means for dealing with relative accuracy with conditions which otherwise would almost certainly preclude any satisfactory attempt at burden application. These methods are not perfect, but they do permit a comparatively high ideal of control of the allocation of the earned burden.

Wanted—A Museum of Machine Tools

By L. L. Thwing

WHAT we need is a sort of Pepys' Diary of a mechanic in the early part of the last century. How interesting it would be if we could have the detailed experience of just one day. What time our diarist got up; what he had for breakfast; what time he started work; what sort of a shop it was; from what did they get their power; how many and what kinds of machines did they have; what kinds of tools did they use; how long did it take to do a certain piece of work, and a thousand and one details that would paint a picture of the early American mechanic—what he had to do, and how he did it.

Fortunately man's works last longer than he does himself so that while we have very few mechanics of 1850 with us today, there are in the aggregate a good many tools in this country that were built even earlier than that. They are naturally not to be found in the productive line of a modern shop, but you will find them stored away and forgotten, or used in some non-productive way. The writer was in Brandon, Vermont, ten years ago and saw there a practically new chain feed lathe. It was explained that the original owner of the lathe had died shortly after purchasing it, and his widow had stored it in a barn for over fifty years. Another chain lathe is in use today for wood turning in the carpenter shop of a well known company.

An Old-Time Milling Machine

The Union Vise Co. of Boston was the predecessor of the Brainerd Milling Machine Co. and one of the first to build a plain column and knee type miller. A machine of this make dates back to the seventies or earlier. One of these machines is held for occasional use today, but its owner has offered to give it to the Smithsonian Institute when it is finally discarded. Within the last year the writer has seen a Jones and Lamson planer, a New York Machine Co. drilling machine with a square thread on the spindle sleeve, dating probably to civil war times, and a small boring mill that is even older. Today these machines are practically junk—fifty years from now they will be valuable museum pieces if we can get them preserved.

The following is a quotation from a letter received from Guy Hubbard, whose interesting articles are now appearing in the *American Machinist:*

I shall be very much interested in the progress of the movement for the preservation of old-time machine tools, and believe that action should be taken on this matter at once for the reason that such ancient tools are rapidly becoming extinct. For instance, at the present time I know the whereabouts of one of the first turret lathes

ever built; this having been built by the Robbins & Lawrence Co. at Windsor, Vermont, in 1854. I also know the whereabouts of one of their original Howe milling machines, built in 1849 (now the well known Lincoln milling machine), and one of their original universal milling machines of 1850. Each of these machines has made history in the engineering fields, as they are unquestionably the first of the thousands of such machines since manufactured.

The cylinder for the first locomotive brought to this country is in the basement of the Smithsonian Institute as there is no room for it on the exhibition floors.

It is deplorable that we have no special museum for early machine tools, one that will house examples of the early builders' work. The Smithsonian Institute is full of devices built with machine tools, but contains not a single example of the machines themselves.

This is no original thought as this situation has been recognized by the Allied Engineering Societies and a committee appointed to discuss ways and means for securing such a museum. This is naturally a slow process, and in the meantime, due to economic pressure, old and obsolete tools are being scrapped every day.

There are a large number of empty, or nearly empty, buildings, products of the world war, which could be used to store these relics until such time as the museum is an established fact. I have no doubt that the owners of the buildings would offer storage space, and I am sure that the owners of old machine tools would donate these tools for such a museum if properly approached. In the meantime the writer would be glad to learn the location of any exceptionally old (light) machine tools, or other machines that deserve a place in the museum. A list of these will be kept until such time as provision is made for storage. Any communication will be forwarded to me by the editor.

The Care of Tracings—Discussion

By W. Roland Needham
Goodmayes, Essex, England

THE notes which follow are largely the outcome of an intimate knowledge of drawing office requirements and routine. They are not offered by way of criticism of the main propositions laid down by Dwight C. Howard in the original article under the same heading on page 479, Vol. 58, of the *American Machinist*. If in any sense these suggestions clash with those, then the reader must adjudge from the peculiar circumstances which obtain in his particular case, which of the two methods will the better suit him.

Where there is no marked partiality, nor rules and regulations to forbid it, it is not a bad plan to trace on the dull side of the tracing cloth. The ink catches in better, and less preparatory dusting of the surface is required. Not only so, but the natural curvature of the cloth automatically assists in tightening the sheet. This action is clear when we recall that the tracing cloth as rolled has its prepared surface inwards. Thus when one applies a sheet to the board dull surface uppermost, the tendency of the cloth to curl downward at the ends actually expresses itself by a flattening of the sheet onto the board. The tracer can then quite easily pin down the sheet so that it is well stretched and taut.

Where full size tracings are required one can, if it be deemed advisable, pin the cloth onto the edges running the length of the board. The drawing would be held in place at each corner by good quality sticky-back strips. The tracing cloth would, of course, overlap the top and bottom edges of the board, so as to permit of the necessary tacking down. Sticky-back strips can be added about mid-position on each edge along the width of the tracing sheet. Such an expedient enables one to keep the main surface of the drawing board reasonably free from pin holes.

It is usually quite good to tear off the selvage of the cloth. It tears very readily and cleanly. One can perform this minor operation with speed and yet without undue risk of damaging the cloth. The time factor is not unimportant.

Unless it be for exceptional work, it is excellent policy to maintain a tracing staff as distinct from a drawing staff. Women often make tracers *par excellence*. Where a draftsman does his own tracing work his tracings are seldom so neat as those done by a whole-time tracer. It may be objected that the draftsman can all the better reproduce his own work and also effect certain economies in the original. The writer does not in any way minimize this aspect of the case. However, a tracer can quickly familiarize herself with the idiosyncrasies of the men whose work she has in hand.

The method suggested tends to promote a measure of uniformity which otherwise might be lacking. Since the drawings have to be interpreted by men in the workshop, the technique of the tracing counts for more than many men appreciate. The most important consideration, however, is that of the relative importance of the work different people are called upon to undertake. If a draftsman be paid £6, 10 shillings per week and a tracer £4 per week, it is surely quite obvious that, unless things are slack, it is far more profitable to keep the higher paid employee at the designing and drafting end of the job.

So far as the cleaning of tracings is concerned, this work can be undertaken quite well by one or the other of the tracing staff. Such instructions as Mr. Howard gives could with advantage be issued as office orders to the tracing staff.

It is most desirable that the general character of all drawings for any one works should be as nearly uniform as possible. Thus methods of projection, arrangement of views for certain classes of work, method of dimensioning drawings, provision for requisitioning material, size of drawings and the like, should be standardized. This matter is of extreme value to the foremen and others who have to read the drawings in the shops, as it simplifies matters tremendously.

To this end, despite its flavor of red tape, it is a first-rate policy for the chief of the department to issue standard instructions. The instructions should deal clearly with these important matters, and above all they should be concise and as few in number as possible. The wordy and frequent variety as a cure is almost worse than the disease. But they must be firm instructions.

The printing room staff should be carefully instructed in the importance of the work undertaken, and be made to realize the great value of the tracings handled. Firm instructions here would often cut out much grievous and entirely unwarranted damage to highly important tracings.

These notes are not meant to be exhaustive. They are offered purely by way of suggestion.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

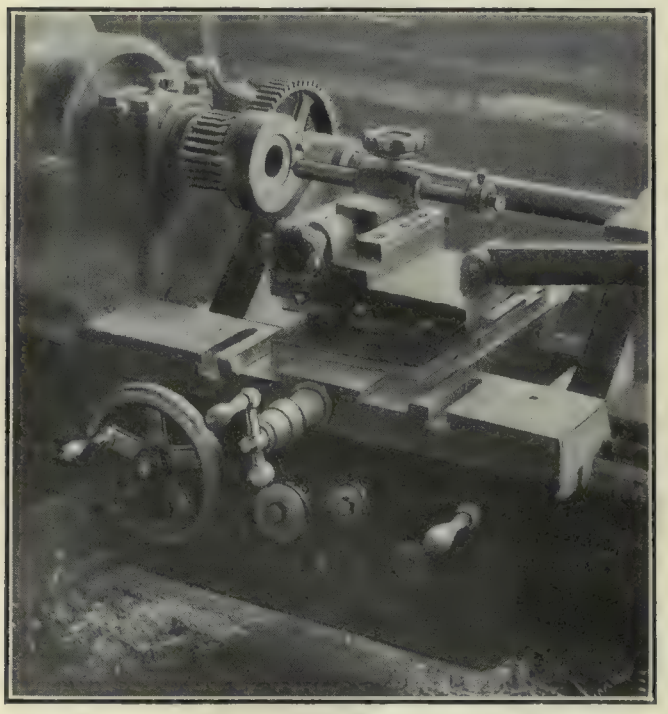
Oil Grooving Attachment for a Lathe

By Harold Brown

An inexpensive and handy arrangement for oil grooving is shown in the illustration, the gear guards being removed to show the construction.

It was found necessary to cut "figure eight" oil grooves in 10,000 bushings and, as the time to rig up for the work was very limited, we had to use any parts we had on hand.

The device shown consists of a pair of spur gears to



OIL GROOVING ATTACHMENT FOR A LATHE

give a 2 to 1 reduction between the spindle and the shaft at the back of the fixture; a pair of mitre gears to give the proper motion to the slotted disk; a slide to fit the compound rest of the lathe, and a top slide to carry the tool bar and feed the cutting tool into the work.

The cutter bar is flattened on top and held in proper position by means of the hand screw shown over the bar. The collar on the bar is used for locating the position of the cut in the work. The chuck has a split clamp-bushing which holds the work by means of a hollow-head setscrew in the periphery of the chuck. The pin to be seen in the end of the chuck was used for a special job, which was flanged, and fitted a drilled hole in the flange for locating.

The slide is adjustably connected to the slotted disk by a connecting rod, so that the length of stroke can be changed to suit the work. The carriage is locked to the ways after job is set up.

In operation, a bushing is placed in the chuck and fastened securely by tightening the clamping screw, the bar is set in position with the collar against end of bar holder and the hand screw tightened. The machine is then started, the slide receiving a reciprocating motion from the crank disk, while the tool is fed into the work by means of the hand knob facing the operator. The cutter bar can be withdrawn far enough to allow the removal and insertion of the work. The machining time was 20 sec. for each bushing.

The time necessary to get this device ready for production was very limited so, before it was fully designed, the mitre gears were secured, the ones used being discarded from an old automobile differential. The large spur gear was an easier matter, being a change gear from an old lathe. The actual time and cost of building the device was as follows:

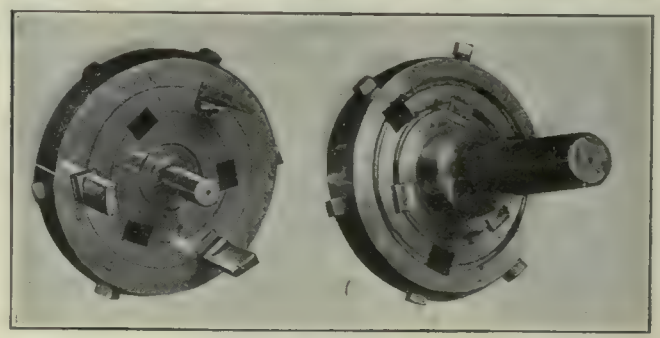
Design, 15 hr. Pattern, 40 hr. Machining and assembling, 53 hr. Material $15.

Trepanning Tool for Flue Sheets—Discussion

By E. A. Thanton

The trepanning tool described by R. E. D. Delrue, on page 921, Vol. 58, of the *American Machinist*, is good, but I believe we have one that beats it, in that it may be used for more than one size of hole; cutters are easily set, reground or replaced; pilot is easily replaced with another of different size; and the whole tool is not difficult for any fair machinist to make.

As shown, there are three trepanning cutters, but more or less can easily be put in. If the pilot and shank are centered, the blades may be ground to suit



A SIMPLE TREPANNING TOOL

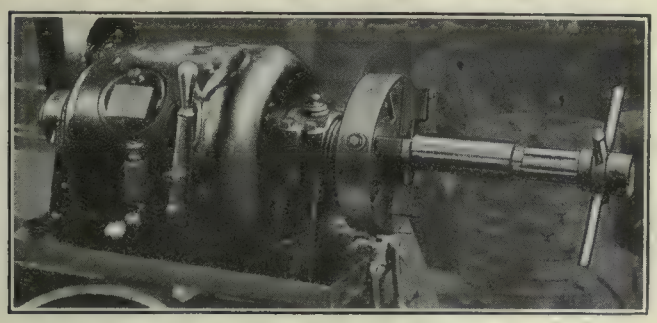
the circle to be cut, in any good-sized cylindrical grinding machine, or turned in a lathe before hardening and then stoned for clearance. For heavy work the body should be made of machinery steel, although sometimes it could be made of cast iron. The shank may be tapered and pressed into the body, or the body may be shrunk on. The pilot should be tapered so as to press into a taper hole in the part of the shank that projects through the body. If a drift hole is made in the shank, the pilot can easily be removed.

Floating Holders for Reamers—Discussion

By A. R. Gage

In writing about floating reamer holders, J. T. Towlson, on page 149, Vol. 59, of the *American Machinist*, says he had to finally resort to hand reaming in order to get accurate results. This is all right, but ordinary hand reaming is a pretty slow job and I am showing the way we do "hand reaming" by machinery.

The reaming we have to do is the finishing of the



POWER DRIVEN HAND REAMER

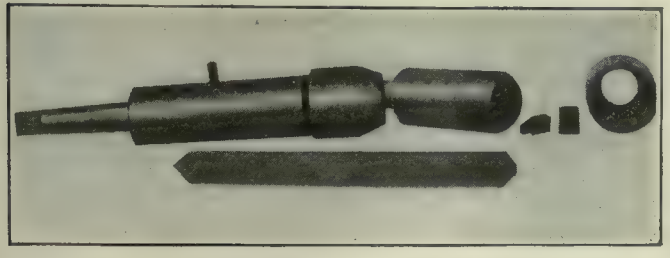
hole in brass bushings. We had on hand an old geared head from a lathe that was wrecked by accident. This head we mounted as shown and placed an adjustable hand reamer in the chuck. The bushings are held in a special holder and kept from turning by means of a setscrew which is very lightly screwed down onto the work. In effect, the device makes a power-driven hand reamer with all of the advantages of a floating reamer holder and with none of its disadvantages. Various speeds and reverse are obtained by shifting the hand lever on the lathe head.

Of course, it is entirely possible that the pieces handled by Mr. Towlson could not be so easily moved by hand as are these bushings, but the idea may be used for numerous small articles.

A Chuck for Flat Drills

By Frank Avey

It is often convenient or necessary to make drills out of flat-bar stock, but it isn't always easy to hold them properly. We do a lot of odd jobs and find



A CHUCK FOR FLAT DRILLS

frequent use for various sizes of drills, yet it would hardly pay us to keep a large stock of regular drills on hand, since it is seldom that we get any two jobs calling for drills of exactly the same size. For this reason we resort to the making of special drills from flat-bar tool steel. These drills we can forge or grind to any fractional size we need with very little trouble.

However, it isn't always easy to chuck a flat drill satisfactorily, so we have made several chucks like the two shown in the illustration. A chuck of this kind has only five parts in all: the body, which includes the shank; the clamping cap; two jaws; and a stop pin which keeps the drill from slipping up too far into the body slot.

A completely assembled chuck is shown at the left and a disassembled one at the right.

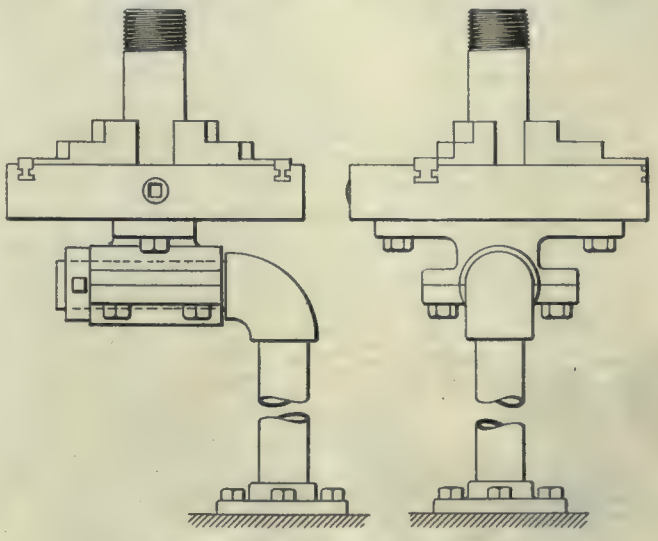
We make the body and cap of machine steel but caseharden the latter. The two jaws are also casehadened but the other parts are left soft. For a better class of work it might pay to caseharden all the parts and to grind the shanks, but for our purpose they are all right as described.

A Universal Floor Vise

By Joe V. Romig

The universal floor vise here shown and described is a very handy piece of equipment for the assembling or other department where there are any number of round pieces of work to be held temporarily; as in die-threading bolts, correcting damaged threads, and many similar jobs for which the regular bench vise is neither suitable nor convenient.

The principal item in the bill of materials required



FLOOR VISE MADE FROM CHUCK

is a 3-jawed universal lathe-chuck. Preferably one that has outlived its days of usefulness for its original purpose and has been superseded. The remaining parts are: about 3 ft. of 3-in. pipe, a flange, an ell, a nipple and a small pillow-block casting.

The nipple should be put in the lathe and its body turned to a diameter that will just clean up and leave the nipple round and smooth. The flange is lagged to the floor, the pipe screwed in the flange, the ell screwed on the upper end of the pipe and the nipple screwed into the ell. The pillow-block should be bored to clamp on the turned nipple, and its base fastened to the back of the chuck by means of the regular chuck-bolts.

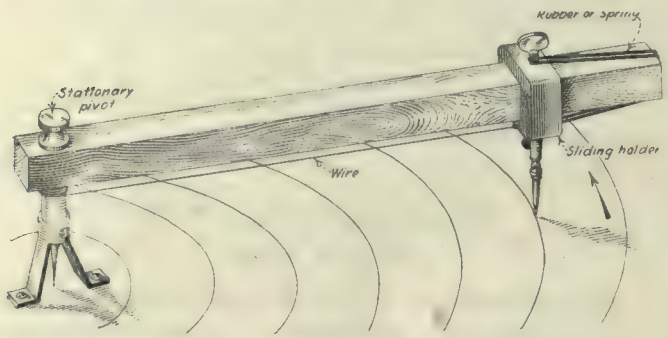
This rig provides a vise that can be used for many purposes and is especially adapted to holding round pieces. It has the further advantage that it may be located anywhere on the floor that may be convenient to the work.

Device for Drawing an Accurate Spiral

By Ernest Jones

An effective method of describing an accurate spiral has been developed by Dr. Rippey of McKinley Tech, Washington, D. C. The method was evolved because of the need for a mathematically accurate drawing for a new calculating instrument known as the Spirule.

Spirals are ordinarily drawn by using two or four



HOW SPIRALS CAN BE ACCURATELY DRAWN

centers and drawing part of the curve from each by means of a compass, the result approximating a spiral. In the Rippey method, an ordinary beam compass is employed. The ruling pen or pencil has sufficient lateral movement to care for the largest and smallest radii required on the spiral. A rubber band is fastened to the holder and also to the end of the beam. From the pen or pencil holder a fine wire is carried to the fixed stationary pivot of the compass, through a hole drilled therein and fastened in any convenient manner. The length of the wire from the pivot to the pen determines the radius.

The pen is set at the outer radius required, the wire is tightened by winding it on the pivot and movement of the compass about its pivot is begun. The wire is thus wound upon the pivot so as to continuously shorten the radius until the completion of the spiral. The distance between the turns is regulated by using a pivot, or a bushing on it, of the proper size. One turn of wire around a 1-in. drum would make an interval of 3.1416 in. between the turns on the paper, being the same between each turn made. The interval will always be 3.1416 times the diameter of the pivot.

Computing a Connecting Radius

By Hubert G. Smith

The following formulas were worked out by the writer in the absence of data covering the problem given, and are submitted for the benefit of others who may be interested.

Referring to the figure, the problem is to find the radius R of an arc which will connect with an arc drawn from center P with the radius D. The distances A, B and D are given. It will be noted that where the required arc is flat the center O is at so great a distance that a drawing board layout is inconvenient and the easy computation of the required radius is then a distinct advantage.

In order to find the required radius R, the distance X is first computed and for this a distance C which equals B minus D is used.

$$C = B - D$$

The expression for X is then found to be

$$X = \frac{A^2 - C^2}{2C}$$

This relation is readily shown by combining the

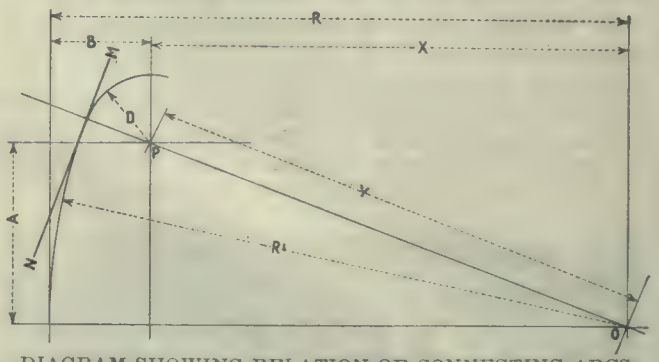


DIAGRAM SHOWING RELATION OF CONNECTING ARCS

various factors of the problem algebraically as follows:

$$X + B = R$$
$$X + D + C = R$$
$$Y + D = R$$
$$R - D = X + C$$
$$R - D = Y$$
$$X + C = Y$$
$$X^2 + A^2 = Y^2$$
$$X^2 - Y^2 = -A^2$$
$$X - Y = -C$$
$$X^2 - 2XY + Y^2 = C^2$$
$$2X^2 - 2XY = C^2 - A^2$$
$$X(X - Y) = \frac{C^2 - A^2}{2}$$
$$X = \frac{A^2 - C^2}{2C}$$

When the value of X is determined the value of R is very easily found by using the first of the series of equations above.

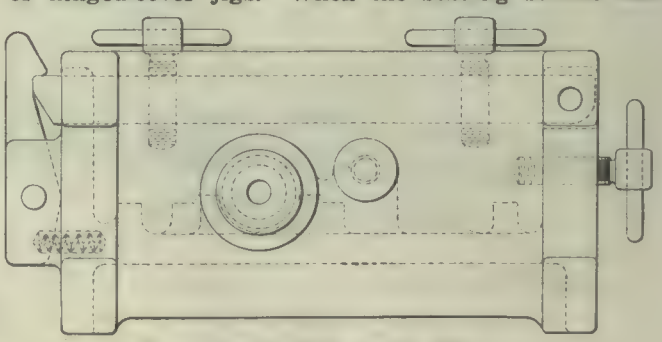
$$X + B = R$$

The line MN is a common tangent at the connection point of the two arcs.

Automatic Catch for Leaf-Jig

By Edw. L. Robenolt

The accompanying sketch shows a simple and convenient form of catch to be used in connection with leaf- or hinged-cover jigs. When the binding screws that



CATCH FOR LEAF JIG

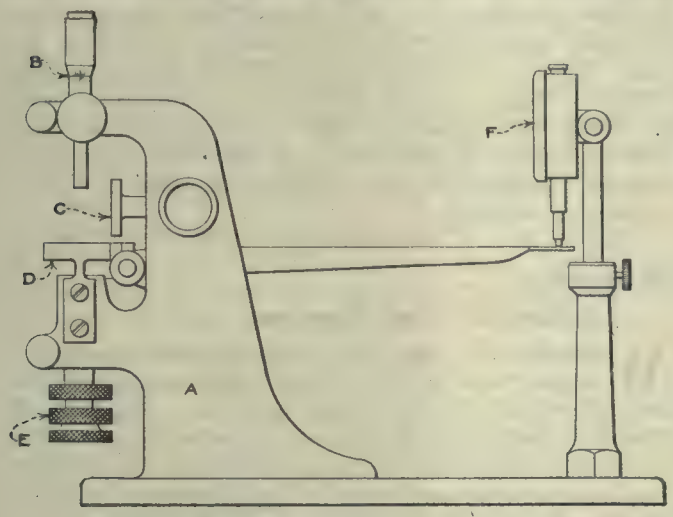
hold the work are released, the operator has only to press back the catch with his thumb against the action of the enclosed coil spring, and lift the cover. Lowering the cover to place on the next piece of work automatically locks it without further attention from the operator.

Measuring Piston Pins

By Herbert F. Crawford

The H. R. L. Motor Co., Seattle, Wash., is specializing in piston pins for replacement work and has built the measuring device shown herewith for inspecting the finished pins.

The frame or base *A*, carries a micrometer barrel at *B* and a backrest at *C*, the latter being adjustable so



DEVICE FOR MEASURING PISTON PINS

as to handle pins of different diameters. The movable or measuring plunger *D* is also adjustable by means of the knurled screw and check nut at *E*, and is connected by a multiplying lever to the dial indicator *F*. The dial indicator is also adjustable vertically so that the measuring device can be readily set to handle work within a wide range.

After this gage has been once set, work can be handled very rapidly, and the combination of the multiplying lever and the dial indicator makes it easily possible to read extremely small variations very rapidly.

Lubricating a Clutch Pulley

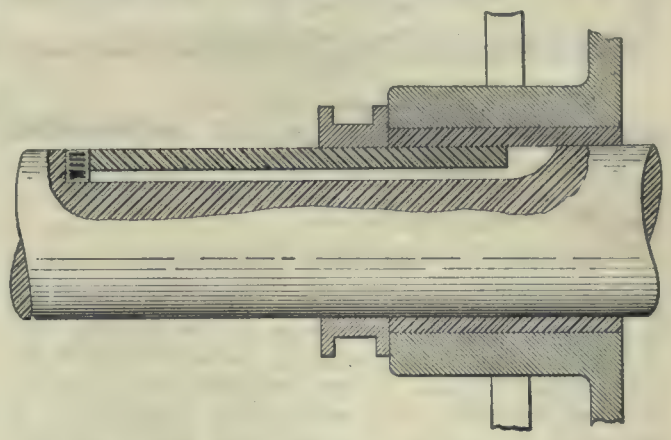
By James Ellis

In our plant there is a 4-ft. clutch pulley located about midway of the length of a 2 15/16-in. shaft. The condition of the drive is such that the pulley runs continuously while the shaft is stopped and started periodically by means of the clutch, and remains idle for a considerable part of the time.

We experienced difficulty in keeping the bearings of the pulley properly lubricated, so much so that the bushings would wear out about every six months, while the shaft itself had to be replaced every year. What was needed was a way to get oil or grease to the pulley bearings through the shaft while the latter was idle, and the way we accomplished it was as appears in the accompanying sketch.

We first milled a keyway in the shaft 3/8 in. wide by 1/2 in. deep, from a point midway of the pulley bushing to a point well outside the clutch collar. Next, a keyway, or slot, 3/16 in. wide and deep was milled the whole length of the larger slot at the bottom. A piece of 3/8-in. key stock was then fitted in the larger keyway, peened in place and filed on the outside to conform to the circumference of the shaft.

The new piece was fitted flush with the outer end of the slot and left about 1/4 in. short at the inner end, as the sketch indicates. A hole was then drilled and tapped through the outer end of the piece and we thus



OILING A BEARING THROUGH THE SHAFT

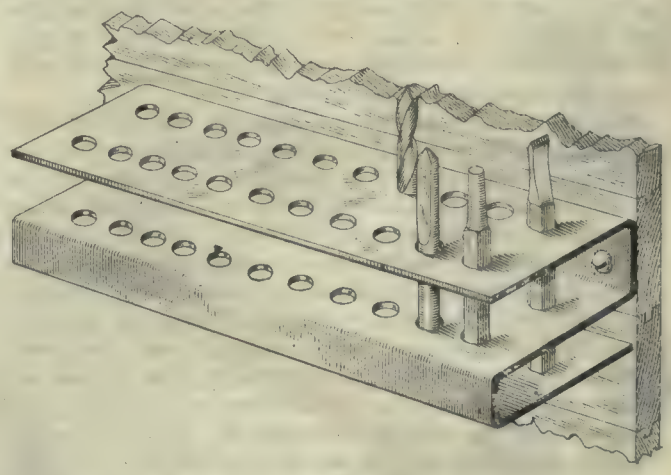
have a 3/16-in. square oil channel running through the shaft to the middle of the bearing. A grease cup screwed into the tapped hole completed the arrangement.

We can now force oil or grease right to the center of the pulley bearing at any time when the shaft is stopped.

Sheet Metal Rack for Small Tools

By G. A. Luers

A cheap and easily made rack for small tools, such as punches, chisels, wrenches, screwdrivers, etc., is shown in the accompanying sketch. Placed in some position above the bench where it is conveniently



SHEET METAL RACK FOR SMALL TOOLS

accessible, it provides a place to keep such tools between times of using and thus saves the workman from the annoyance of having them roll off and get lost.

The rack consists of a single piece of sheet metal bent in the form of a letter S, with holes of suitable size drilled or otherwise cut through the upper and middle planes. It may be attached with screws to any convenient beam or to the wall above the bench, within easy reach of the workman.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors

September 20, 1923

The Machine Tool Builder and the Second Hand Problem

PRIMITIVE instincts have an uncanny and sometimes unpleasant way of persisting in the interior construction of the human being no matter how thick his veneer of civilization. Given the right conditions and the most peaceful citizen will join in a man hunt—to the death, if necessary. Under much less provocation he will pursue the hoary pastime of bargain hunting. He may scoff and jeer at his good wife when she frequents sales at the department stores but he knows, deep down in his heart, that he is a hypocrite and that he is just as bad as she is when he thinks he sees a bargain.

It is this ineradicable human quality that is responsible for one of the two phases of the second hand problem as it confronts the machine tool builder. He may talk himself blue in the face about the risk run by the purchaser in buying machinery that is without any service guaranty whatever and that may be in almost any kind of disrepair under the surface. He may present veritable armies of figures to prove that the cost per piece of product will be less with the higher priced new machine. All his arguments fall on deaf ears when the bargain mania grips the customer. Nine times out of ten the bargain turns out to be a delusion but the ardor of the bargain hunter never seems to abate. It even seizes the machine tool builder himself at times and causes him to adopt policies in purchasing tools for his own shop that hardly square with what he urges on his customers.

But there is also the other phase of the second hand problem and it is certainly no less difficult to overcome than the one we have just mentioned. It concerns the making of excessive allowances for old machines which are traded in by customers.

The tremendous production of automobiles has given the manufacturers and dealers a second hand problem that has resulted in many a failure. You can probably remember at least one dealer in your own town who thought to make a fortune by a large bulk of new car sales stimulated by fat allowances on old cars and who went to the wall in consequence. His exact counterpart, unfortunately, exists in the machine tool business.

It is one of the strange contradictions of human nature that a man who will adhere to his printed price list with the tenacity displayed by chewing gum when you step on it, will make allowances on second hand tools offered in trade that speak ill for his ability as an appraiser of values.

Some people are ill-natured enough to look upon this practice as closely akin to price cutting. Perhaps it would be more charitable to call it a misguided form of altruism. Misguided, because the beneficiary never appreciates what is being done for him but rather scorns his benefactor, and also because it almost invariably leads the benefactor to financial ruin just as in the case of the automobile dealer mentioned above.

As to the first phase it is probably too much to expect that such a deep-seated human characteristic will yield to argument and education without the expending of much more effort than has been put forth in the past. When it comes to the other phase of the problem there is perhaps a little more hope. Those who insist on loading themselves up with worthless traded-in machinery eventually fail and in so doing leave one more horrible example of bad business practice for their successors to avoid.

Wanted— A Machine Tool Museum

WE ARE very glad to print on page 452 a communication from L. L. Thwing which points out the desirability if not the actual need for a Museum of Machine Tools. While this is not a new idea, and Mr. Thwing disclaims any credit for originality, it has been too long neglected and many old machines which would have made valuable exhibits, have found their way into the cupola.

There have been spasmodic attempts to start a museum of this kind, but they have been short lived and have never even made a real beginning. We believe, however, that this is a good time to inaugurate a movement of this kind that will be of real service to all concerned. All that is necessary is to have the builders of machine tools realize the desirability of such an institution. For with their active organization, behind such a movement its success is assured.

Such a museum will have more than a sentimental interest although even this is not to be altogether overlooked. It will have a real value in showing designers how various problems were solved in the early days and will, in many cases, show how some of our bright ideas were anticipated long years ago.

We do not believe there will be any difficulty in securing storage space for exhibits in some of the war buildings which are now practically empty. Nor will there be any trouble regarding the donation of old machines from many quarters. All that is needed is a definite program with a live organization behind it, to assure the success of the movement at this time.

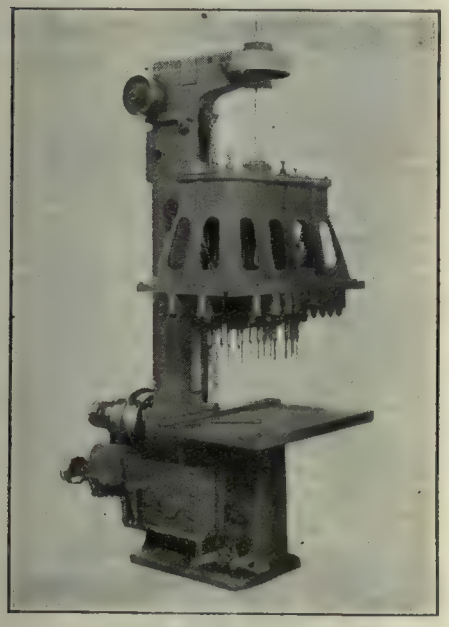
The *American Machinist* stands ready to assist in the movement for the establishment of a museum in which typical machines of earlier periods may find an honored resting place, for the benefit of the industry at present and in the future. We shall be glad to hear of any machines which are old enough, and typical enough, to deserve a place in such a museum. Such information will be turned over to the proper persons for action in securing desirable exhibits. The movement needs the cooperation of all who are interested in machine tool developments. And this we are sure, will be forthcoming. For, without the development of machine tools we should have none of our great industries but would, of necessity, be leading a primitive existence.

Shop Equipment News

Fox Multiple Spindle Drilling Machine

A multiple spindle drilling machine which is designed for automatic rapid drilling is a recent addition to the line of drilling machines manufactured by the Fox Machine Co., Jackson, Mich.

A feature of the machine is the aluminum drill head, the casting for which weighs 174 lb. To suit the requirements for which the machine was built the head is bored for 22 spindles, arranged in three clusters. Twenty of the spindles are ¾ in. in diam. with No. 1 taper, and two are



FOX MULTIPLE SPINDLE DRILLING MACHINE

⅝ in. in diam. with No. 0 taper. The spindle speed is 2,000 r.p.m.

As shown in the illustration, the aluminum head is secured to a cast iron saddle which slides up and down on the column. The maximum travel of the head is 7 in. and is automatically repeated as long as the operator keeps his foot on the treadle at the base of the machine.

The feed gearing for the head is so arranged that the head will make 5, 8 or 11 cycles per min., a 580-lb. counterweight being provided to reduce the force required for reciprocating the head. The variation in length of feed is accomplished by adjusting the radius of the driving crank, which is done by moving the crank pin in a slot in the crank disk. The feed changes are made by sliding cone gears and the feed clutch is of the saw tooth type. The feed worm gear is bronze and the worm wheel, which is on the same shaft as the adjustable crank, is of soft steel. All feed gearing runs in oil. The crank mechanism gives a quick return motion to the head.

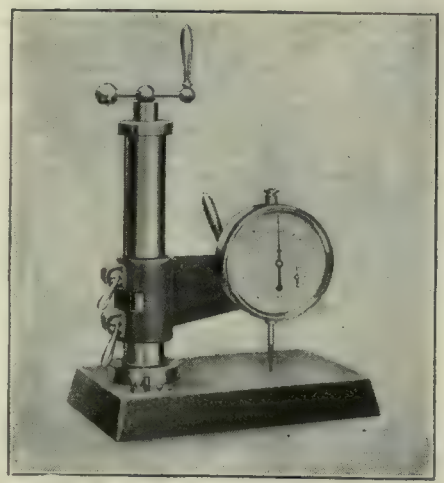
The head saddle carries a bronze adjusting nut, by means of which the position of the head may be adjusted vertically through a distance of 15½ in. The column guides for the head saddle are of steel.

The drive shaft is arranged to be driven from a countershaft at 400 r.p.m., and drives the feed gear box shaft through a belt on the small pulleys at the rear of the machine. The driving shaft of the head is also belt-driven from the main drive shaft, suitable idlers being provided for changing the direction of the belt.

This machine has a special table and a standard column 58 in. long. The net weight of the machine is 2,800 pounds.

Waltham Universal Gage

A gage mounting for its 4-in. dial indicator is now being marketed by the Waltham Dial Gage Co., 85 Myrtle Street, Waltham, Mass. This mounting is used for the measurement in quantity of parts which are to be held within certain limits. It is said to eliminate chances of error due to wear of inspection gages, to handle work quickly and to show what the errors are.



WALTHAM UNIVERSAL GAGE

The base is 10x6 in. and carries the upright column upon which slides an overhanging arm. To this arm an indicator is attached as shown in the accompanying illustration. The arm is moved vertically by means of the ball crank at the top of the column and clamped in position by the two levers at the side.

The upright column gives a gaging capacity of 6 in., and the distance from the column to the indicator spindle is 3¾ in. The weight of the gage is 22 lb. and it is 14¾ in. high.

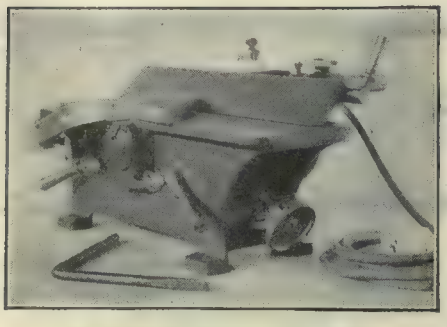
Whipple Portable Motor-Driven Bench Jointer

The Nazel Engineering & Machine Works, Nicetown, Philadelphia, Pa., has recently placed on the market a 4-in. portable motor-driven bench jointer which will be of interest to pattern and other wood-working shops.

The box-shaped base has inclined ways upon which the two tables may be adjusted and clamped in position. The surfaces of the tables are ground to insure proper alignment and are provided with inserted steel lips, machined to give a minimum opening of ⅛ in. at the cutting circle. The rear table has a rabbeting ledge, the front table being extended to suit.

The gage or fence is supported by an arm attached to the main frame and can be set at any angle up to 45 deg. An aluminum safety guard of unusual design is pivoted on the table.

The cylinder is of the three-knife, solid, safety type and is direct-connected to the motor shaft. It is machined from a crucible steel forging and constructed to leave only sufficient knife throat opening for free cutting of any kind of wood. The knives are of high-speed steel and all rotating parts are dynamically balanced.



WHIPPLE BENCH JOINTER

The machine is regularly equipped with a 60-cycle a.c. motor of desired voltage or a d.c. motor for 115 or 230 volts, but a.c. motors for other cycles can be furnished. A heavy snap switch is mounted on the motor casing and a suitable cord and attachment plug is provided.

Waltham 4-Inch Dial Indicator

An indicator of unusually rugged construction and with comparatively heavy parts has recently been placed on the market by the Waltham Dial Gage Co., 85 Myrtle St., Waltham, Mass.

The dial, which is 4 in. in diam., is divided into 100 divisions, each division representing 0.001 in. On account of the large diameter it is said that the graduations are large enough to permit reading to one-half or one-quarter of a division. A dial reading from 0 to 50 each way will be furnished on order.



WALTHAM 4-INCH DIAL INDICATOR

The dial revolves in the case and can be set in any position with respect to the pointer by turning the knurled bezel. The travel of the spindle is ½ in. and is transmitted to the pointer by means of a so-called floating rack and suitable gearing.

The floating rack is a feature of the indicator as it is said to cushion the shocks on the gears, and to give accurate readings whether the spindle is gently lowered or snapped down on the work.

The spindle is regularly fitted with a button tip but any shape of tip or contact point can be furnished. The spindle runs in hardened steel bushings. A lug on the back of the instrument has a ⅜ in. hole for attaching to any machine. The indicator weighs 3¾ pounds.

Methods of Payment for Exports

Before and since the world war many articles have appeared in the press on the subject of export trade which have given special emphasis to the matter of the terms that should be granted, and it would appear that so far as machinery is concerned a great deal of confusion has arisen. In this way a situation has developed that makes a better understanding desirable.

In the first place it should be recognized that practically all machinery represents a capital investment, as contrasted with hardware, haberdashery, and other classes of commodities that pass directly into consumption. As good banking makes it necessary for lending institutions to maintain their accounts in liquid form if possible, it is perfectly obvious that a banker is justified in restricting his loans in so far as they apply to machinery. It will also be recognized that the ordinary machinery manufacturer will not have sufficient capital invested in his business to justify him in tying it up for long periods. Some reports received from foreign countries in connection with export business suggests that foreign buyers should be allowed liberal terms—a remark which if applied to consumption goods, might be interpreted to mean the allowing of 90 or 120 days before demanding payment of the accompanying drafts. If this expression is applied to goods representing capital investment, such as machinery, and to transactions negotiated directly with the ultimate consumer, one might infer from these reports that a year or more should be granted to the purchaser.

There is nothing about export business that makes it necessary to engage in unbusinesslike practices. Properly handled, export trade in machinery is one of the cleanest and most attractive kinds of business, and unless there is some particularly good reason to the contrary the trade should be kept upon this basis. For a manufacturer to allow his customers a year, more or less, in which to pay for factory machinery, appears to be a most unbusinesslike procedure, because one must infer that he is encouraging his customers to build factories without first providing adequate capital, and it is not a kindness to encourage an oversea buyer to engage in business without sufficient fixed capital, as this arrangement suggests that there would be almost no working capital, and the particular enterprise would be seriously handicapped from its inception. In ordinary cases it therefore appears that so far as factory and industrial machinery are concerned, the user should have funds with which to buy before being allowed to sign a contract. This fact in itself suggests that it will not ordinarily be necessary to grant unusual terms in connection with machinery sales when these transactions represent investments of fixed capital.

Other Cases

For the sake of simplicity, the above has been so worded as to suggest a transaction executed directly between the machinery manufacturer in this country and a factory owner abroad. But to this extent the above remarks are misleading, because such transactions are unusual. Almost invariably American industrial machinery is sold in foreign countries through machinery dealers residing in the various foreign cities. The question of terms may therefore be complicated somewhat out of regard for the wishes of the machinery dealer as distinguished from the ultimate consumer.

From the very nature of his business the foreign machinery dealer to be successful must keep his capital turning over very rapidly, and for the purposes of this discussion it may be desirable to assume that this dealer will turn his capital over some five or six times a year. He will therefore prefer to arrange his transactions in such a way that he is able to collect from his customers before paying his obligations to his principal. Obviously, it is to the manufacturer's interest to promote the convenience of his foreign representative, and, quite conceivably, terms should be extended that will allow the foreign dealer time to adjust his financial arrangements. This complicates the discussion, because there is an endless variety of terms extended to foreign buyers by these foreign dealers.

An Excellent Arrangement

Frequently the machinery dealer abroad will negotiate a contract arranging for payment, perhaps one-third with the order, one-third on delivery, and one-third after test. If, for purposes of argument, we assume that the customs duty, delivery charges, and dealer's profit at destination approximate one-third of his contract price, it becomes clear that the final payment he secures from his customer covers his expenses after the arrival of the consignment at point of destination, and the two earlier payments make it possible for him to pay the original charges shortly after arrival. This, in fact, is a very common arrangement and again shows the possibility of making prompt payment. There are a large number of transactions where this particular arrangement is not possible, but, on the other hand, in many cases it will be found that terms such as those just described are actually employed. It will, therefore, ordinarily meet the dealer's requirements if the consignment is accompanied by a draft payable soon after arrival of the shipment.

From a Trade Information Bulletin, Department of Commerce.

News Section

Decrease Shown in Employment

Preliminary figures of employment in the United States made public by the Bureau of Labor Statistics, a branch of the Department of Labor, indicate that there was a decrease in August, as compared with July of two-tenths of 1 per cent, but an increase of seven-tenths per cent in the total amount paid in wages, and of nine-tenths per cent in average weekly earnings.

The figures compiled are for fifty-one manufacturing industries, representing 6,598 representative establishments, with 2,279,659 employees. In one week in August these employees received $59,967,607. The same establishments in July reported 2,284,642 employees whose weekly wages aggregated $59,564,865.

Some Increases

Comparing August with July, increases in employment are shown in twenty-two of the fifty-one establishments, and increases in total wages in twenty-one industries. The greatest increases in wages were in the pottery, iron and steel, flour, women's clothing, boots and shoes industries. The greatest decreases in wages were in machine tools, steel shipbuilding, shirts and collars, and automobile tire industries.

Increased employment was shown for the flour, fertilizer, pottery, structural iron work, confectionery and ice cream and boots and shoes industries. The greatest decrease in employment was in machine tools, "due entirely to annual vacations." The automobile tire industry had the next heaviest decrease.

Complete Plans for Power Exhibit

Dec. 3 to 8, 1923 are the dates set for the National Exposition of Power and Mechanical Engineering and the place will be the Grand Central Palace, New York City. Contracts already signed give assurance that the coming event will exceed that of last year, which was the first exposition of the kind, both in size and diversity. In addition to exhibits of devices for the generation of all kinds of power, space has been set aside for equipment used in the transmission of power. This will add greatly to the interest of the exposition.

All Engineers Interested

The appeal of this exposition is to engineers not only in the power and mechanical fields but in all fields. Notable advances in the art and science of power generation will be packed in the Grand Central Palace and even the technical man, only casually interested in power, will find novelties to interest him for several hours.

The co-operation which the American Society of Mechanical Engineers is extending is an indication of the importance of the Exposition. The A.S.M.E. annual meeting parallels the first four days of it, and to permit the mechanical engineers to reap the benefits of both meeting and exposition, the power and mechanical sessions at the meeting are to be assigned to the morning. As the Exposition does not open until noon each day there is no conflict and members can have ample time to give careful study to the Exposition. The American Society of Refrigerating Engineers' meeting also parallels the first days of the Exposition and members of that organization, as well as mechanical engineers, will be admitted on display of their badge.

Illinois Central's Program

As its portion of the improvement program of the railroads of the United States the Illinois Central now has under construction or has authorized expenditures for work that will cost a total of approximately $145,000,000. Included in this huge expenditure is the construction of a Chicago terminal extension, new equipment that the railroad has purchased for 1923 and the new 166-mile line from Edwood, Ill., to Fulton, Ky.

The financing of some of these undertakings has already been provided, and in other cases the improvement will not be completed for some time, so that the $145,000,000 to be expended by the railroad will be spread over a number of years.

Of the new improvements, the largest is the Chicago Terminal. This work has been going on for some time, and when completed will give the Illinois Central greatly improved terminal facilities in the Chicago district. It will cost about $82,000,000, according to the present figures.

Pennsylvania Tries New Equipment

New locomotives to enable the Pennsylvania R.R. to get the same motive power on its branch lines as it gets with the big locomotives on the main line are now being tried out by the railroad. The first of these locomotives, of which forty are now on order at the Pennsylvania's shops in Altoona, Pa., has just been delivered.

When completed it is expected that they will be ready for use on either the branch or the main lines. They are designed to handle heavy passenger trains where the heavier locomotives would damage the light trackage. This was accomplished by dividing the driving weight over three pairs of wheels instead of two and by using larger cylinders and smaller wheels, it was said.

Steel Production Declines

The August rate of steel ingot production was about 42,400,000 tons a year, representing a 3 per cent decrease from the rate of the previous month. There has been a gradual decline in steel production since April, when the rate of output was considerably greater than it had been thought the steel industry could attain, with the difficulties expected to stand in the way.

The rate now is probably about 41,000,000 tons a year, which would represent a 16 per cent decrease from the record rate, but would still be a slightly higher rate than was reached at any time last year. Even with the decrease in production in the last four or five months, steel is being produced at between a 25 and 30 per cent higher rate than the average in the four post-war years, 1919 to 1922 inclusive.

Unfilled Orders Increase

The unfilled obligations of the United State Steel Corp. decreased by 496,100 tons during August, against decreases of 475,498 tons in July and 595,090 tons in June. In the three months, the Steel corporation's bookings ran fairly uniform, averaging a trifle more than half the capacity, while shipments decreased from about 92 per cent of capacity in June to about 87 in August. As the independents have been able to make earlier deliveries on new business than the Steel corporation, they have been in better position lately to secure orders, while on the other hand they stood more in need of orders. This spell has now lasted about five months, but the dullness is only relative, there being a volume of buying that would have been called large fifteen years ago.

More Locomotives Are Conditioned

The railroads of the United States have realized the program of the American Railway Association by reducing the number of locomotives in need of heavy repair on Sept. 1 to 14.7 per cent of the number of locomotives in line. The program as announced last April provided that the number on Oct. 1 should be reduced to 15 per cent.

This is the smallest number of locomotives in need of heavy repair since Aug. 1, 1920, when the Car Service Division began the compilation of these reports. The total of 9,392 locomotives in need of heavy repairs, on Sept. 1, was a decrease of 1,095 from the number on Aug. 15.

The railroads on Sept. 1 had 53,438 serviceable locomotives. They had, also, 2,714 locomotives in good repair but stored for future use, an increase of 47 since the middle of August. The heavy Fall freight that is anticipated will need engines in the best of conditions.

Personals

HENRY MARX, president of the G. A. Gray Co., Cincinnati, has recently returned from a vacation spent at Lake Placid, N. Y.

HARRY B. LINDSEY, sales engineer with the Norton Co., Worcester, Mass., will join the staff of the C. D. Tuska Co., Hartford, Conn., in the capacity of sales manager about Oct. 1.

HOWARD E. ADT, president of the Geometric Tool Co., New Haven, Conn., returned recently on the S.S. Lapland from a three months tour of Europe.

L. KATTENBURG, director of R. S. Stokvis & Sons, Holland, with a branch office in the Whitehall Building, New York City, arrived from Rotterdam recently and will spend about two weeks in this country.

S. G. EASTMAN, who has been the district manager for the Niles-Bement-Bond Co., New York, in the San Francisco, Calif., district, has been transferred to the Chicago district where he will serve in the same capacity. He succeeds GEORGE F. MILLER who has retired.

OLIVER A. LANCHANTIN will be the general manager of sales of the Eastern Steel Products Co., Spring City, Pa. Mr. Lanchantin was formerly manager of the Pittsburgh office of Oliver Bros., New York.

F. M. WYSS, formerly superintendent of the Dunham Co., Berea, Ohio, has been made foundry superintendent for the Michigan Gray Iron Castings Co., Detroit, Mich.

H. V. FREEMAN, for eight years with the Mack Iron & Wire Works, Sandusky, Ohio, and previous to that connected with the Federal Steel Sash Co., Waukesha, Wis., is president of the H. V. Freeman Co., Lima, Ohio. The company was recently organized to deal in products such as metal lath and steel sash.

J. D. PHILLIPS has been appointed office manager of the new Oakland, Calif., plant of the General Electric Co. Mr. Phillips, who was formerly traveling auditor, will have charge of accounting, statistics, payrolls and all clerical operations at these works.

CLARENCE F. TYRRELL, assistant treasurer of the Reeves Pulley Co., Columbus, Ind., has announced his intention to resign his position about Oct. 1 and seek other business connections in California.

WALTER A. DEEMS, for the past ten years master mechanic of the Baltimore & Ohio's New York terminals and the Staten Island Rapid Transit Co., has resigned as of Sept. 15, and has joined the machine tool department sales organization of Manning, Maxwell & Moore, Inc., with headquarters at 100 East 42d St.

FRED C. SHAEFER, Atlanta, Ga., has been appointed Southern representative for the Parks, Cramer Co., Fitchburg, Mass. His headquarters will be in Atlanta.

JAMES R. DOWNS has been promoted from manager of the Pittsburgh office to manager of the mining department of the Burke Electric Co., Erie, Pa. His headquarters will be maintained in Pittsburgh.

W. J. B. SMITH, for many years secretary of the Beaman & Smith Co., Providence, R. I., has severed his connection with that firm and has established a station at 63 Baker St., Providence, R. I., for the painting and refinishing of automobiles.

WILSON K. RAY of Pittsburgh, Pa., formerly of the staff of the Industrial Machinery Division of the Department of Commerce, has been appointed assistant trade commissioner, assigned to France with headquarters at the American embassy.

A. J. MCELHONE has been appointed advertising director of The Eaton Axle & Spring Co., Cleveland, Ohio.

DOUGLAS ANDREWS has been added to the sales staff of Wills Sainte Claire, Inc., Marysville, Mich., it has been announced. Mr. Andrews will serve as traveling sales representative on general assignment, working directly under orders from Marysville. He is a veteran of automobile sales and has served with the Autocar, Maxwell, Hudson and Liberty organizations.

J. A. QUEENEY, for ten years connected with the Boston Elevated Railway and formerly with the railway department of the General Electric Co., at Schenectady, N. Y., has become personal assistant to THOMAS E. MITTEN, chairman of the directors of the Philadelphia Rapid Transit Co.

WILLIAM S. WALLACE has been appointed manager of the Pittsburgh office of the Burke Electric Co., Erie, Pa.

Obituary

GEORGE MACLAGAN, treasurer of the Garvin Machine Co., New York City, died suddenly Sept. 15 at his home at Mountain Lakes, N. J., following a stroke of apoplexy. Mr. Maclagan was 65 years of age and was well known in the machine tool industry in the East. He had been treasurer of the Garvin Machine Co. since Nov. 25, 1901, and was formerly with McKesson & Robbins, drugs and chemicals. He was a member of the Machinery Club and was active in St. John's Episcopal Church at Passaic, N. J. Mr. Maclagan is survived by three daughters.

LANGDON GIBSON, noted explorer and brother of Charles Dana Gibson, the well-known contemporary artist, died Sept. 5 at Criehaven, Maine, where he was spending the summer. Death was due to cerebral hemorrhage. He was a native of Boston and was 58 years of age. Mr. Gibson up to two years ago, was production manager of the General Electric Co., Schenectady works. He had been associated with that concern for 31 years and was well known throughout the industrial world. He was a man of great activity and vigor, being one of the few members of the Stanton expedition successfully completing the expedition through the Grand Canyon of the Colorado River in 1889. He gained added fame through his accompanying Admiral Peary's second northern expedition to explore and map the northern coast of Greenland.

J. AMORY HASKELL, vice-president of the General Motors Corp. and of E. I. duPont de Nemours & Co. died recently at his home, Red Bank, N. J.

E. CLAYTON GOODWIN, aged 57 years, vice-president of the Fafnir Bearing Co., New Britain, Conn., died recently in that city.

Business Items

The Paramount Machine Co., with a capitalization of $500,000 has been organized in Ashville, N. C. The incorporators are H. P. Eanes, E. E. Reed and E. L. McEniry.

Increased activity after Oct. 1 will be experienced at the Plainfield, N. J., plant of the Bessemer-American Motors Corp. Recently the corporation sold its Philadelphia plant and hereafter both the Besemer motor trucks and the American motor cars will be built at Plainfield.

The Allied Machinery Co. of America has received advice by cable from T. G. Nee, president of the Horne Co., Ltd., Tokio, with which the Allied Machinery Co. of America is closely affiliated, that the entire head office staff in Tokio is safe.

A new department for the handling of equipment and machinery used by contractors has recently been announced by the Fulton Supply Co., of Atlanta, Ga., one of the largest Southern jobbers of machinery and tools. The department is in charge of D. F. Shanahan, well known in the Southern field as an equipment engineer.

J. G. Brill & Co., have delivered a second consignment of 100 new trolley cars to the Philadelphia Rapid Transit Co. Including those previously placed in service the number now in use is 150, of the recent order of 520.

The R. E. Lovekin Corp., industrial advertising, will occupy the sixth floor of the Smith Building, 18th and Market Sts., Philadelphia, after Oct. 1.

The Studebaker Corp., South Bend, Ind., has purchased four Westinghouse new model multiple retort underfeed stokers of the extra long type. They will be equipped with non-clinkering extension sidewall tuyeres and steam operated double dump grates. The stokers will be driven by four Westinghouse Brown-Lipe variable speed transmissions. These transmissions have four speeds forward and one reverse which gives maximum flexibility in operation. Four 150 hp. motors will drive the fans supplying forced draft air. These stokers will be installed under four 1,509-hp. Connelly boilers. An experienced Westinghouse erecting engineer will supervise the installation. This plant will use Indiana coal of about 12,000 B.t.u.

Three more body plant units will be built at the Iron Mountain plant of the Ford Motor Co. at Iron Mountain, Mich., next Spring, it has been announced. This will bring the total to six. When the present Ford construction program is completed, which also includes a chemical plant, about 8,000 men will be on the payroll. The present force is 2,200.

The Wilson Foundry & Machine Co., of Pontiac, Mich., has announced an expansion program costing $1,500,000.

The Carnegie Steel Co. has purchased for its Mingo Junction plant two Westinghouse "SK" motors complete with rails, two drum controllers with grid resistance and two Morse chain and sprockets complete for stoker drive. The motors are totally enclosed.

The Hercules Motor Corp., Canton, Ohio, a new company with capital stock of $300,000 and of which E. A. Langenbach is president and H. H. Timken, chairman of the board of directors, has taken over the plant of the Hercules Motor Co. from E. A. Langenbach who recently purchased it from the receiver.

A deal has been completed whereby Mansfield, Ohio, interests are to take over the Ashtabula Steel Co., Ashtabula, Ohio, formed in 1920 by Ashtabula capital. A new company has been incorporated known as the Ashtabula Sheet Steel Co., the incorporators being W. H. Davey, A. I. Davey, Sam Davey and W. P. Jenkin of Mansfield.

The Canadian Hart Products, Ltd., has been purchased by a number of Hamilton, Ontario, business men who will carry on the abrasive wheel-making establishment as the company has done for the past forty years, the name of the new firm to be the Canadian Hart Wheel Works, Ltd. H. W. Holmes who is president and general manager has had long experience in the United States and Canada. F. J. MacDonnell, who is secretary and sales manager, has also been associated with the Canadian trade for a number of years.

The Canada Car & Foundry Co. has received an order for 3,500 wheels from the Canadian National Railways. This order will be made up in the wheel foundry of the Amherst plant. With this order to hand the foundry will have two months work ahead. The plant at Amherst has finished something like eight thousand wheels for the Canadian National.

Vickery & Vickery, attorneys for the Stockholders' Protective Committee of the Whitney Tractor Co., Port Huron, Mich., have placed on sale the entire machine tool equipment of that plant that is valued slightly in excess of $25,000. The plant will be open for inspection from Sept. 17 to 22 and bids will be received until Sept. 29 by Vickery & Vickery, Cleveland Discount Building, Cleveland, Ohio.

Olds Motor Works Will Expand

More than 1,000 workmen will be added to the payroll of the Olds Motor Works of Lansing, Mich., when present factory alterations are completed, according to John Scott, factory manager, who asserts that one of the most complete shifts ever made at any automobile factory has now been nearly completed, without in the least disturbing the present high production.

Mr. Scott says that the Olds Motor Works has been holding to its production schedule despite the fact that the motor plant has been moved a distance of several hundred yards and the axle plant has also been entirely changed; other departments of the factory have been moved to make room for new enameling ovens and a progressive chain assembly system for the making of engines.

In connection with these expansion plans the Olds Motor Works has added 500 new machines to the engine plant alone and 250 more to the axle plant. Other sections of the factory have been so changed that better paint shop facilities and body making departments will be available.

Activity Resumed in Philadelphia

The general business situation in the Philadelphia district showed improvement this week. There was a general feeling of optimism among manufacturers, who while believing it too early to forecast what the Fall and Winter will bring forth, feel there is hope for an active season.

Machinery and machine tool manufacturers report that orders have increased in the last two or three months, and some announced their business has advanced over the same period of last year. The railroads have been heavy purchasers.

The demand for pneumatic tools has increased, due partly to a large volume of street repair and new work. The demand for general pneumatic appliances is good Industrial establishments have been quite large purchasers of boilers in the last few weeks. Boiler manufacturers specializing in marine work also have done an active business for the United States Navy.

Good Elevator Business

Elevator manufacturers report a continued satisfactory business, with many calls for industrial elevators as well as passenger equipment for new office buildings.

Scarcity of labor has retarded the construction work on the new locomotive shops of the Pennsylvania R.R. at the Juniata yards. It was hoped to have these shops in operation next Summer, but owing to the inability to obtain competent craftsmen its opening will go over probably until a later date.

Manufacturers of woodworking machinery report a fair demand for their products. Furniture factories have been purchasers. Demand for skilled workers in the machinery line continues good. Display advertisements have been inserted in the daily newspapers for machinists qualified on radial drill presses, boring mills, milling machines, turret lathes, drill presses, etc.

Railroad Revenues During July

Net operating income of the class 1 steam railroads, comprising about 95 per cent of the total rail mileage in the United States, amounted to $84,614,945 for July, according to figures made public by the Interstate Commerce Commission. For the same month last year the net income was $69,320,528.

Total operating revenues for the month, the commission reported, were $535,813,616 against $443,840,164 for July, 1922. The increase in revenues has a counterpart in expenditures, the carriers paying $414,519,968 in operating costs in July, while in the same month a year ago, operating expenses were $341,081,191.

Detroit Business Is Steady

A noticeable improvement in the machine tool market in Detroit has occurred during the past two weeks, due, executives agree, to the resumption of peak production by the various industrial plants in this region.

Recent announcements of changes in models of a number of automobiles have had their influence on the industry in a small way, but an even greater one is looked for as the factories get into the regular Fall swing of production.

According to machine tool manufacturers, there has been less of a slump in the market during the ordinarily slack months of July and August this year than in several years past. They attribute this steadiness in the market to a prevailing effort of industries to substitute high-production labor-saving tools and machinery for that in service for the last several years.

Automotive Activities

Buick, Cadillac, Oakland, Ford and other automobile concerns have started active production of the 1924 models, with a result that a wide-spread change is being made in machinery and tools.

The spread of the 4-wheel brake idea as evidenced by the speed with which the various makes of automobiles are adopting this safety device is likely to prove a boom to the machine tool plants.

Employment after dropping for the two weeks from Aug. 21 to Sept. 4 has once again started to climb, figures of the Employers' Association showing 215,887 employed among its members during the week ending Sept. 11 as against 210,506 for the week before. This is an increase of 5,381.

Building construction, bank clearances, postal receipts, and increased capitalization show substantial increases.

Railroads are hastening their improvements before cold weather comes. Additions to the facilities on a number of lines are being made.

Canada As a Customer of America

Figures and argument contained in an enlightening memorandum upon Canada's trade and industrial relations within the British Empire, which has been prepared by the Government for use at the Imperial Economic Conference, show that the United States is playing a forceful part in the development and expansion of Canada's commerce in addition to being, in the totality, Canada's largest customer.

"So far as Canada's development in the past has been stimulated by external trade, the stimulus has been due mainly to Empire buying, but also largely to United States buying," says the memorandum. "The effect of Empire buying has been chiefly reflected in Canada's huge development of farm lands, while the impetus to the development of Canada's forests, fisheries, and minerals has been due much more to United States buying than any other factor. Thus Empire markets and United States markets are both immensely importants, and, furthermore, are complementary from the standpoint of meeting Canada's needs. Each is essential to Canadian development."

Unemployment Still Great Britain's Most Serious Problem

By Our London Correspondent

THE holiday period having passed, Great Britain resumed work without much change in general conditions. On all sides the approach of Winter is regarded with apprehension, and no immediate solution of the continental problems is anticipated. Rather, in fact, do troubles become accentuated. The dependence to a marked extent of Great Britain on foreign trade needs no emphasis. It is the growth of unemployment that causes worry.

Cost of living figures also show a definite advance. During the past few weeks, owing to seasonal activities, the numbers of the unemployed should have declined, but in fact they have risen, and not merely in one or two industries. The cotton industry of Lancashire, agriculture, and the engineering industry are acknowledged to be in a most unsatisfactory condition, and the depreciation of capital in Lancashire reached, according to one estimate, 100 million pounds during the past year or so. A special committee of the government has had under consideration the unemployment problem with a view, it is understood, to helping in the finance of schemes of a revenue-producing character, but under private control.

Unemployment Grants

Some time ago grants were made to cover such work as road-making, which could not be regarded as revenue-producing. The work being entirely insufficient to relieve the unemployment, grants have been made in connection with statutory schemes intended to be of a revenue-producing character, and calling for work in districts where unemployment is particularly bad. According to report, by the latest schemes under consideration financial help may be extended to the cotton industry, engineering and shipbuilding. It is stated that grants amounting to half the interest on loans raised for a period of ten years can be obtained for—"works in respect of which a substantial part of the expenditure will take the form of orders for materials which will give employment in an industry which is seriously affected, though not necessarily in the area in which the work is to be carried out." The arrangement, as suggested above, is to apply, under conditions, to private companies whose object is the pursuit of profits. A considerable number of schemes are under consideration.

Future Work Prospects

In addition of course we have many extensions being made to the application of electric traction to railways, etc., and the reserve funds the railway companies have accumulated, amounting, according to assertions, to 130 million pounds, are expected to provide work for many of the workless. The job is to persuade the directors of the railways to that end. To particularize, this expenditure is expected to help the machine tool industry which, despite some rose-colored reports, is beyond question in an entirely unsatisfactory condition. Relief is of course sought, and in some cases obtained, in the manufacture of other engineering articles. Even the small tool side, which is at least relatively better off, can provide the spectacle of shops practically closed.

Those people who imagine that the railway companies ought to provide relief to the machine tool maker have so far been disappointed, and a number of them appear to have been under a misapprehension. An idea of the conditions under which new tools will be purchased on behalf of the railway companies has already been given in these columns. Now for the purpose of renewal, and it may be extension, the chief mechanical engineer of each railway has allotted to him by the directors a definite sum of money per annum and, while he can certainly spend this, he cannot go beyond it without the special consent of those who have control of finance. And those officials are apt to be at a considerable distance from the mechanical engineer. In fact the machine tool man often has no opportunity to impress the mechanical engineer himself as he comes in contact with subordinate officials only who certainly have no power to order, whatever they may be able to do by way of recommendation. An estimate of the total buying capacity of the railway shops does not lead to anticipation of much relief to the machine tool maker. Private locomotive building shops are certainly not busy, and present conditions do not suggest the possibility of extension.

An engineering exhibition held at Olympia, London, W., for three weeks ending on Sept. 22, contained very little in the way of machine tools. This is natural, for, quite apart from the unsatisfactory trade prospects, the Machine Tool Trades Association, as usual, placed an embargo on the show, so that members, willing or otherwise, were unable to take part.

Preparation for Japan's Buying

That Japan will eventually be in the market for many new machine tools and machinery, most of it of the latest improved type and also for much electrical goods is the general opinion expressed at the New York offices of Japanese exporters and importers. Just when the stricken country will be ready to receive these tools is very uncertain and any attempt to place a definite date was considered by these firms as pure guess-work. However, it is safe to assume, according to these merchants, that as soon as the people have been taken care of, the buildings fairly well along toward completion and the necessity for replacement been made apparent, the orders will come rapidly.

Every effort is being made by the New York offices to get as soon as possible a list of the probable requirements so that a great rush of work will not be thrown on the American manufacturers at one time, but may be distributed over a period of several months. As yet, no specific news has been received from Japan, but advices are expected within the week.

At the office of Mitsubishi & Co. it was stated that iron and steel was being purchased and that they, like the other companies were anxiously awaiting some word from Japan. Mitsui & Co., one of the largest firms in the world, stated that in all probability ordering of some machinery would start within a month and that within three months it could be pretty well ascertained what would be needed. At the New York offices of the Andrew & George Co. it was stated that wood working machinery, road building machinery, cement mixers and structural steel would be the first orders placed with electrical goods, wiring, brass and copper and machine tools following, but that it was much too early to even think of anything of a definite nature. At other offices the statements were along the same lines.

Increased Trade in the South

There has been a considerable improvement in machinery and machine tool sales among the Atlanta, Ga., dealers and jobbers since the first of September, and though it is impossible to give definite figures representing the increase, most of the larger distributors seem agreed that sales the first ten days of September were from 12 to 16 per cent better than the first ten days of August, and that the present outlook indicates the month as a whole will be approximately 15 per cent above the sales volume during August. Two of the larger distributors, in fact, state that their volume the first ten days of the month was approximately one-half the entire August total, and that sales for the period are the best they have been since April.

The principal demand has been for lathes and for various machine tools used by the woodworking industries, the latter being unusually active. This is due to the fact that within the past two or three months there has been a marked activity in the increasing of production facilities by such industries, and they are just now entering the market for such new equipment as they need. Also, it is noted that some prospective purchasers who had been holding off their buying in anticipation of lower prices have concluded that they are not coming in the very near future, and have therefore entered the market.

Inquiries received the past two or three weeks have shown no increase to speak of in number, but a larger proportion of them have been developing business than was the case a month ago.

There has been a material improvement also since the first of the month in foundry and machine shop operations throughout the whole Southeast, and an increase in inquiries from this source has been noted as a result, though most of the buying is being done by the smaller shops, so far as this market is concerned.

The trade in Atlanta is feeling considerably better over the outlook than in a number of months, and nearly all larger dealers agree that the last four months of this year should be almost on a par with the excellent volume of business they were enjoying the first four months of the year.

Better Business Reported from Cincinnati Markets

The machine tool industry in Cincinnati is running about sixty per cent of capacity with orders and inquiries coming in in fair quantities. Many manufacturers report that they are suffering from a temporary dullness caused by the reduction in building operations and by the inactivity of the automobile manufacturers in purchasing equipment. It is expected, however, that the automotive industry will be in the local market shortly and will thereby stimulate production. Even though the present operations of Cincinnati manufacturers is on a somewhat curtailed basis, many firms report that their volume of business is approximately twenty per cent ahead of 1922 which is definite cause for encouragement.

Business on conveying machinery is good with the automotive trade making purchases in sizeable quantities and machine shops also buying goodly amounts. Export trade has been quite a factor with Japan and the Argentine taking several large shipments recently. The sales of conveying machinery during August were considerably ahead of July and far in excess of August, 1922. The railroads, steel mills, and foundries have not been in the market to any extent for conveying machinery lately. The production of planers was about the same during the past month as during July and the early part of August. Inquiries are holding up well, but actual buying is not quite up to the standard. It is anticipated that Mexico will come into the market for planers in the near future. While steel plants and machine shops are not doing much buying of planers, business is far ahead of last year at this time of the year.

There is a temporary lull in the purchase of electrical tools by automotive manufacturers. In fact the electrical tool business is Cincinnati is rather quiet at present, although inquiries remain fair. Orders now being placed are small in volume, indicating conservatism on the part of buyers. Several concerns, however, say that August was ten per cent ahead of August, 1922, and twenty per cent ahead of July of this year.

Slow sales of both radial and upright drills are reported by the Cincinnati concerns manufacturing them. Inquiries have remained fair and prospects for export business to Mexico are bright. Lathes have also slumped to some extent in sales, but it is thought that the railroads are about ready to place some excellent orders for lathes with local manufacturers.

The labor situation in Cincinnati has eased a bit and local firms are better able to secure both skilled and unskilled workmen than they were throughout the past three or four months. Business in the metal trades shows more activity. Numerous small orders are taken as an indication of conservative buying, but in the aggregate they contribute to a good volume. There is an upward price tendency in some steel products. The metal trades are fairly busy in Cincinnati with good prospects for a satisfactory Fall business, according to manufacturers.

Indiana Expecting Busy Fall

Regardless of the fact that actual orders do not show any vast expansion in business in Indiana, the large number of inquiries from all sources are very encouraging both to machinery and tool men here. The story about the "ill wind" holds true yet. Machinery men say they already are getting inquiries, especially from those factories allied with the steel industry for machinery and tools to take care of proposed expansion and increased production due to orders from Japan, the orders following closely in the wake of the earthquake there.

Trade Stimulated

In some lines demand is contracting somewhat, but in others not only are orders up to expectations but running a little ahead. Most of the automobile plants here are operating. None of them is operating anything resembling capacity, but there have been increases in production schedules during the last two weeks and executives say the end of orders is not in sight. The tooling demands in automotive plants seem to be exceptionally heavy. It is pointed out by some that many plants had postponed buying for months and with the exception of emergency orders, no purchases were made, so considerable volume of this business may be expected..

The last two weeks have seen a decrease in demand for machinery for woodworking factories, with the exception of furniture factories. Sash and door and interior finish mills here have about caught up with their orders. Furniture factories report large volumes of orders, however, and predict a steady Winter's production.

There is an increase noted in the volume of coal mining machinery. Mines are beginning to work more steadily as cold weather comes and more machinery of special design is needed. Most mines had been permitted to run down during the slump in the coal market.

Business Steady in New York

Railroad buying and further increases in inquiries are the high spots of the New York market this week. Dealers report satisfaction with the present condition and the future is anticipated with the best of prospects. The Pennsylvania R.R. continued its buying into the week and this was augmented with buying from the Seaboard Air Line and some few orders were also received from the New York Central, New York, New Haven and Hartford and other roads in the East and South. Inquiries are reported from locomotive builders and ship building companies and it is expected that sales will be the result in most cases.

Some buying was noted in the automotive field this week and orders were also received from accessory makers. The prospects in the automobile industry are most encouraging this Fall and dealers are laying their plans for renewed activity within a month.

General industry was not a good purchaser during the week with the exception of single sales here and there.

Exporting Improved

The export business shows some improvement over the past few months and exporters are looking forward to greater improvement with the settlement of the Ruhr trouble and with the gradual return of economic normalcy in Europe generally.

Used machinery dealers can only characterize their business as "fair" with difficulty found in securing the right type of machines in some cases and in the dearth of buyers for popular types of tools in other instances.

Japan Inquiries in Chicago

Machine tool sales and inquiries continue at a low point in the Chicago district, but dealers retain their belief that there will soon be an upward swing. The Illinois Central R.R. and Santa Fe R.R. purchased a few tools recently. No new railroad lists have been issued lately and it appears that the railways have secured most of their machine tool requirements. Second-hand machinery seems to sell more readily than new. An order of 20,000 boxes of tin plate for Japan which has been in the market for several days was closed within the last few days. India is in the market for a substantial tonnage of sheets.

Heavy inquiries for steel are coming into the Chicago market for shipment to Japan. Included are requests for bars, shapes and plates in large tonnages. It was generally believed that the heavier material would not be wanted until later, but according to Chicago mills quite a little is in the present inquiry. Several fairly good inquiries for machine tools have been received.

Railroads Buying Cars

One large railroad system is getting tentative bids on 6,000 cars and another on 4,000. Railroads continue to buy rails in large tonnages. The Louisville & Nashville R.R. has increased its order to 50,000 tons. The Canadian National has ordered 20,000 tons.

The activity of Illinois industries and the good wages paid is causing a migration of workers from other industrial centers. So large has been the influx that the anomalous situation is presented of the state's industries at the peak of profitable employment with some increase in unemployment. The August summary of the Illinois Department of Labor shows that industries increased their working forces 1.3 per cent during the month, bringing employment at 15.8 per cent above a year ago. Chicago had 129 seekers for every 100 jobs. Machinists and other workers in the metal trades are plentiful, but just how long this condition will last is problematical. Manufacturers still have fresh in their memories the shortage of men last Spring.

The Industrial Review

How the makers of machinery and machine tools are finding business conditions and how the future looks—Steady Improvement anticipated in all parts of the country

THE prospects for the Fall season in the machine tool industry are considered good and from all parts of the country come reports to the effect that many more inquiries are being received than is usual at this time of the year. While inquiries do not necessarily mean future business they offer the best barometer that the dealers and makers may go by. If a fair portion of the inquiries that have come in result in business, dealers say that a year described as "better than usual" will be the result.

Business in the industry during the first four months of the year was good and this was followed by a period of quietude caused by the Summer seasonal dullness and also by a note of caution that was sounded at about this time and was obeyed by buyers in every line of business. Recovery from both the Summer and the caution has been effected now and reports are coming in of better conditions in nearly all lines.

Not all machine tool builders are busy, however. One will find here and there direct set-backs to the note of optimism. Factories working overtime and factories working in three eight-hour shifts are to be found in the same localities as factories that are virtually shut down for lack of orders. It is no local trouble as this condition is true in every part of the United States. New England is having its troubles as well as Milwaukee, Cincinnati, Chicago and other centers of the industry. But the consensus of opinion is that machine tool builders generally are in a better condition this year than they were last year.

Electrical Business

Reports from the electrical field prove very interesting. Power equipment is being purchased at a rate that has long since passed the peak of the war production. Bigger projects than were ever before attempted are in the course of construction and orders are being placed almost daily in every part of the country. This indicates that companies furnishing power are convinced that business is to move forward during the coming months with added strength and are willing to back their belief by investing dollars in adequate equipment to produce that power.

Electric control equipment factories are all working at near capacity at the present time which is unusual for this season. The production of motors is good, but the sales have been slightly under expectations, it is said. This statement is supplemented, however, with the explanation that motor equipment is the last installation in a new building as a rule and the building program this year has been delayed in completion due to labor troubles. Motor manufacturers are confident of better business after Sept. 1, it is asserted.

The General Electric Co. has announced that within a short time it will have more men on its payroll than it had at any time during the war which was the record enrollment in its history.

Street Railways Buying

During the first six months of the year more street railway cars were purchased than during the entire twelve months of 1922. In fact, the first half of the year has furnished a record in the history of street car railroading. New equipment in car houses and repair shops has been purchased steadily since the first of the year. As an indication of what is doing in this line, the Philadelphia Rapid Transit Co. has recently announced that it will build a new car house and repair shop to cost $1,300,000, and similar reports are being received from every part of the country.

The traction company at Fort Wayne, Ind., will spend over a million dollars on improvements and the Boston Elevated Co. is also reported as prepared to spend a large amount for new equipment.

Watch Bus Transportation

Bus transportation is another line of travel that is seriously entering into the field of activities and machine tool makers would do well to keep an eye on this branch and to cultivate the growing trade that is being developed. There are now approximately fifty thousand passenger buses in the United States. Some of these are individually owned, while others are operated in fleets of from five to a hundred. Investigation shows that where more than five are owned by one company or individual not only light repairs but heavy repairs requiring machine tools are done by the owners themselves in their own machine shops. And in many cases it has been found that individuals have "pooled" their interests and established their own repair shop. At the present time such a project is on foot in New Jersey where sixty buses will be repaired in one shop.

Also to be noted is the fact that in every part of the United States factories for the manufacture of buses are established.

Building Records

Here are some figures of importance to the machine tool industry, although not directly affecting it. Industrial building during the month of April, which was the high point this year, was twelve million dollars greater than the average for the past three years. That was last April. Now the buildings are ready for occupancy and to receive new equipment and machines. While this was exceptional, it does not mean that there has been a slump since April in industrial building. The chart curve shows that the record has stayed above the three-year average since that time and is today higher than it has been for any August since the war. Also it is well to remember that this is in the face of higher costs of building.

The total construction in the United States last year was four and a half billion dollars. During the first half of 1923, building totaled three billion dollars. Figures further show that renewed activity in building has been recorded this September following the usual decline of permits in Summer.

Mining Activities

Increases in the mining industry are noted in several different sections of the country, notably in the Northern Ontario district. In the Porcupine region the Hollister Gold Mines, Ltd., is increasing its capacity so that it will have the biggest gold mine in the world.

In the Sudbury nickel country the International Nickel Co. is installing new smelter equipment and other companies are reporting expansion in the same region.

Iron mining in Minnesota is in excellent shape and reports from the iron ranges state that the miners expect to ship between 50 and 55 million tons of iron ore to the steel districts during the shipping season on the Great Lakes.

Coal Situation

Now that the strike in the anthracite coal regions has been settled and a season of work is ahead, it can safely be said that the coal mine operators are in a better position to buy machinery than ever before. The bituminous mines are generally in excellent shape and recent reports from the United States Geological Survey show that record weeks in production have resulted and that the prospects for the coming Winter are most encouraging. All records were broken recently in both fields when there were mined 2,165,000 tons of anthracite and 11,346,000 tons of bituminous.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb....	$0.0337	$0.0337	$0.0285
Cold finished shafting.....	per lb....	0.0433	0.0428	0.0373
Brass rods.....	per lb....	0.17	0.1741	0.1666
Solder (½ and ½)	per lb....	0.276	0.276	0.2283
Cotton waste...	per lb....	0.1225	0.1231	0.1458
Washers, cast iron (½ in.)...	per 100 lb.	4.66	4.66	4.00
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100...	3.08	3.08	2.96
Lard cutting oil	per gal...	0.575	0.575	0.575
Machine oil....	per gal...	0.349	0.349	0.36
Belting, leather, medium.....	off list....	37%	37%	44½%
Machine bolts up to 1x30 in.	off list....	49½%	44½%	53½%

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
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EARLY last week the markets reflected the relief generally felt at the disappearance of the political clouds which had hung over Europe for so long. But on Wednesday a mild reaction set in, and at the week end the price level of speculative stocks and commodities was slightly lower than at the week's commencement.

This record is in accordance with precedent, for many professional speculators make it a rule to sell on good news, and however sound and prosperous conditions may be it is never to be expected that prices will move continuously in one direction.

There is, however, no change in fundamental conditions. Emboldened perhaps by his success in bullying defenseless Greece, the Italian Premier, Mussolini, is shaking his fist at Jugo-Slavia, and the Captain-General of the Spanish army at Barcelona is threatening to lead the troops under his command in an attack upon King Alphonso's government unless the present Cabinet is removed.

But neither the American nor the European markets have been much affected by the political bluster that seems to have become a habit with the Latin peoples of southern Europe. It may perhaps explain why the scenes of so many comic operas are laid in Italy or Spain, but it is not regarded as otherwise important, and day by day more pessimists are being converted to optimism.

The probability of a general advance in prices is in fact becoming so evident to so many people that some bankers are already talking about inflation and how to prevent it, but after the experience of 1921 and the criticism to which the Federal Reserve Board was then subjected it is unlikely that the mistakes of that year will be repeated. In any event we are a long way off from the time when the repression of commercial activity by credit restriction will be necessary, for as Shepard Morgan, Assistant Federal Reserve Agent at New York, says:

"The increase in bank loans and investments throughout the country is estimated at $3,500,000,000, and the increase in deposits over 1921, both demand and time, is estimated at somewhat more than $4,000,000,000.

"But the immense increase in bank loans and deposits involved no increase at all in the use of Federal Reserve Bank credit.

"This was true even though the total bank deposits of the country, reflecting a very large volume of loans and investments, reached a level nearly two billions higher than at the maximum of credit expansion in 1920, when the banks were deeply indebted to the Federal Reserve banks.

"At that time, when the amount of gold in the country was about a billion less than at present, the banks borrowed heavily from the reserve banks in order to provide themselves with currency and the necessary reserves against their deposits. The contrast between the present and the 1920 period of expansion is clearly marked—now a very moderate employment of Federal Reserve credit—then employment almost to the legal limit."

The weekly statement of the Federal Reserve System bears out the foregoing, for it shows an increase of $8,651,000 in the gold held, an increase of $30,000,000 in member banks' deposits and a reserve ratio of 75.9 as against 76.4 per cent last week.

"But neither the American nor the European markets have been much affected by the political bluster that seems to have become a habit with the Latin peoples of southern Europe. It may perhaps explain why the scenes of so many comic operas are laid in Italy or Spain, but it is not regarded as otherwise important and day by day more pessimists are being converted into optimists."

In detail the stock market has been quiet, with some weakness in the oil shares and an antithetical strength in the stocks of most of the railway companies. Apparently the leaders of the oil industry are somewhat depressed at the over-production of petroleum and the decline in the value of gasoline, while the public are commencing to realize that the large railway traffic must sooner or later be reflected in the prices of railway shares.

In the bond market there has been some decline in the prices of municipal bonds and other tax exempt securities, largely because of Secretary Mellon's persistent advocacy of another reduction in income supertaxes which will of course lessen the desirability of tax exempt bonds as an investment for the very rich.

In the commodity markets there are but few changes to report. After advancing to well above 28 cents cotton futures have reacted slightly as was to have been expected, and wheat is also a shade easier as the magnitude of the Canadian crop is being brought into relief. Sugar has been firmer upon reduced crop estimates and coffee has shown no little strength, reflecting the inflationary prosperity reported from Brazil as the gold value declines.

As the news from Japan indicates that the silk producing districts were not much injured by the earthquake the market for raw silk has become a little less hysterical and trading has been resumed at prices which are reported to be very much above those current before the Japanese catastrophe. The steel industry has been somewhat disappointed at the non-receipt of expected orders from Japan, but reasonable activity prevails and there is a good demand for railroad as well as structural steel.

A decided revival in building is reported, especially in New York, where the plans filed during the month of August show an increase of 56 per cent over last year in the expenditures contemplated. For the whole country the increase, as shown by the plans filed in 150 cities, is 13 per cent over last year. Copper continues to be the only laggard among the metals. It is still below 14 cents, chiefly as a result of the small export demand.

As Germany shows a tendency to parley with France for a settlement most of the foreign currencies have improved in value, but although marks are nominally quoted at the fantastic price of one dollar per hundred million they are practically worthless and sterling and dollars are gradually displacing them as currency in Germany.

In the dry goods trade a fair distribution is reported, but retail sales continue large and there is no accumulation of stocks anywhere. The indications are therefore in favor of a sustained and reasonable activity.

The foreign trade figures for August show merchandise exports valued at $313,000,000 and imports valued at $275,000,000. The excess of exports for the month is $38,000,000 as compared with $20,000,000 last year. But for the 8 months ending August 31 there has been an excess of imports over exports amounting to $88,000,000. Net imports of gold for August were $30,600,000 as compared with $27,000,000 in July.

Surplus Freight Cars in Good Condition

Despite the fact that loading of revenue freight for the week of Sept. 1 amounted to 1,092,567 cars, the greatest number for any one week in history, the railroads of the United States had on that date 66,559 surplus freight cars in good repair and immediately available for service if required, according to reports filed by the carriers with the Car Service Division of the American Railway Association. Reports also showed that on that date the reported car shortage amounted only to 9,441 cars for the country as a whole.

The number of surplus freight cars was a decrease of 8,358 since Aug. 22, while there was an increase during the same period of 1,751 in the reported car shortage.

Car Loading Breaks Another Record

A new record in car loadings was again reported by the American Railway Association for the week ended Sept. 1, with a total of 1,092,567 cars. This is 22,635 more cars than the previous record made in the week ended Aug. 25, and is approximately 74 000 cars more than the high record of 1920, established in the week ended Oct. 14.

This figure exceeds by 10,000 cars the peak freight movement anticipated by the association earlier in the year, and is 82,000 more cars than was estimated for the last week in August. The record also was an increase of 168,761 cars over the same week of last year, and 261,279 more than for the same week two years ago.

A new high record also was established in the number of cars loaded with merchandise and miscellaneous freight, considered by many as a criterion of general business conditions. The total in this classification amounted to 622,-710 cars. This was an increase of 16,605 cars over the preceding week.

This is the twelfth week this year that the million car loading mark has been passed, and in eight of the twelve weeks the total exceeded the record established during the week of Oct. 14, 1920.

Steel Buildings Damaged Least by Quake

American steel and concrete buildings in Tokio and Yokohama withstood the earthquake shock and are in good condition, according to a cable from Assistant Trade Commissioner G. C. Howard at Kobe. Officials of the Department of Commerce expresse! gratification over the first practical demonstration of the effectiveness of the new so-called earthquake-proof factories and office buildings which have been constructed within the past three years. There are about six of these buildings in Tokio. The fact that this construction has proved earthquake proof is likely to influence favorably the adoption of this type of construction in the future.

The Assistant Trade Commissioner also cables that export as well as import shipments probably must be made via Kobe for some time. Kobe, on the Inland Sea, is 200 miles outside the devastated area. It is the chief import center of Japan and is surpassed only by Yokohama in export trade.

Railroads Purchasing Steel Rails

Railroads are displaying more interest in the purchase of steel rails and other finished products, according to reports in the steel trade. The Canadian National Railways has just let a contract to the Illinois Steel Co., a subsidiary of the United States Steel Corporation, calling for delivery in 1924 of 23,000 tons of rails. The rails will be used on the Grand Trunk lines in this country. The order was the largest received during the last week, but in the aggregate all companies have received contracts calling for delivery of between 75,000 and 100,000 tons of rails.

Buying on the part of the railroads is still the outstanding feature in the market and this is expected to continue for the remainder of the year, according to steel trade officials. They expect that the carriers will soon lay plans for locomotive and other equipment requirements for the new year and anticipate contracts in connection with such needs.

Erie R.R. Orders Many New Cars

Forty-four new suburban cars costing $1,000,000, which have just been ordered by the Erie R.R., will be placed in the commuting service inbound to and outbound from Jersey City before the end of the year as a part of the program of the Erie to use heavier locomotives and longer trains. It was announced that twenty-five Pacific type locomotives had just been allocated to this service. In addition twelve "K" type engines have been delivered and will be used in the service.

The new cars will accommodate eighty-six passengers each, giving an additional capacity of 3,784 persons, to handle the rapidly increasing commutation business to and from New York City. The cars will be of the most advanced type of construction, it was stated recently, having an average weight of but 1,000 pounds to each passenger space.

The heavier locomotives are being obtained as the result of the new equipment being installed on the main line by the Erie. These locomotives have resulted in an increase in the length of the run in some cases to 180 to 200 miles. This in turn has made it possible for the Erie to turn back into the commuter service some of the Pacific type locomotives.

Navy Department Will Sell Battleships

The navy department announces that 21 battleships and battle cruisers will be eliminated from the United States Navy in accordance with the terms of the treaty for the limitation of armament. The battleships will be sold for salvage under sealed proposals each ship to be sold as a whole and to be scrapped by the purchaser within eighteen months from the date of ratification of the treaty, which became effective Aug. 17. The vessels are to be sold in four lots, the sales to be held and bids opened on Oct. 25, Nov. 1, Nov. 8 and Nov. 30. All bids should be addressed to Officer-in-Charge, Sale of Naval Vessels, Room 1,008 Navy Department, Washington, D. C.

More Rails for the Pennsylvania

The Pennsylvania R.R. has placed orders for 20,000 tons of rail to be delivered during the remaining months of 1923, it was announced. The order has been divided equally between the Bethlehem Steel Corp. and the Carnegie Steel Co.

This order with the 118,171 tons that the Pennsylvania has already ordered for delivery in 1923 will make a total of 138,171 tons of rails that have been purchased by the system.

Reports in the railroad district, which were not confirmed by the Pennsylvania, were to the effect that the Pennsylvania would be back in the market shortly to place orders for between 150,000 and 200,000 tons of rail which it is planning to use in its improvement work in 1924.

Other additions to the tonnage have been made by various roads recently. Among them is the Louisville & Nashville, which, according to reports, has increased its order with the Tennessee Coal, Iron & Railroad Co. by 20,000 tons, making the total placed 50,000 tons.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Automotive accessories. Weltevreden, Java. Purchase. Reference No. 7678.

Ice-manufacturing plant, 40-ton, driven by a semi-Diesel engine. Colombo, Ceylon. Purchase. Reference No. 7662.

Bids are invited on the following railway equipment which the railways department of the State of Victoria, Australia, desires to purchase:

Two ¾-in., seven 1-in. and two 3-in. die heads, including all necessary equipment. Tenders to close at 11 a.m. Oct. 17.

Two 1-ton capacity electric hoists complete with trolley wires and current collectors. Tenders close at 11 a.m. Oct. 24.

"Four-sided" type, high-speed, woodmo'ding machine, capable of molding both hardwood and softwood up to 9x4 in. on four sides in one operation at high rates of feed. The machine must be complete with all accessories. Tenders close at 11 a.m. Oct. 31.

Specifications covering this material may be consulted by interested manufacturers at the district offices in New York, Chicago and Philadelphia of the Department of Commerce.

Forthcoming Meetings

New Haven Branch of the American Society of Mechanical Engineers. Third annual machine tool exhibit Sept. 18, 19, 20 and 21. Mason Laboratory, New Haven, Conn. A. C. Jewett, chairman.

Association of Iron and Steel Electrical Engineers. Iron and steel exposition, Buffalo, Sept. 24 to 28. John F. Kelly, secretary, Association of Iron & Steel Electrical Engineers, 708 Empire Building, Pittsburgh, Pa.

National Safety Council. Twelfth annual congress at Buffalo, N. Y., Oct. 1 to 5. All meetings will be held at the Statler Hotel. Headquarters, 168 No. Michigan Ave., Chicago, Ill.

American Society for Steel Treating. Annual convention at Pittsburgh in connection with the International Steel Exposition, Oct. 8, 9, 10, 11 and 12. W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio, national secretary.

Society of Automotive Engineers. Production meeting at Cleveland, Ohio, Oct. 25 and 26. Headquarters, 29 West 39th St., New York City.

American Gear Manufacturers Association. Fall meeting, Mountain House, Lake Mohonk, N. Y. Oct. 25, 26 and 27. T. W. Owen, secretary, 2,443 Prospect Ave., Cleveland, Ohio.

American Management Association. October 29, 30, and 31, Hotel Astor, New York City.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8. Headquarters, Grand Central Palace, New York City.

New and Enlarged Shops

Machine Tools Wanted

Ala., Gadsden—Eureka Fdry. Co.—drill press and lathe.

Ill., Elgin—H. Burge, 280 Grove Ave.—air compressor, gasoline tanks, pumps, drill press and one small lathe for garage.

Ind., Lafayette—J. F. Horner Automobile Co., 19th and Columbia Sts.—drill press and lathe for proposed $40,000 garage.

Minn., Minneapolis—Minnehaha Welding & Machine Co., 3750 Minnehaha Ave., C. G. Scharf, Purch. Agt.—one cylinder boring machine.

Mo., Joplin—E. N. Cunningham, 606 North Moffat St.—emery stamp and one lathe, 7 x 14 in. swing.

Mo., Joplin—Hamm Mchy. Co., 209 Virginia St.—tool post grinder, crank shaft tool grinder, expansion reamer, milling attachment for 16 in. lathe, also piston grinder.

Mo., Joplin—McNeil Mchy. Co., 3rd and Joplin Sts.—Mitts & Merrill No. 4 keyseater.

Mo., St. Louis—C. Bleisch, 3325A California Ave.—lathes, drills, etc., for garage at 3348 California Ave.

Mo., Webb City—Bartlett's Garage, 222 North Madason St., N. R. Bartlett, Purch. Agt.—drill press (used).

Mo., Webb City—Burwick's Garage, 201-3 South Main St., A. H. Burwick, Purch. Agt.—regrinding machine and 18 in. American lathe.

Mo., Webb City—West Side Machine Co., 224 North Madason St., W. H. Tholborn, Purch. Agt.—key seater and turret lathe.

N. J., Jersey City—Bertolette Machine Tool Co., 357 West Side Ave.—one Blanchard, also one Pratt & Whitney vertical grinder.

N. Y., Alabama—G. Cook—equipment for proposed machine shop at Fullers Pond, Batavia.

N. Y., Buffalo—G. Bruiknern, 1471 Hertel Ave.—equipment for garage and repair shop.

N. Y., Buffalo—M. Buehler, 126 Leroy Ave.—equipment for garage and repair shop at 19 Brewster St.

N. Y., Buffalo—F. H. Chilson, 302 Auburn Ave.—equipment for garage and repair shop on Auburn and Grant Sts.

N. Y., Buffalo—J. K. Fisher, 1095 Sycamore St.—sheet metal machinery.

N. Y., Buffalo—C. J. Joslyn, 161 Huntington Ave.—equipment for garage and repair shop on Huntington and Parker Aves.

N. Y., Buffalo—J. A. Markett, 157 West Tupper St.—equipment for garage and repair shop at 3417 Bailey Ave.

N. Y., Buffalo—L. Patrick, 555 Abbott Rd.—equipment for garage and repair shop at 1056 Abbott Rd.

N. Y., Buffalo—C. S. Rowley, 20 Thatcher Ave.—equipment for garage and repair shop, also one 1,000 gal. gasoline tank and pump.

N. Y., Salamanca—Rodman Auto Supply Co., Main St., R. Lawson, owner—equipment for proposed service station.

O., Columbus—E. P. Cott Mfg. Co., 286½ North Front St. (manufacturer of counter brackets)—grinder and drill press.

O., Columbus—Joseph's Garage, Oak St. and Champion Ave., F. F. Pierce and H. Shipley, Purch. Agts. — machinery and equipment for machine shop and service station.

O., Fostoria—W. J. Hakes—equipment for $50,000 garage and service station.

O., Sandusky—Union Chain & Mfg. Co.—punch presses, 5 to 6 in. stroke.

O., Toledo — Toledo Metals Mfg. Co., Cleveland and Michigan Sts., J. M. Sawhill, Treas.—machinery and equipment for proposed metal manufacturing plant, to replace that which was recently destroyed by fire.

Okla., Picher—C. R. Curzan, 310 Netta St.—machinist's vise, electric drill, emery wheel, stand and lathe for garage.

Okla., Picher—E. T. Harris, Netta St.—blacksmith's tire shrinker and drill press.

Okla., Picher—Netta St. Garage, J. McUle, Purch. Agt.—lathe (used).

Okla., Picher—Standard Mchy. & Supply Co., West A St.—lathe, drill press, emery stand and wheel (used preferred).

Okla., Picher—Wise Welding Wks., Connell Ave., L. R. Wise, Purch. Agt.—grinding machinery, machinist's lathe, emery wheel and stand (used).

Pa., Phila.—Miller Lock Co., 4530 Tacony St.—toggle jointed 200 to 250 ton capacity embossing press, stroke of not less than 2 in. (used).

Pa., Wilkes-Barre—J. Bergan, 221 Lincoln St.—equipment for garage and service station.

Pa., Wilkes-Barre—V. Purdsminici, 86 Seneca St.—garage and repair equipment.

Tenn., Memphis—Pilcher Printing Co., 54 North 2nd St.—machinery and equipment for new plant at 33 Beale Ave.

Va., Norfolk—Taylor-Parker Co., Water St. and Commerce Pl., C. A. McLean, Purch. Agt.—medium size milling machine, universal or plain (used).

W. Va., Logan—Guyan Machine Shops—heavy duty milling machines or gear cutters, also portable hoists, electric, steam or belt driven.

Wis., Manitowoc—E. W. Krug Mfg. Co., 918 South 19th St.—equipment, small tools, belting and shafting for proposed machine and repair shop.

Wis., Milwaukee — J. H. Knaup, 1524 Galena St.—20 in. drill press, tool room lathe, emery grinders and air pump for garage.

Wis., Poskin—D. & H. Sure Grip Brake Co., A. Delegard, Mgr.—special machinery, drill presses, lathe, belting, shafting and hoists for proposed $50,000 factory.

Wis., Racine—M. Hamnes and L. J. Boiman—shop equipment for the manufacture of automobile headlight deflector devices.

Wis., South Milwaukee—Milwaukee Tool & Forge Co., G. Haubert, Purch. Agt.—medium size steam hammer and several heavy duty grinding machines.

Que., Montreal — H. Rayment, 412 1st Ave.—complete equipment for garage.

Que., Sutton—R. Martin, Main St.—garage and repair shop equipment.

Machinery Wanted

Calif., Sacramento — County of Sacramento, H. W. Hall, Clk.—receiving bids until Sept. 24 for refrigerating plant in county hospital.

D. C., Wash.—Dist. Comrs.—receiving bids until Sept. 25 for print shop equipment and woodworking machinery for the Eastern Junior High School.

D. C., Wash.—A. L. Flint, Genl. Purch. Officer of the Panama Canal—receiving bids until Sept. 24 for insulated wire and cable, steel conduit, oil pump, breast and hand drills, punches, tinner's shears, pulleys, etc.

Ga., Atlanta—J. M. Torrence 170 Trinity Ave.—machine for the manufacture of hammer handles.

Ia., Dubuque—The city, O. E. Carr, City Hall, Mgr.—one traveling crane, hand or electrically operated.

Kan., Wellsville—Globe—10 x 15 in. job printing press.

Ky., Louisville — St. Joseph's Infirmary, 4th St.—complete equipment for proposed $60,000 laundry.

La., Monroe—Acme Carbon Mfg. Corp., Ouachita Natl. Bank Bldg.—equipment for proposed plant.

La., New Orleans—Banner Dye House, 815 Camp St.—$65,000 worth of equipment for drying section of proposed cleaning and dyeing house.

Mass., Newton (Boston P. O.)—Security Mills, Inc.—Payne winders and bottle bobbins for same.

Mass., Ware — School Bd. — wood and metal working tools and machinery for proposed $160,000 junior high school.

Mo., Joplin—Joplin Leather Co., 10th and Main Sts., J. Axel, Purch. Agt.—sole fastener, heel slugger, patching machine, combination skiver and sole cutter, also leather stitching machine.

Mo., Joplin—Laupher Motor Co., 9th and Joplin Sts., E. Smith, Purch. Agt.—connecting rod aligning machine.

Mo. Joplin — Waggy Auto Service 210 East 5th St. W. C. Waggy Purch. Agt.—electric drill (used).

Mo., Kansas City—G. Lee, 422 Blue Ridge St.—power leather stitcher.

Mo., St. Louis—J. Sharpo, Room 2, 620 Chestnut St.—7 x 11 in. Pearl press or 8 x 12 in. Chandler & Price press.

N. J., Newark—Riverside Steel Casting Co., Plank Rd. and Passaic River—one 10 ton, 40 ft. span electric traveling crane with cage 220 volt d.c.

N. Y., Buffalo—Art Work Shop, 828 East Ferry St. (manufacturer of automobile hardware, vanity and smoking cases), W. J. Pierce, Secy.—small drop hammer and cutting machines for proposed small addition to factory.

N. Y. Buffalo—J. C. Breker, 132 Spruce St.—equipment for light manufacturing and metal plating.

N. Y., Buffalo—F. M. Clapps, 154 Massachusetts Ave.—equipment for proposed bakery at 408 7th St.

N. Y., Buffalo—J. O. Guercio, 312 Front Ave.—equipment for bakery on North Ogden and Ludington Sts.

N. Y., Buffalo—J. Dodge, 361 Parkdale Ave.—tinsmith machines.

N. Y., Buffalo—C. Owen, 85 Englewood Ave.—equipment for the manufacture of confectionery.

N. Y., Buffalo—G. J. Sanford, 632 West Ave.—equipment for small factory for the manufacture of potato chips, at 651 West Ave.

N. Y., Niagara Falls—Niagara Ammonia Co., Buffalo-Columbus Ave.—equipment for plant.

N. Y., Syracuse—Chemical Toilet Corp., Liverpool Rd.—upright can closing or seaming machine for 20 in. diameter, 22 gage and lighter (used).

N. C., Durham — Durham Service Co., 215 East Main St.—floor polishing machine for tile floors.

N. C., Raleigh — Walker & Jones, 511 Tucker Bldg. (machinery dealer)—electric portable mortiser.

O., Cleveland—The city, c/o G. Beckwith, City Hall—receiving bids until Sept. 28 for one portal pier locomotive crane.

O., Columbus—Tri-State Brick, Tile & Coal Co., 16 North 3rd St., W. Klein, Van Wert, Purch. Agt.—tipple machinery for coal mine near Ironton; also brick making machinery.

O., Massillon—Reynolds Machine Co., O. T. Benford, Purch. Agt. — screw driving machine.

O., Toledo — J. Meister, 838 Bway. — laundry equipment to enlarge plant.

Pa., Phila.—H. J. Homan Co., 1713 Chestnut St. (contractor), C. Fleming, Purch. Agt.—refrigerating machinery, tools, oil and water tanks.

Pa., Pittsburgh—Gulf Refining Co., Frick Annex—two 15 ton, 3 motor, 45 ft. span electric cranes for Port Arthur, Tex.

Pa., Pittsburgh—Pennsylvania Casting & Machine Co., Keystone Bldg.—one 3 ton crane.

Pa., Wilkes-Barre—M. Blazejewski, 411 North Main St.—equipment for proposed additions to bottling works.

Tenn., Chattanooga—M. B. Parker—electric welding outfit.

Tenn., Nashville—Southern Portland Cement Co., 313 Independent Life Bldg.—complete equipment for large plant, to be purchased in a few weeks.

Tex., Dawson—Dawson Hardware Co.—tinner's brake, hand tools and riveter.

Tex., Fort Worth—Ritchie Branch, 110 North Commerce St.—power sticker for job printing.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Iron and Steel—Pig-iron market tending downward since settlement of coal strike. Furnaces piling iron, preparatory to going out of blast until demand improves. Structurals very firm at $2.50 base. Car material demand strong and plate shipments improved. Structural demand also increased, principally for schools, commercial and residential buildings and bridge construction. Bars stronger; buying active, particularly in cold finished material. Bulk of present steel business in sheets and tin plates.

Advances—Black and galvanized steel sheets advanced 15c. per 100 lb. in New York warehouses, effective Sept. 1. Tin plates also higher. Babbitt metal up 2 to 4c. per lb. in Cleveland warehouses. Dealers' purchasing prices of old metals (non-ferrous) higher in Cleveland and Chicago. Lead market active; prices tending upward.

Declines—Electrolytic copper dropped ⅛c. per lb. in week, at New York warehouses; zinc down 30c. per 100 lb. Tin tending downward; buying more active. Lead and tin most active metals so far as buying is concerned.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$28.05
Northern Basic	25@26
Southern Ohio No. 2	26.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	31.00
BIRMINGHAM	
No. 2 Foundry	24.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	26.75
Virginia No. 2	30.17
Basic	26.00
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	27.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	26.90
Basic	26.90
Bessemer	27.90

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5.00@5.50

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.50	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.95	4.45	5.05
Nos. 22 and 24.	3.75	5.00	4.50	5.05
Nos. 25 and 26.	3.80	5.05	4.55	5.10
No. 28	3.85	5.15	4.65	5.20
Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00	5.15	4.70	5.35
Nos. 12 and 14.	4.10	5.25	4.80	5.45
Nos. 17 and 21.	4.40	5.55	5.10	5.75
Nos. 22 and 24.	4.55	5.70	5.25	5.90
No. 26	4.70	5.85	5.50	6.05
No. 28	5.00	6.15	5.80	6.35

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	62	50½	¼ to 1½	30	13
		LAP WELD			
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	28	13
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	60	49½	¼	28	12
2 and 3	61	50½	1 to 1½	30	14
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ¼-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.65	3.90	4.55
Cold finished flats, squares	5.15	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.37½
Tin, 5-ton lots, New York			42.50
Lead (up to carlots), St. Louis	6.85	New York	7.37½
Zinc (up to carlots), St. Louis	6.50	New York	6.95

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-ton lots	26.10	27.00	26.00
Antimony (Chinese), ton spot	8.50	10.50	8.75
Copper sheets, base	22.25	22.00	23.00
Copper wire (l.c.l.)	16.50	19.25	16.25
Copper bars (l.c.l.)	20.75	22.50	19.50
Copper tubing (l.c.l.)	25.50	27.50	23.00
Brass sheets (l.c.l.)	18.50	23.00	18.75
Brass tubing (l.c.l.)	24.00	28.50	20.50
Brass rods (l. c. l.)	16.75	18.50	15.75
Brass wire (l. c. l.)	19.00	23.00	.....
Zinc sheets (casks)	10.25	10.45	.....
Solder (½ and ½), (case lots)	29.50	27.75	20.00
Babbitt metal (83% tin)	52.00	53.00	42.00
Babbitt metal (35% tin)	25.00	17.00	18.00
Nickel (ingot and shot)	29.00	.....	35 00
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	11.75	12.00
Copper, heavy, and wire	11.50	11.25	11.25
Copper, light, and bottoms	10.00	9.25	10.25
Lead, heavy	5.00	5.50	5.75
Lead, tea	4.00	4.25	4.75
Brass, heavy, yellow	7.50	....	7.25
Brass, heavy, red	9.50	9.50	9.00
Brass, light	6.00	5.25	6.50
No. 1 yellow brass turnings	7.00	6.00	7.00
Zinc	3.75	3.00	4.00

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$25.10	$19.50	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.40	17.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	12.60	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13½x13¼, per lb.	11.00	36.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	.95	1.06	1.14
White lead, dry or in oil	100 lb. kegs.	New York, 14.00	
Red lead, dry	100 lb. kegs.	New York, 14.00	
Red lead, in oil	100 lb. kegs.	New York, 15.50	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.50@5.00	
Coke, prompt foundry, Connellsville	per net ton	5.50@6.00	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40-10%	50-10%	45-5%
1⅛ and 1¼x3 in. up to 12 in	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	25-10%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30-10%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	40-10%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30-10%	45%	40-5%
Bolt ends, with hot pressed nuts	40-10%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 9/16 and smaller	60%	.....	....
Semi-finished nuts, ⅝ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	0.50	2.75	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	50-10%	50-10%	60%
Rivets, tinned	50-10%	50-10%	4½c. net
Button heads ⅜-in., ½-in., 1x2 in. to 5 in., per 100 lb (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30-10%	30-10%	30-10%
Heavy grade	20-5-2½	30%	20-5-2½%
Rubber and duck:			
First grade	50-10-5%	50-10%	40-10%
Second grade	60-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1 49	1 24	1.40
Cloth	3.38	2.67	3.20

Tex., Garland—W. A. Holford—7 column quarto drum, 2 revolution newspaper press.

Va., Boydton—Baptist & Goode (wheelwright)—machinery for the manufacture of single tree irons.

Va., Martinsville—H. C. Field & Co. (mica products)—portable air compressor, jack hammer and drill.

Va., Williamsburg — W. B. Bozarth — planer and circular saw for box factory.

Wis., Appleton—Helm Cut Stone Co., 578 Locust St.—stone cutting machinery, including one 5 ton and one 12 ton hand operated crane, small chain hoists, carborundum saws, polishing machines, etc.

Wis., Astico—Astico Milk Products Co. (manufacturer of condensed milk)—special machinery, belting and shafting.

Wis., Berlin—Berlin Tanning & Mfg. Co.—special machinery, belting and shafting for proposed $50,000 tannery, to replace that which was recently destroyed by fire.

Wis., Black Earth — Lakeside Mfg. Co. (manufacturer of dishwashing machinery, etc.)—one brass furnace, several moulding machines, also complete nickel plating and baking-on equipment.

Wis., Hartford—Bear Brand Hosiery Co.—textile machinery for proposed $40,000 factory.

Wis., Juda—Bd. Educ., J. W. Roderick, Secy.—manual training equipment, woodworking machinery, etc., for new high school.

Wis., Madison—J. Fischenick, 2201 University Ave.—gasoline storage tanks, pumps and free air service equipment for new garage.

Wis., Madison—Heilprin Fruit Co., West Mifflin and Bedford Sts., J. Heilprin, Pres.—large ice machine.

Wis., Madison—Mead & Seastone, State Journal Bldg.—two traveling gate hoists for hydro-electric plant.

Wis., Madison—Piper Bros. Co., 31 North Pinckney St., S. Piper, Mgr.—electrically operated baking machinery, mixers, belting, shafting, etc., for proposed $50,000 bakery.

Wis., Milwaukee—Natl. Distilling Co., 79 Buffalo St., A. M. Grau, Purch. Agt.—belt driven conveying machinery.

Wis., Milwaukee — L. Rohn, 36th and Sycamore Sts. (manufacturer of automobile bodies, etc.)—one circle saw and one bandsaw.

Wis., North Milwaukee—C. G. Johnson—foundry equipment, including cupola, moulding machines and ladles.

Wis., Prentice—Northern Publishing Co.—presses and paper cutter for proposed $40,000 plant.

Wis., Stevens Point—Bd. Educ., c/o Clk., City Hall—sheet metal working equipment, printing presses and type machines for new $200,000 high school.

Wis., Weyauwega—Baldwin Mill Cheese Co., R. F. D. 1—dairy and creamery machinery, to replace that which was destroyed by fire.

Ont., Almonte — Yorkshire Wool Stock Mills Co.—about $50,000 worth of machinery to replace fire loss.

Ont., Elora—T. E Bissell Co.—machinery for addition to plant for the manufacture of farm implements.

Ont., Toronto—Boake Mfg. Co., Dartnell Ave.—sash and door machinery, including planers, saws and tenon machines for proposed $150,000 woodworking factory.

Que., Montreal — Imperial Printing Co., Registered, 22 Notre Dame St., East—14 x 22 in. Chandler press.

Que., Montreal — Laurentian Timber Products Co., Ltd., c/o J. Coderre, 6331 St. Charles St.—complete sawmill equipment for new plant.

Que., Montreal—Maisoneuve Box & Lumber, Ltd., 5th Ave. and Girard Sts., Viauville, R. Dursavet, Purch. Agt.—one power feed rip saw.

Que., Montreal — L. Villeneuve & Co., Ltd., 2599 St. Lawrence Blvd., M. Paquette, Purch. Agt.—bandsaw and other equipment for sash and door factory.

Que., St. Sebastien—A. Tetreau—equipment for blacksmith shop and wheelwright repairs.

Metal Working Shops

Calif., Woodland—The trustees of Woodland High School Dist. will receive bids until Sept. 27 for the construction of 1 story manual training shops, 200 ft. long. Estimated cost $40,000. W. H. Weeks, 369 Pine St., San Francisco, Archt. Noted Aug. 30.

Conn., South Manchester—H. Stephens, 161 Center St., is having plans prepared for the construction of a 1 story (ultimately 3 story), 60 x 90 ft. garage, etc. Estimated cost $40,000. R. M. Gosler, 19 Madison St., Archt.

Conn., West Hartford (Hartford P. O.)—Prospect Garage, Prospect Ave., awarded the contract for the construction of a 1 story, 100 x 100 ft. garage. Estimated cost $40,000. Noted July 26.

Fla., Dade City—The Dade City Motor Co. will soon award the contract for the construction of a 2 story, 30 x 60 ft. garage. Estimated cost $10,000. Private plans.

Ill., Chicago—L. Bromberg, 1337 North Oakley Blvd., is receiving bids for the construction of a 1 story, 100 x 250 ft. automobile sales and service station on Milwaukee Ave. near Crawford St. Estimated cost $100,000. A. M. Ruttenberg, 64 West Randolph St., Archt.

Ill., Chicago—F. E. Gotterdam, Archt., 138 North La Salle St., is receiving bids for the construction of a 2 story, 50 x 72 ft. factory at 1908-14 Park Ave. for the Crown Rheostat & Supply Co., 35 South Desplaines St., manufacturer of plating and polishing material and equipment. Estimated cost $28,000.

Ill., Chicago—The D. O. James Mfg. Co., 1120 West Monroe St., manufacturer of cut gears, awarded the contract for the construction of a 3 story, 48 x 50 ft. factory at 1114-1118 West Monroe St. Estimated cost $50,000. Noted Aug. 23.

Ill., Chicago — F. E. Jonas, 133 West Washington St., awarded the contract for the construction of a 1 story, 100 x 125 ft. automobile sales and service station at 3417-25 Diversey Parkway. Estimated cost $45,000.

Ind., Lafayette—The J. F. Horner Automobile Co., 19th and Columbia Sts., plans to build a 1 story, 40 x 130 ft. garage. Estimated cost $40,000.

Ind., Pendleton—The Indiana Reformatory plans to build a 1 story foundry. Estimated cost $40,000.

Ky., Louisville — The Ford Motor Co., Highland Park (Detroit P. O.), plans to build an assembly plant on a 22 acre site, capacity 300 cars per day, on Western Parkway, here. Estimated cost $1,000,000.

La., Monroe — The Acme Carbon Mfg. Corp., Ouachita Natl. Bank Bldg., plans to build thirty 12 x 120 ft. burning houses, 25 x 75 ft. warehouse, 30 x 50 ft. packing house, 20 x 30 ft. machine shop, etc.

La., New Orleans—M. Feitel, 3722 Tulane Ave., is having plans prepared for the construction of a 1 story, 125 x 155 ft. garage on Constance and Poeyfarre Sts. Estimated cost $20,000. Harry Bros., Carrolton Ave. along tracks of Yazoo and Mississippi Valley R.R., Archts. Toye Bros. Taxi Co., South Rampart and Gravier Sts., lessee.

Mich., Detroit — H. C. Nicholson, 5843 Commonwealth Ave., awarded the contract for the construction of a 1 story, 60 x 136 ft. garage on Commonwealth Ave. Estimated cost $40,000.

Mich., Detroit — Pitman & Thieme, c/o S. E. Remey, Archt., 1140 Griswold St., is having plans prepared for the construction of a 1 story, 90 x 120 ft. garage and repair shop on Hamilton Blvd. Estimated cost $40,000.

Mich., Detroit—The Texas Co., 17 Battery Pl., New York, awarded the contract for the construction of a distribution plant, including a 1 story, 38 x 122 ft. warehouse and office building, 32 x 100 ft. garage and power plant, steel tanks, etc., on Ferndale Ave., here. Estimated cost $100,000.

Minn., Minneapolis — The Minnehaha Welding & Machine Co., 3750 Minnehaha Ave., plans to build a 1 story, 40 x 150 ft. machine shop. Estimated cost $12,000.

Minn., St. Paul—The Western Fruit Express Co., 1505 Pioneer Bldg., is having plans prepared for the construction of a repair shop for refrigerator cars in the Midway district. Estimated cost $50,000. F. G. Luth, Mechanical Supt. Private plans.

Mo., Kansas City—The Kansas City Light & Power Co., 1330 Grand Ave., has had plans prepared for the construction of a 1 story, 160 x 180 ft. garage on 19th and Charollette Sts. Estimated cost $90,000. Private plans.

Mo., St. Louis—P. H. Fuchs, 3126 Locust St., awarded the contract for the construction of a 1 story, 89 x 117 ft. garage at 608 South Bway. Estimated cost $40,000.

Mo., St. Louis — The Heine Boiler Co., 5319 Marcus Ave., awarded the contract for the construction of a 1 story, 80 x 139 ft. factory. Estimated cost $50,000.

Mo., St. Louis—The Tate Motor Car Co., 3111 Locust St., awarded the contract for the construction of a 3 story, 135 x 165 ft. automobile sales and service station on Washington St. Estimated cost $250,000. Noted July 5.

Neb., Omaha—The Fairmount Creamery, 12th and Jones Sts., awarded the contract for the construction of a 2 story, 132 x 132 ft. garage, etc. Estimated cost $90,000.

N. Y., Saratoga Springs—The Baker Mfg. Co. has had plans prepared for the construction of a 1 story, 50 x 87 ft. foundry unit on Ballston St. Estimated cost $50,000. Private plans. Noted May 24.

N. C., Raleigh—J. W. Evans, East Morgan St., plans to build a 2 story, 100 x 100 ft. automobile and general repair shop on Blount and Morgan Sts. Estimated cost $50,000. Engineer or architect not announced.

Utah, Salt Lake City—A. Kahn, Archt., 1000 Marquette Bldg., Detroit, will receive bids until Sept. 24 for the construction of a 2 story, 165 x 247 ft. assembly plant on 3rd South St., here, for the Ford Motor Co., Highland Park (Detroit P. O.).

Watch The Latest Opportunities

Turn To Pages 128-137

In The Searchlight Section Of This Paper

American Machinist
Volume 59 NEW YORK, SEPTEMBER 27, 1923 Number 13

Is Beauty an Important Factor in Machine Design?

By K. H. CONDIT
Editor, *American Machinist*

The views of Mr. Maxfield Parrish, artist, machinist and draftsman, as expressed in a recent interview in the shop under his studio at Cornish

PROBABLY the factor receiving the least consideration in the design of almost any piece of machinery is that of beauty. Generally speaking, both builder and user are apt to consider that the product is satisfactory if it does its work well. There can be no question that the performance factor is the most important one in judging the quality of most mechanical contrivances. Yet there are other factors to be thought of and beauty of design is one of them.

In this day of specialization when one wants information on a question that is outside of his own experience he naturally consults an expert. Consequently our first thought when the question of beauty in machinery was put up to us, was of the only man on our subscription list, and probably in the country, really qualified to give an expert opinion on such a subject. Everyone is familiar with Mr. Maxfield Parrish as an artist but few know him as a machinist, a bent that is not surprising when one remembers that he is a great nephew of the famous Sellers' of Philadelphia.



A CORNER OF MR. PARRISH'S MACHINE SHOP

Mr. Parrish's home, studio and shop are located in Cornish, N. H., just across the Connecticut River from Windsor, Vt., traditional cradle of creative machinists for generations. The buildings are on a high hillside that commands one of the most superb views I have ever seen. His machine shop is beneath his studio and one of his problems has been how to eliminate the vibration of the studio floor set up by the countershafts hung below it. The tools themselves are set on concrete supports that run down many feet to the rock underneath the building, but the lathe countershaft which is directly under the place where he stands to paint sets up a disconcerting vibration when one of his boys starts to do a little turning job. The neatness of the shop and its orderly arrangement prove that its owner is no amateur mechanic.

So much for Mr. Parrish's qualifications and surroundings. Now for his expert opinion.

He maintains that there is a close relationship between the artist and what he calls the "creative machinist" to distinguish him from the unimaginative machine operator. Each must have a pictorial imagination. In other words, he must be able to visualize his work before a start is made toward constructing it. One difference between them is that they work with different media, the artist with paint and brushes or canvas, the machinist on metals with tools of more or less complexity. Another is that where the artist by his picture strives to convey his message to the souls of men through the medium of their eyes, the machinist is endeavoring to produce a mechanical masterpiece that will lighten men's burdens by doing their work for them.

If we grant the correctness of Mr. Parrish's claim that machinists are artistic, as I think we must, doesn't it follow that they should be rather susceptible to beauty of design in the tools with which they work? And if we concede the logic of this reasoning, isn't it worth while to pay some attention to balance, to symmetry, to proper proportioning of parts—in other words, to beauty—when we are designing machines to sell to men with such sensibilities?

If you are dubious on this point pick up several machine tool catalogs or run through the advertising pages of the *American Machinist*. Without knowing anything of the capabilities or workmanship entering the construction of various machines of the same gen-

eral type, you will still find that it is not hard for you to select the one which appeals to you as the best machine. Mr. Parrish has in his shop a tool which he cites as an example to prove this ability to recognize artistic merit in a machine tool. It is a twenty-inch drill press of a well known make. He has no fault to find with it as a maker of holes but he maintains that there is something wrong with its proportions. The twenty-four-inch model of the same machine is a much better balanced tool, he insists, and one that he would select in preference to the other every time.

Making the First Selection

Many a purchaser of machine tools picks out from the editorial or advertising illustrations of such magazines as the *American Machinist* the few tools of a given type from which he will make his final selection. Of course, this preliminary selection is only the first step in the narrowing down process which eventually results in the placing of an order, but it would seem to be a wise precaution to design a machine with sufficient attention to appearance to prevent its being eliminated from consideration in the very first test.

If beauty is to be accounted a desirable factor in the design of a machine how are we to know when we have achieved it? What criterion can be set up which will determine unerringly whether a new machine meets our requirements in this direction? Here we have a question that is difficult to answer.

Mr. Parrish has ideas of his own on this subject. He contends that Jay Hambidge's treatise on the subject of beauty is entirely sound although he feels that Mr. Hambidge has rather complicated matters by reducing his theories to mathematical formulas. Mr. Parrish says that the average artist has not the mathematical knowledge to follow formulas or understand them and he threatens to work out the same formulas in such a simple form that they can be demonstrated by means of two pins and a string. According to Mr. Parrish all Euclid can be worked out this way.

He believes that there is a natural law of right proportioning that runs through everything, enabling us to say without hesitation that one horse is more beautiful than another or that one lathe is more attractive than another. He also believes that some objects are intrinsically ugly. To bring out his position on this point he told of an argument he had just had with two artistically inclined college women. They tried to prove to him that a cow could be as beautiful for a cow as a horse is beautiful for a horse. Although they employed every bit of logic they possessed he remained stubbornly convinced that a cow is an unfortunately designed animal and cannot be considered beautiful by any stretch of the imagination.

On the other hand, there are certain things that are intrinsically beautiful. Greek temples fall in this class and so do sailing yachts. Neither one conforms to the other nor to anything else, yet we know instinctively that here is real beauty of line and proportion. To prove this nonconformity Mr. Parrish cites the attempts of machine designers of the early days of machinery to adapt the Greek column to their supporting members.

The Greek column is naturally beautiful, perhaps because when we look at it we have not the slightest doubt that it is proportioned to carry the load placed upon it. Used as a leg for a lathe or as a support for a walking beam of an engine in surroundings entirely foreign, it loses its beauty and detracts from the general appearance of the assembly to which it has been added. The Sellers' were among the first to realize that there was something wrong with this attempt to combine unrelated elements in a structure. Their machines were therefore the first to show the simplicity of line and the satisfying strength of proportion which brings true beauty to such a structure.

Mr. Parrish has a high regard for the English designers of locomotives and steamships. He recalls the work of the department which was intrusted with the careful study of line and proportions of locomotives in English locomotive shops. The engine of one crack train was finished entirely in yellow enamel, rubbed down. It may be that these old artistic designers carried things a little too far, for they certainly paid scant heed to the comfort of the engine driver whose well-proportioned cab was so short that he had to stand the full length of his run.

The same care in selecting proper proportions is evident in English steamers which have a beauty lacking in both France and American ships. Mr. Parrish maintains that even the English tugs have their stacks placed just right, and of a diameter and rake that show consideration of looks.

When it comes to such modern locomotive vehicles as the automobile, Mr. Parrish is rather severe in his criticism of their lack of beauty which has been sacrificed to style. He compares the present-day touring body to a chopped-off rowboat. In the early days of the automobile it was simply a carriage with a motor hung on at the least accessible point. Then as the motor car became established in public favor its designers and builders awoke to the fact that it was not a horseless carriage but a transportation machine. They stopped trying to follow the well established styles of horse drawn carriages and began to develop individual designs, some of which were really beautiful. Then came the stage of imitation where the smaller fry copied what their more successful competitors developed and finally the craze for style which has brought cars that are as unpleasing to look at as they are uncomfortable to ride in with their low seats that bring the occupant's knees level with his ears. In such machines as motor cars, where the most potent selling appeal for a large part of the purchasing public lies in the appearance of the machine, it would certainly seem that particular attention should be paid to beauty of design.

Beauty Indicates Right Proportioning

The whole thing, as Mr. Parrish says, comes down to this. Beauty in a machine tool, or in any other mechanical contrivance, very often indicates that the weights of the various parts have been perfectly proportioned to the strains they have to withstand. Consequently, it is not unreasonable to expect that such a product will perform more perfectly than one which is not so well balanced. The designer, to be successful in securing this perfect balance in his design, must have an unconscious sense of beauty or proportion. Perhaps, some day, we shall discover the law of natural beauty and it will then be possible for the designer to apply mathematical rules to secure it. Until that day comes, however, he must depend upon his innate artistic sensibilities with the comforting assurance that if he is successful in expressing them in his design, the result will be a machine successful mechanically, artistically and commercially.

Development of Machine Tools in New England

BY GUY HUBBARD

The sixth article—Special machines built for manufacturing rotary pumps—Development of the interchangeable system — Advanced sales methods — Working with convict labor

ASAHEL HUBBARD built the first wooden model of his revolving hydraulic engine at his "watermill" near the West Parish of Windsor, and after some experimenting he built one of cast iron, doing most of the work by hand, as he had but little machinery available. The teeth of the bucket wheels of this first pump were shaped by chipping and filing, being afterward ground in with powdered glass and oil.

On account of the lack of the necessary mechanical

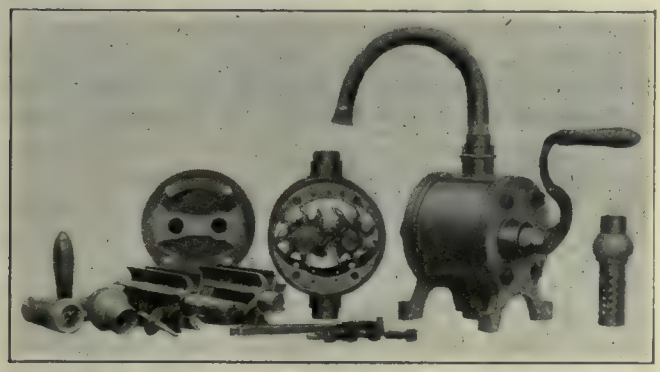


FIG. 30—ONE OF THE ORIGINAL HUBBARD PUMPS

equipment for the quantity manufacture of the revolving hydraulic engine at Windsor, and because both the local capital and local public interest were all tied up in the similar Cooper invention, Asahel Hubbard journeyed to Proctorsville, Vt., some twenty miles across the mountains west of Windsor, and interested Jabez Proctor in the proposition. Jabez Proctor (1780-1839) manufacturer, capitalist, politician and one of the most honored and influential men in the State, was born at Westford, Mass. He came to Vermont at the age of three with his father, Capt. Leonard Proctor, a Revolutionary officer who founded the village of Proctorsville in the wilderness of the township of Cavendish.

Mr. Proctor installed Ashahel Hubbard, temporarily, in the machine shop of his mill on the Black River in Proctorsville village, and on Oct. 28, 1829, they incorporated The National Hydraulic Co., with a capital of $50,000. This was the beginning of the chain of machine industries which, through various changes of name, has existed unbroken at Windsor for more than ninety years and through which has always run a strong community spirit. In these industries there have been developed some of the most important improvements in the mechanic arts and some of the greatest American mechanics, and from them have sprung no less than thirty other American industries, many of which are leaders in their field today.

Redfield Proctor, son of Jabez, was the founder of the Vermont marble industries at Rutland and Proctor, in the mechanical development of which he was greatly aided by another famous Windsor mechanic, Albert Ball, whose work will be taken up later on in considerable detail.

THE FIRST STATIONARY STEAM ENGINE

The special machines for manufacturing the revolving hydraulic engines and a few of the earliest engines were built at Proctorsville. In a short time Mr. Proctor, through his political influence, succeeded in having Asahel Hubbard appointed warden of the Vermont State Prison at Windsor, at the same time getting the authorities to install a steam engine (with the exception of that on board Thomas Blanchard's steamboat "Vermont," the first in Windsor) and a machine shop at the prison. In 1830, The National Hydraulic Co. removed its machinery from Proctorsville and located in this shop, beginning there the quantity manufacture of the revolving hydraulic engines by the interchangeable system and under a peculiar labor condition. One of the original pumps and some of its parts are shown in Fig. 30.

The manufacture of machinery under this so-called interchangeable or American system consists in making every part of each machine exactly like the corre-

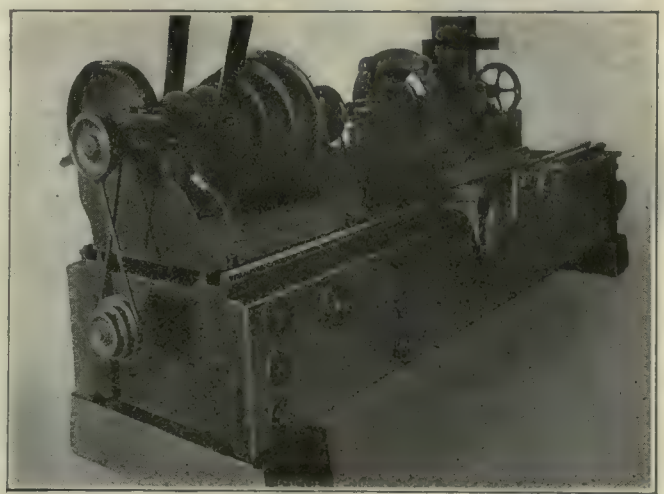


FIG. 31—BELT-FEED ENGINE LATHE, BUILT BY ALVIN JENKS, PAWTUCKET, R. I., ABOUT 1833

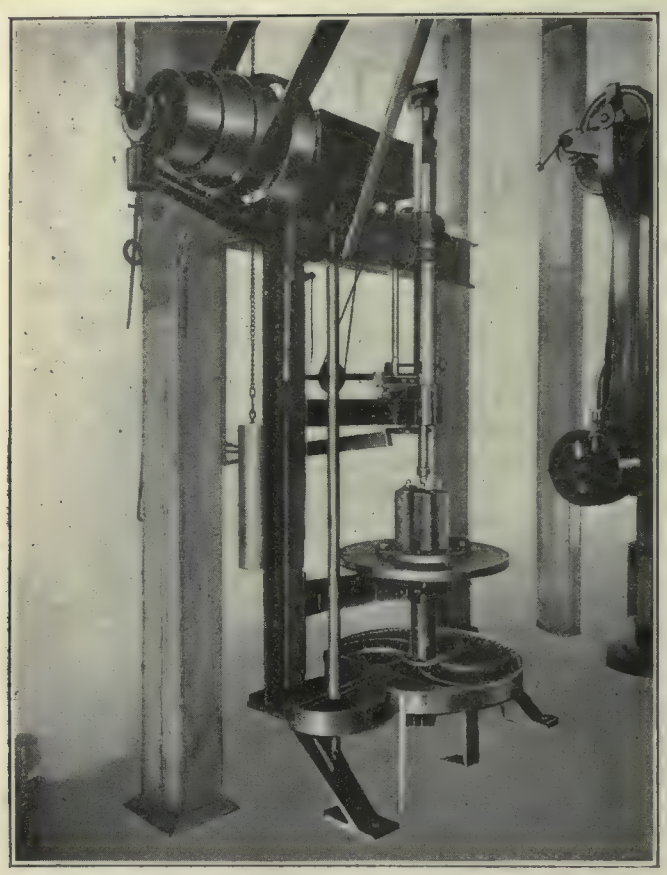


FIG. 32—BORING MILL AND DRILLING MACHINE, BUILT BY ALVIN JENKS, PAWTUCKET, R. I., ABOUT 1833

sponding part in every other machine of the same class and size, so that in assembling the parts no fitting is necessary, by reason of which repair parts can be furnished that will go directly into place. To build machinery upon this plan, it is necessary to either make very careful measurements during every stage of the production of each piece (the tool-room method) or to fit each piece to accurate gages, the drilling and shaping being controlled by accurate work-holding and tool-guiding devices called jigs and fixtures (the manufacturing method). The tool-room method is applied only to small lots of parts such as the jigs and fixtures themselves. In the manufacturing method the skill of the toolmakers who built the jigs, fixtures and gages is reproduced again and again upon the parts for which they are used; the "transfer of skill" it is called by Prof. Dexter S. Kimball in his "Principles of Industrial Organization." Thus the keynote of the interchangeable system is *accuracy*.

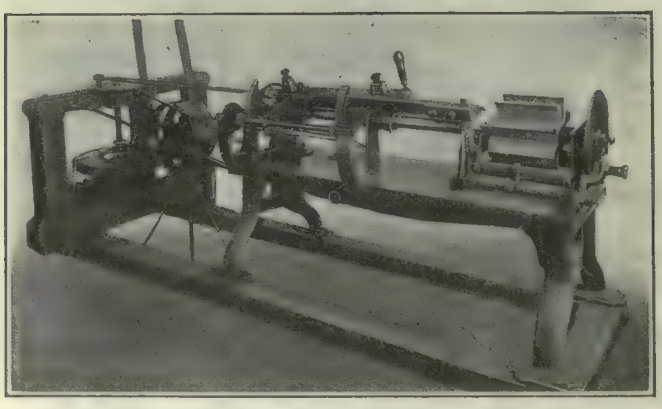


FIG. 33—CRANK PLANER FOR PLANING ROTARY-PUMP BUCKETS, BUILT BY ALVIN JENKS, PAWTUCKET, R. I., ABOUT 1833

The interchangeable system was projected by the armorers in France as early as 1717, but as late as 1785, the attempt of the gunsmith LeBlanc to build muskets by this system did not prove entirely successful, partly on account of lack of funds. The work of LeBlanc came to the attention of Thomas Jefferson, then Minister to France, and being himself mechanically inclined it interested him greatly. In fact he wrote to John Jay and to James Monroe of the possibility of applying the LeBlanc system at the United States Armories. Although he made some moves toward sending the inventor to this country, the matter lapsed at the time but very likely this agitation influenced the later backing given to Whitney by the Government.

Interchangeable Manufacture Abroad

Tackle blocks for ships were made at the Navy Yard at Portsmouth, England, by something approaching the interchangeable system about 1791, by Samuel Bentham (brother of Jeremy Bentham, the great prison reformer) and by Sir Marc Isambard Brunel (who during his exile in America came close to Vermont when he built the Hudson-Champlain Canal). Then in 1806, John George Bodmer, the famous Swiss mechanic, began to manufacture guns by special machinery at St. Blaise in the Black Forest, but in neither of these projects did the system exist in any degree of completeness.

It was in 1798 that Eli Whitney, the inventor of the cotton gin, accepted a contract for 15,000 United States muskets of which he proposed "to make the same

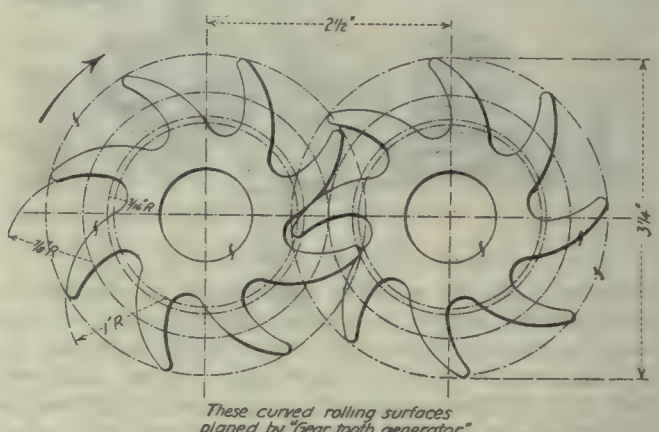


FIG. 34—DIAGRAM OF BUCKET WHEELS OF HUBBARD'S ROTARY PUMP, 1828

parts of different guns, as their locks for example, as much like each other as the successive impressions of a copper-plate engraving." In 1800, Whitney built and equipped his armory outside of New Haven and of his work Jefferson said in a letter to Monroe in 1801: "He has invented molds and machines for making all the pieces of his locks so exactly equal that take 100 locks to pieces and mingle their parts, and the 100 locks may be put together by taking the pieces which come to hand." Thus was this system first completely practiced at Whitneyville, Conn., and became known as the American system. It has since spread to all parts of the world.

Although the interchangeable system had thus early been applied to the manufacture of firearms (where its value was self-evident), its application to machine building did not immediately follow and the revolving

hydraulic engine was unquestionably one of the first instances in which it was applied in this connection. Upon the early application of this system and its subsequent development, rests not only much of the success of the Windsor machine builders (who, with the exception of Eli Whitney, in the early days probably did more to develop and spread this system than any others) but also that of American industry in general.

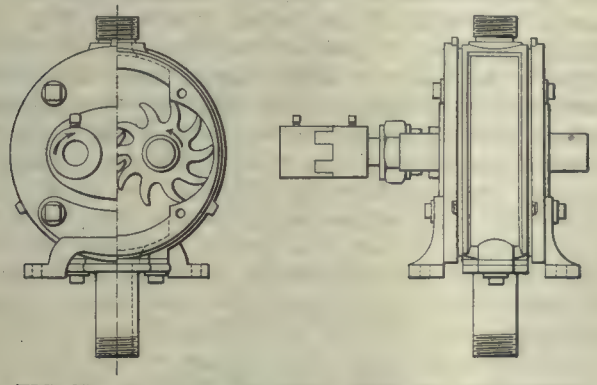


FIG. 35—DIAGRAM OF HUBBARD'S ROTARY PUMPS FOR HOUSEHOLD USE

The experiment in regard to labor at the prison touched both the free mechanics and the convicts who were employed by The National Hydraulic Co. The life of a mechanic in those early times of twelve-hour days and "bound-out" apprentices was not a rosy one, and the life of a convict in the days of damp cells, balls and chains, and whipping posts was much less so. The National Hydraulic Co., however, began to treat its free workmen, not like servants, but as fellow craftsmen and it made a special effort to send out its convict labor with self-respect and with a useful trade learned. At the same time the prison became a source of revenue to the State, instead of being a drain upon it.

Early Office Systems

The old books of the National Hydraulic Co., which are in the possession of the writer, show that it had excellent "systems," much like those used today in machine shops. List of jigs, fixtures, patterns, castings, operations, etc., were kept, as well as a record of each pump manufactured, showing its number (which was stamped upon all its parts), its test results, and to whom it was sent. All letters and orders were copied and filed. Quite accurate time was kept on the work in the shop, from which costs were figured, and records were kept of the quality of the work done by the various men. Entries in these ancient books show that when the more efficient convicts were pardoned or otherwise released, they were either kept on as free men or were fitted out with tools, new clothes and recommendations, so that they could start life anew elsewhere as useful citizens.

An apprenticeship system was also developed, by which likely boys were taken in at what was then a fair living wage ($100 per year and board) and were taught all branches of the business during a period of three years. These points go to explain why, years later, the workmen in their turn stood by the Windsor industries during periods of depression, for it is not beside the point to say they felt much the same toward these industries as graduates of a modern engineering college feel toward their *alma mater*.

The National Hydraulic Co. built pumps and fire engines, ranging from small cast-iron, brass or pewter hand pumps, to industrial pumps of more than a thousand gallons per minute capacity. The several small pumps which are still in existence prove them to have been strictly interchangeable. Following distinctly modern policies, the company began extensive advertising and sent salesmen out from Windsor who penetrated even as far as Northern Mexico. It also established agencies in all parts of the country.

The First Water Works

In 1829, Mayor Daniel D. Page and the Board of Aldermen of St. Louis, set on foot a movement to build the first water-works for that rapidly growing city and a firm of contractors, Wilson & Fox, undertook the work. Through Charles Manser, its agent at St. Louis, The National Hydraulic Co., in 1830, was given an order to build a revolving hydraulic engine of 20 hp., capable of raising water from the Mississippi and forcing it through 1,300 ft. of iron pipe into a 230,310-gal. reservoir. The reservoir was located on top of one of the mounds on the east side of what was later called Broadway, near the residence of Gen. W. H. Ashley, and was 104 ft. above the normal level of the river.

This "huge pump" was built at once and under the direction of the inventor was taken to St. Louis, being transported by wagon over the Green Mountains at Albany, by canalboat from Albany to Buffalo, by lake steamer from Buffalo to Chicago (then only a small settlement) and by wagon and riverboat from Chicago to St. Louis. This journey lasted for several weeks

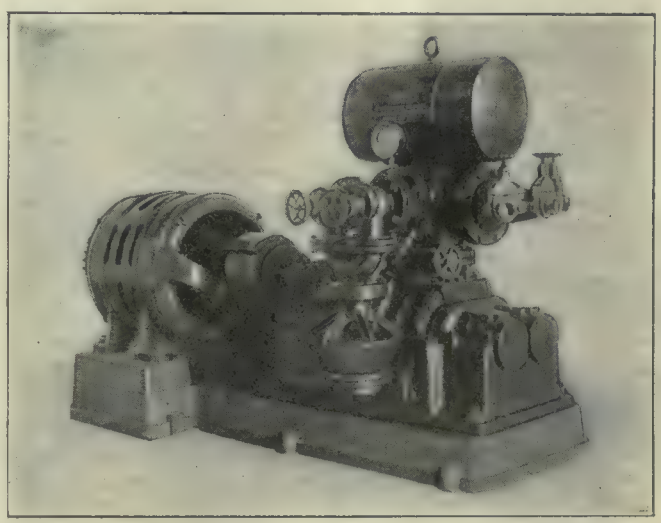


FIG. 36—A 750-GAL. HUBBARD ROTARY FIRE-PUMP, FALES & JENKS MACHINE CO., 1917

but both the inventor and the pump arrived safely at the then "far western" city. Under Asahel Hubbard's direction the pump was attached to a steam engine built by Francis Pratt of Pittsburgh and coupled to the mains which had been cast by Vanleer & Co. and Woods, Stacker & Co. at their iron works in Tennessee.

The pump worked very satisfactorily, but when it came to settling the bill, it was discovered that the water company did not have sufficient money on hand to pay for it. A committee of citizens, forerunners of the very progressive St. Louis Chamber of Commerce, then took up a collection but still there was a deficit, so these patriotic citizens presented the inventor with a fine, pure-white saddle horse. Asahel Hubbard, who was by that time anxious to return home, was glad to

accept this as payment of the balance. Taking the cash in gold in a money belt, he rode the horse to Davenport, Iowa, where he had other business and from there he and the horse journeyed back to Windsor by the same route and method by which he had gone west. His arrival in Windsor on his St. Louis horse was an event long remembered by the old residents.

The revolving hydraulic engine remained in use at the St. Louis Water Works, with another type of pump later added, until 1848, when it was replaced by a new steam pump of 150 horsepower.

Orders from Far Off

The National Hydraulic Co. began to receive orders from all over the country, a large order coming from far-away Matamoros in Mexico, and about fifty men, some convicts and some free, were employed. After the St. Louis trip, Asahel Hubbard spent most of his time traveling, going to all parts of the country from Canada to western Florida in the interests of the business. When away he left his son Colman, who had learned the machinists' trade under him, in charge of the prison and of the shop at Windsor.

On account of the difficulty of shipping large pumps from Windsor, the inventor, in 1833, sold his patent rights for the State of Rhode Island to David G. Fales and Alvin Jenks, who in 1830 had founded a machine business at Central Falls under the name Fales & Jenks. Mr. Jenks, a brilliant mechanic himself, was a member of a famous mechanical family and a descendant of Joseph Jenks of Hammersmith, England, who settled in Lynn in 1642 and who was, according to Lewis in his "History of Lynn," the first founder who worked in brass and iron on the "Western continent." Fales & Jenks, who had begun by building cotton machinery, immediately made Hubbard's patent rotary pump a prominent article of its manufacture, especially in the form of stationary fire-pumps for large buildings. After ninety years, the Fales & Jenks Machine Co. continues to build them in sizes varying from small bronze chemical pumps driven by hand, up to huge electric fire-pumps of a thousand gallons per minute capacity. The design is practically unchanged and it is now one of the oldest mechanical products continuously built by one concern in the United States. In the plant at Pawtucket may still be seen, in running order, some of the machines built by Alvin Jenks in 1833, which will give a clear idea of those used by The National Hydraulic Co. in the pioneer days at Windsor.

Special Machinery

One of these machines is a heavy engine lathe for boring the pump cases, shown in Fig. 31. It has a massive wooden bed with cast iron ways bolted to it and is fitted with a reversible carriage having a rack feed, operated by an ingenious endless belt arrangement on the front of the bed. The boring is done by an adjustable tool, held on a bar between the lathe centers and the cases are held in a fixture in which they can be quickly shifted by means of a slide, so that first one side and then the other may be bored at one setting.

Another ingenious machine is a combination boring mill and drilling machine, Fig. 32, which was designed primarily for boring the centers of the cast bucket-wheels for the steel shaft (an improvement in construction introduced in the pumps by Mr. Jenks). This machine is used as a boring mill by fixing the spindle with a sliding key and throwing the table into gear so as to revolve. As a drilling machine, the table driving-gear is thrown out of mesh, the table clamped in place and the key removed from the spindle, which is then thrown into gear. This machine has a speed-changing gear box and an adjustable power feed.

The third machine of this historic group, is a gear tooth generator for automatically shaping the rolling faces of the teeth of the bucket wheels, see Fig. 33, upon the accuracy of which the efficiency of the pump so greatly depends. In 1828, planers and milling machines were very rare in New England and probably had been scarcely heard of in Vermont. Plane surfaces, or special curved surfaces which could not be cut in the lathe, were produced by chipping and filing, just as were the teeth of Asahel Hubbard's first cast-iron bucket wheels. In fact the special machinery by Mr. Jenks was built by this method, the labor of chipping and filing (which by the way is almost a lost art among mechanics) being reduced to a minimum by providing raised "spottings" upon the castings where the plane surfaces were required. One of the first special machines built by the National Hydraulic Co. was a sort of hand planer in which the cutting tool was guided by a form to follow the curve of the tooth as it made its progressive strokes. As is the case of most early gearing, the tooth curve of the bucket wheels of these pumps was an arc of a circle which approximated the true epicyloidal form, as shown by the accompanying diagram, Fig. 34.

Planer with Forming Attachment

Alvin Jenks greatly improved this planer by making it power driven, by relieving the cutting tool on the back stroke, by providing a power feed with automatic stop and by making the machine adjustable to different sizes of bucket wheels. This machine, which Prof. Joseph W. Roe believes to be the original gear tooth generator, is primarily a crank shaper, with the ram sliding upon a round rod and about which it is also fitted to swing. The radius of the swing is adjustable by raising or lowering the slide by screws, and the swing or feed is controlled by pinions meshing into quadrants fastened to the body of the slide. The pinions are turned step by step by a ratchet wheel, which is kicked by a dog on the toolslide at the end of each return stroke, the motion of the ratchet wheel being communicated to the pinion shaft by bevel gears. This mechanism is adjustable for coarse and fine feeds. The bucket wheel is held between centers in an adjustable fixture having an index plate like a milling machine. The relieving of the tool is accomplished by a wedge, a sort of slide within the toolslide, which forces the tool up to the cut when the stroke is forward but lifts it slightly when the stroke is to the rear. Automatic stopping is provided by lifting a pin clutch in the drive mechanism, by a lever operated by an arm on the toolslide, when the toolslide has traveled through the required arc.

To operate the generator, a bucket-wheel casting which has been turned, bored and pressed on its shaft, is mounted in the fixture with the proper index plate in place. By means of a gage, the center of the gear-tooth arc is lined up with the center of the rod on which the toolslide moves and the radius of swing of the tool is set to the radius of this arc. With the tool beginning to cut at the bottom of a tooth, the machine is started, and at each return stroke the tool moves a step toward

the top of the tooth, gradually swinging on the proper curved path. When the tooth is completely planed, the machine automatically stops, the operator indexes the gear to another tooth, sets the toolslide back and starts the machine. This cycle of operations is repeated for each tooth, the operator meanwhile tending to other machines.

Although the Fales & Jenks Machine Co. has a complete equipment of modern machine tools and cuts the teeth in its standard pumps in a powerful milling machine with formed cutters, these ancient machines are by no means idle, being frequently called into service to make repair parts or during the construction of special pumps. As there was no general public water supply in Providence until subsequent to 1870, hundreds of the small pumps such as shown in the diagram in Fig. 35, were sold to the householders of that city to draw water from wells and cisterns. Of late years, The Fales & Jenks Machine Co. has developed automatic electric fire-pumps for large buildings, the largest of which, Fig. 36, will deliver a thousand gallons per minute for high-pressure fire service. From its original and somewhat sacrilegious test upon the steeple of the South Meeting House in Windsor Village in 1828, Hubbard's Rotary Pump was developed under Fales & Jenks, to a point where it threw a powerful stream almost to the pinnacle of the Tribune Building in New York City, in a test made some fifty years later.

Practical Notes on Speeds and Feeds

By Ernest K. Steiner

IT HAS been my experience to find that only a small percentage of job-setters and foremen really know how to check the speed and feed of the machinery over which they exercise supervision.

For convenience we will use the term "Surface Speed" to designate what is variously called surface speed, peripheral speed, rim speed, cutting speed and circumferential speed. Surface speed is the number of feet on the surface which passes a given point in one minute and on a lathe, where the work is revolving, it is the number of feet of surface revolving past the tool. On a milling machine, where the cutter revolves, the surface speed of the cutter is taken.

For a circular object revolving about a center, the surface speed is found by multiplying the circumference of the object in feet by the r.p.m. of the machine. The circumference in feet is found by multiplying the diameter in inches by 3.1416 and dividing by 12, which gives the following formula:

$$\text{Surface speed} = \frac{\text{Diam. in in.} \times \text{r.p.m.} \times 3.1416}{12}$$

$$= 0.2618 \times \text{diam. in in.} \times \text{r.p.m.}$$

The more important elements which determine surface speed are the kind of material being machined, the type of machine being used, the condition of the machine, the kind and amount of cooling liquid available at the surface of the work, the kind and condition of the tool, and the amount of cut being taken. The table of surface speeds herewith has been compiled through years of experience and the data is given for high-speed tools with the exception of those designated in the note below the table. The grinding speeds were determined from wheels of various makes.

STANDARD SURFACE SPEEDS IN FEET PER MINUTE

Operation	Material						
	C. R. Steel	D. F. Steel	Cast Iron	Mall. Iron	Aluminum	Brass	Bronze
Drill	120	110	140	110	300	300	120
Grind	6,000	...	6,000	...	6,000	...	...
Gear Cut	100	100	125	100	.....	300	200
Mill	200	200	250	175	800	500	225
Profile	200	200	225	175	700	500	225
Turn	175	175	100-R *300-F	*190	1,000	250	175

* Stellite.

These figures represent standard surface speeds that should be used with ideal conditions prevailing, but condition of machine, lubrication, depth of cut, etc., also affect the speed and make it necessary at times to use a slower speed than shown in the table.

According to the table a surface speed of 300 ft. per min. should be used when finishing cast iron with a stellite tool on a lathe. Assuming that the work is 5 in. in diam., the proper r.p.m. can be determined by transposing the formula given above.

$$\text{R.p.m.} = \frac{\text{Surface speed}}{\text{Diam in in.} \times 0.2618}$$

$$= \frac{300}{5 \times 0.2618} = 229, \text{ approximately.}$$

If the diameter of the line shaft pulley is not great enough to give a sufficiently large r.p.m., a larger pulley should be placed and its diameter may be found as follows:

$$\text{Diam. of line shaft pulley} = \frac{\text{diam. of machine pulley} \times \text{r.p.m. of machine}}{\text{r.p.m. of line shaft}}$$

For instance, if a grinding wheel is to run at 750 r.p.m., has a 4-in. pulley, and is to be driven from a line shaft at 250 r.p.m., the diameter of the line shaft pulley required will be $\frac{4 \times 750}{250}$, which equals 12 inches.

The feed of a machine is equally as important as the surface speed but is of such a nature that it can not be tabulated, since the finish required on a piece governs the thickness of cut to be taken. Feed should always be given as a certain fractional part of an inch per revolution of work on cutter.

Practically all production machines have lead screws with plenty of adjustments for any desired feed, but if not, it is a comparatively simple matter to figure the gearing required between spindle and lead screw for a given feed.

Choosing Feed Gears

For example, assume that a feed of 0.0625 in. per rev. of spindle is required, and that the lead screw has 6 threads per inch. It is evident that the lead screw must make $\frac{6}{16}$ or $\frac{3}{8}$ rev. for one revolution of the spindle and this is, therefore, the gear ratio required. It is only necessary to choose gears whose tooth numbers have this ratio and in this case a 24-tooth gear would be placed on the spindle with a 64-tooth gear on the lead screw.

For drilling feeds, 0.004 to 0.007 in. per revolution will be satisfactory for drills under $\frac{1}{2}$ in. in diameter and 0.005 to 0.015 for the larger sizes.

Book Reviews

Engineering Kinematics. By William Griswold Smith, associate professor of mechanical drawing, College of Engineering, Northwestern University. First edition, 6x9 in., clothboard covers, 341 illustrations, 278 pages. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y. Price $3.

Here is a book which has a definite purpose in the field of engineering instruction, as it aims to tie up closely the theory of kinematics, which is the science of motion, with the actual practice of engineering. It is primarily a textbook, and its arrangement and general plan seem to make it well adapted for that purpose. For one thing, the use of illustrations in profusion, giving both diagrams of mechanical movements and views of machines employing the mechanisms, makes the book more readable and interesting. Then, also, the large number of problems given at the end of each chapter helps both instructor and student, as a great variety of questions of a practical nature is presented in them. Usually a typical example is worked out, as an aid to the student.

In the preface the author recognizes the tendency of recent books to combine the theoretical and the practical, and he says about his own volume, "while the fundamental principles of motion, its laws, its conversion, and its transfer, are given first consideration, the applications of these principles to the design of the innumerable agencies of transmission, transportation and production are given as much attention as the size of the volume will permit." In consequence, the author has used as the chief source of material for the work, not so much the textbooks as the large volume of industrial literature to be found in such works as catalogs and technical magazines. The material can thus be considered as largely first-hand.

It is reasonable to expect that the engineering touch to the work, and the illustrations taken from actual practice, will give the student a greater interest in the subject and bring home to him the importance of the science itself. A study of the science in the abstract is apt to be dull to a man interested in machinery primarily, and may not enable him to apply the principles. For this reason the book should be commended for teaching what can be done with a science, as well as explaining the science itself. The viewpoint is truly that of an engineer.

It must not be assumed that the theory has been slighted, as detailed explanations are given wherever necessary. Naturally, owing to the nature of the subject, the treatment cannot all be simple, and the study requires concentration on the part of the student. The text itself seems to be quite clearly and well written, although concise in the main. It should be sufficient to give the student a reasonably broad yet detailed view of the subject.

As for the scope of the work, a glance at the chapter headings might not be amiss. After a chapter on definitions and fundamentals, the properties of mechanisms are discussed. This latter material consists of explanations on the subjects of the determination of relative velocities and accelerations of simple linkwork parts; chains of linkwork; and direct contact pairs, rolling curves and friction transmission. Toothed gearing for both parallel and non-parallel shafts is then considered. After treating of cams, transmission by belt, rope and chain is discussed. The last chapter on chains of mechanism is followed by an appendix explaining a number of devices employed for controlling, regulating and adapting the standard mechanisms.

Lectures on Engineering Practice. Edited by John B. Whitehead. Published by the Johns Hopkins University, School of Engineering, Baltimore, Md. Paper binding, 90 pages, 6x9 in., price $1; illustrated.

In this little book Mr. Whitehead, dean of the Faculty of Engineering at the Johns Hopkins University, has gathered three lectures, given at the university during the past year under a general plan for furthering and improving undergraduate instruction in the methods and problems of the practice of engineering. One lecture each was given in the general subjects, Civil, Electrical and Mechanical Engineering, and they are authoritative, comprehensive and interesting. These lectures were open to the public, but Mr. Whitehead is to be congratulated for his endeavor to make them available to those who were not fortunate enough to hear them at the university.

For the Civil Engineering department, A. T. Goldbeck, Chief, Division of Tests, Bureau of Public Roads, was chosen to speak on the subject, "The Relation of Highway Research to Modern Road Construction." This lecture is not burdened with an overwhelming load of statistics, approaches the subject from the economic as well as the engineering standpoint, and traces the development of modern road building in a very instructive manner. The latest tests and up-to-date designs are discussed, together with the application of the knowledge gained to the practice of highway construction. The information will prove interesting, not only to the highway engineer but to all those who are interested in the development of good roads in this country.

Norman Wilson Storer, General Engineer, Westinghouse Electric & Manufacturing Co., spoke on "Possibilities for Steam Railway Electrification." A historical review of the development of the electric railway is given in which the important forward steps are explained in relation to the devices and discoveries which made them possible. Modern instances of railway electrification are clearly described and the possibilities for further development are discussed. Mr Storer handles his subject in a manner which lends authority to his words and clarifies the problem for one who is not fully conversant with all the details.

The Mechanical Engineering lecture was given by George A. Orrok, Consulting Engineer, the New York Edison Co. His subject was "Power Development—Past and Future." As is evident from the subject, this lecture traces the history of the development of power from the earliest times, not entirely from the standpoint of apparatus design, but more especially as regards plant efficiency and power costs. Mr. Orrok clearly explains the limitations of the steam power plant as regards further increases in efficiency and outlines the possibilities of future development.

To the average reader as well as the engineer, this book will be exceptionally instructive and interesting. All the lectures are well illustrated by means of diagrams and photographic illustrations.

A Recently Developed Automatic Screw Machine

BY SPECIAL CORRESPONDENCE

Unusual design of tool slide—Feed motion through worm gearing—Cam-operated cross slides—Four work spindles mounted in combination bearings—1¼-in. bar capacity and 6-in. machining and feeding length

AN INTERESTING development in the field of automatic multiple-spindle screw machines has been completed by the Detroit Automatic Machine Co., 12380 Wisconsin Ave., Detroit, Mich., and the salient features of the machine, as offered for manufacturing purposes, are shown in the accompanying illustrations. The aim of the development company has apparently been to secure simplicity of design and ease of operation, together with rugged and durable construction.

A front view of the machine is shown in Fig. 1, and illustrates the relative positions of the driving-head, tool-slide, cross-slide and work spindles. Fig. 2 is a rear view of the machine and shows the spindle cam, the work feeding device and other mechanism.

The constant-speed driving pulley, seen at the left in Fig. 2, is mounted on a shaft in the head which is geared to the shaft at the center of the machine. This shaft passes through the tool slide and drives the spindles in the revolving head. The pulley shaft is also geared downward to the feeding mechanism.

The tool slide, of rather unusual design, as shown at the center in Fig. 1, has a rack on its bottom surface which meshes with a pinion of small diameter and long face. As will be noted from the illustration, this slide is rectangular in section with comparatively large surfaces for the attachment of tools, and has its bearing directly on the top of the bed.

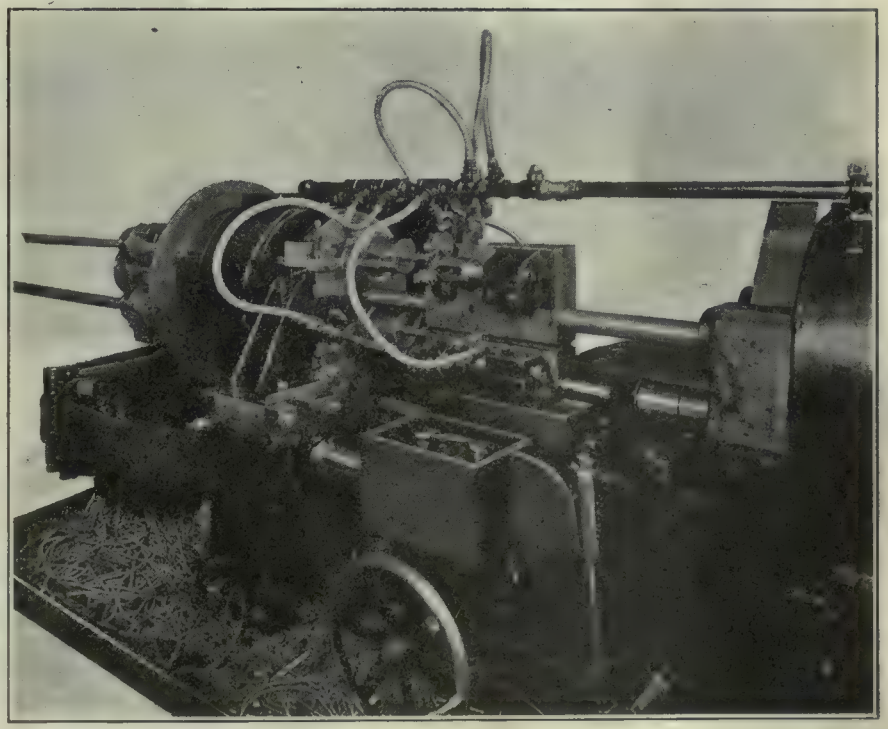


FIG. 1—FRONT VIEW OF THE DETROIT AUTOMATIC SCREW MACHINE

The feed pinion is on the same shaft as the worm wheel, shown below the driving pulley in Fig. 2, and another shorter shaft is geared to the worm wheel shaft by spur gears so that the two shafts run in opposite directions. A pinion on the second shaft also engages the rack on the tool slide. Some of the teeth on both rack pinions are omitted, and they are so timed that, after the worm wheel shaft pinion completes its function of advancing the tool slide, the second pinion, rotating in the opposite direction, engages the rack and returns the slide.

The tool slide, in its extreme forward position, is locked during a dwell period, which is provided to finish square shoulders, etc., on the work. It is also locked at its rearward position so that it will not lose its proper timed relation with the driving pinions.

The worm shaft is driven by a gear mounted in the head and driven from the pulley shaft. The drive from this gear consists of a pair of change gears for the fast return speed, and a planetary reduction arrangement for the slow feed. The worm is driven by these mechanisms through a clutch, which is thrown by a lever mounted on the bed and actuated by trip dogs on the worm wheel. One dog is fixed in position on the wheel and trips the clutch to the quick return speed at the end of the forward travel of the tool slide; the other is adjustable and engages the forward feed.

The feed change lever, although actuated by a spring and plunger, is arranged so as to be positively thrown into neutral if the spring on either side fails to function properly, so that the danger of jamming the tools into the work is guarded against. The worm is not driven directly by the feed changing clutch but through a slip-jaw clutch which is arranged to release under a heavy

load such as might be caused by the machine jamming in any way. This clutch may be thrown in and out of engagement by a starting and stopping lever at the front of the machine.

The bevel gear, shown at the right of the worm wheel in Fig. 2, is connected to a handwheel at the front of the machine, so that when the power feed is thrown out the feed may be operated by hand.

The brackets which support the cross-slides extend downward the full depth of the bed, and the slides are mounted in dovetailed guides, provided with taper gibs. Two take-up springs are provided on each slide as well as a positive return cam for safety.

The actuating cam for driving the cross-slide toward the work is located directly under the center of the slide and transmits motion to a roller mounted on a lever which has a toothed sector at its top. The teeth mesh with a rack on the under side of the slide and the fulcrum of the lever is at the lower end of the cross-slide bracket. Special cross-feed cams can be made for various jobs. The camshaft is geared to the worm wheel shaft previously mentioned.

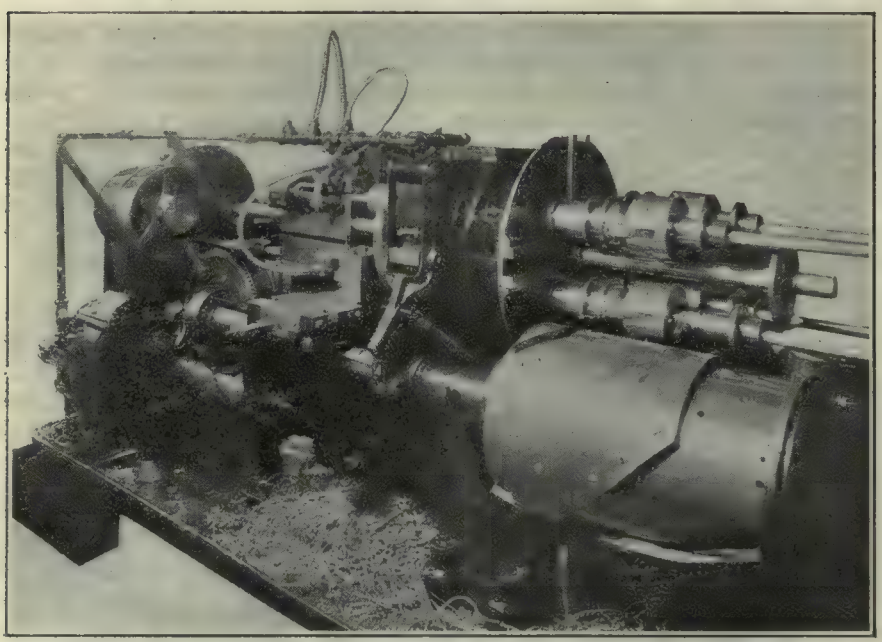


FIG. 2—REAR VIEW SHOWING CAMS AND REVOLVING HEAD

The cross-slides are made wide and long to stand the thrust of wide forming tools, and are of sufficient length to permit the use of a so-called double-deck tool post as shown in Fig. 1. The cutting lubricant system is evident from the illustrations.

The housing for the four work spindles is a separate member, machined in halves and bolted into a recess in the bed. The spindles are machined from high-carbon steel and the center portion, upon which the drive gear is mounted, is of larger diameter. On each side of the gear flange a hardened and ground sleeve is fitted to the spindle and these sleeves provide the journals for the spindle, running in cast iron sleeves forced into the revolving head.

The spindles are driven by a helical gear on the center shaft previously mentioned. A ball thrust bearing and suitable adjustment is provided for spindle end thrust and both the drive gearing and thrust bearings are located inside the housing in an oil-tight compartment. In addition to the thrust and sleeve bearings, a radial ball bearing is located at the front end of the spindle directly behind the collet cap. It is claimed that the ball bearing will absorb the heavier shocks while the straight bearings prevent chatter, and that the arrangement gives a better bearing than the taper sleeve type.

The revolving head, which carries the spindles, is indexed by a Geneva-stop motion and the slotted intermittent plate of the device can be seen in Fig. 2. The Geneva crank is carried on the cam drum shown below the plate. The rectangular locking bolt for the head is located on the center line of the machine in Fig. 2, and is positively withdrawn by a cam. Two springs are provided to seat the bolt firmly in the notch when indexing has been completed. The notch or seat for the bolt has hardened steel sides which may be machined or replaced to correct errors in indexing. The locking bolt also has a taper gib for taking up wear.

The collet-closing and stock-feeding mechanisms are actuated by the cam drum on which the Geneva crank is carried. This drum is on the same shaft as the lock bolt cam and the rear cross-slide cam and is driven through bevel gears from the worm wheel shaft. The cams, which operate the collets, are fixed to the drum, but the cams which draw the stock feeding tube back preparatory to feeding, are removable. The cam which advances the feed tube is permanent.

The cam followers consist of two pairs of levers linked together at one end and pivoted at the other on the frame. The shoes which operate the mechanisms are mounted on these levers and are thus given a straight line motion without the use of the usual slides. Another advantage of this arrangement is that a leverage is provided so that the total force required to close the collet is not carried by the cam.

The stock feeding is not started forward until after the head has started to index and this arrangement allows the placing of the stock stop in such a position that the cut-off or fourth position is free from obstruction and available for such operations as threading, pointing or reaming. A spring is arranged in the feeding drive so that the feeding fingers will not be broken as sometimes happens at the end of a bar. The collet is of the stationary type and has a long bite with two grips arranged to move in a straight line against the work.

Development of Machine Tools in New England—Errata

In the first article there was an error in the geneological chart on page 2. In the center column near the top, the words native iron should have been native born.

In the second article, page 140, Samuel Morey is said to be from Oxford, N. H. This should have read Orford, N. H.

In the fifth article, in the drawing of Cooper's Rotative Piston (Fig. 26, page 390) the positions of the inlet and outlet should be reversed.

Plant Depreciation

By Hamish S. Reid
Upper Burma, India

IT IS of happy augury that of recent years engineers are showing more interest in the principles of depreciation. They realize that a knowledge of this continuous factor is essential and must be of an intimate nature if efficient planning and successful economies are desired. In modern days when rule-of-thumb methods and crude conventions are giving way to methods founded on investigation and experience, it rather behooves engineers to use in monetary calculations, speaking with regard to the plant, a similar degree of accuracy and exactitude to that which is used in workshop practice. Depreciation can no longer be ignored in estimates and shop mathematics. It is, one must realize, something real and actual, and it is of as much consequence to the engineer as it is to the financier and accountant.

Depreciation Defined

Depreciation of a plant may be defined as the diminution of value, due either to the physical effects of wear and tear, to the economic effects of obsolescence, or to both. The monetary provision allowed to make good, when necessary, the physical depreciation is termed "renewals," and provision for the economic depreciation, "improvements." The difference between these two funds must be clearly borne in mind.

The plant may perhaps possess the physical capacity to serve competently and constantly for a further duration of many more years but, due to pressure and influence exercised by trade competition, it must be scrapped for the substitution of another plant containing up-to-date improvements or economic advantages. Thus, while the renewals fund provides money for the plant to be replaced when worn out, disused, or scrapped, the charges made for improvements permit the utilization of advantages brought about by industrial progress and invention.

For adequate provision against depreciation the division of the charges made into the two above funds is important. The rate of decrease in value of a plant from the economical point of view will be moderately steady and constant but it will depend entirely upon the measure of industrial invention and advancement. From the physical point of view, however, the depreciation of a plant must be reckoned in units of work rather than in units of time or progress.

Depreciation Rates Vary

There is neither rhyme nor reason in asserting that a plant working at its top speed or stressed to its maximum capacity would depreciate at a rate similar to that of another plant lying in a state of rest or semi-rest. For both funds charges must be made accordingly. The improvements fund is substantially a fund for the use of the works management, for it is a fund through and by which this department can effect economies and improvements.

Depreciation primarily affects the engineer. It is his function not only to supply accurate data for the use of the financier and accountant, but he himself will need such information for his own shop and office calculations. The data that is required of the engineer concerns the present value, the life, the age, and the residual value of the plant, the ultimate aim being to accurately determine the annual charges. The extent of the annual charges cannot be arrived at by one estimate alone but only by a series of periodic examinations extended over a length of time, and by such treatment the results obtained, rather than being a matter of sheer haphazard prediction, are of practical use. All information collected should be systematically tabulated for future reference. Figures set down by manufacturers are at times not without bias and should, no doubt, be accepted with some discrimination and care.

Previous to the purchase of a new plant of any magnitude it is first necessary to decide, by taking into account the annual charges, which of two or more alternative plants will be the more economical. Depreciation being an annual charge must also be considered.

Let us consider two hypothetical plants as follows:

	Plant "A"	Plant "B"
Initial cost	£30,000	£22,000
Return on capital at 5 per cent	1,500	1,100
Renewals } Depreciation	1,300	1,800
Improvements } Depreciation	1,200	1,400
Operative expenses	2,000	2,400
Maintenance	600	750
Total annual charge	6,600	7,450

Thus, and this case is not untypical, the plant having the higher initial capital cost has the lower total annual charges which, extending over a number of years, will multiply into a large sum and amply justify the higher original outlay. By the substitution of the present value for the initial cost it may be determined what economies, if any, would be effected by the scrapping of the existing plant and the installation of the other.

Depreciation in an Oil Field

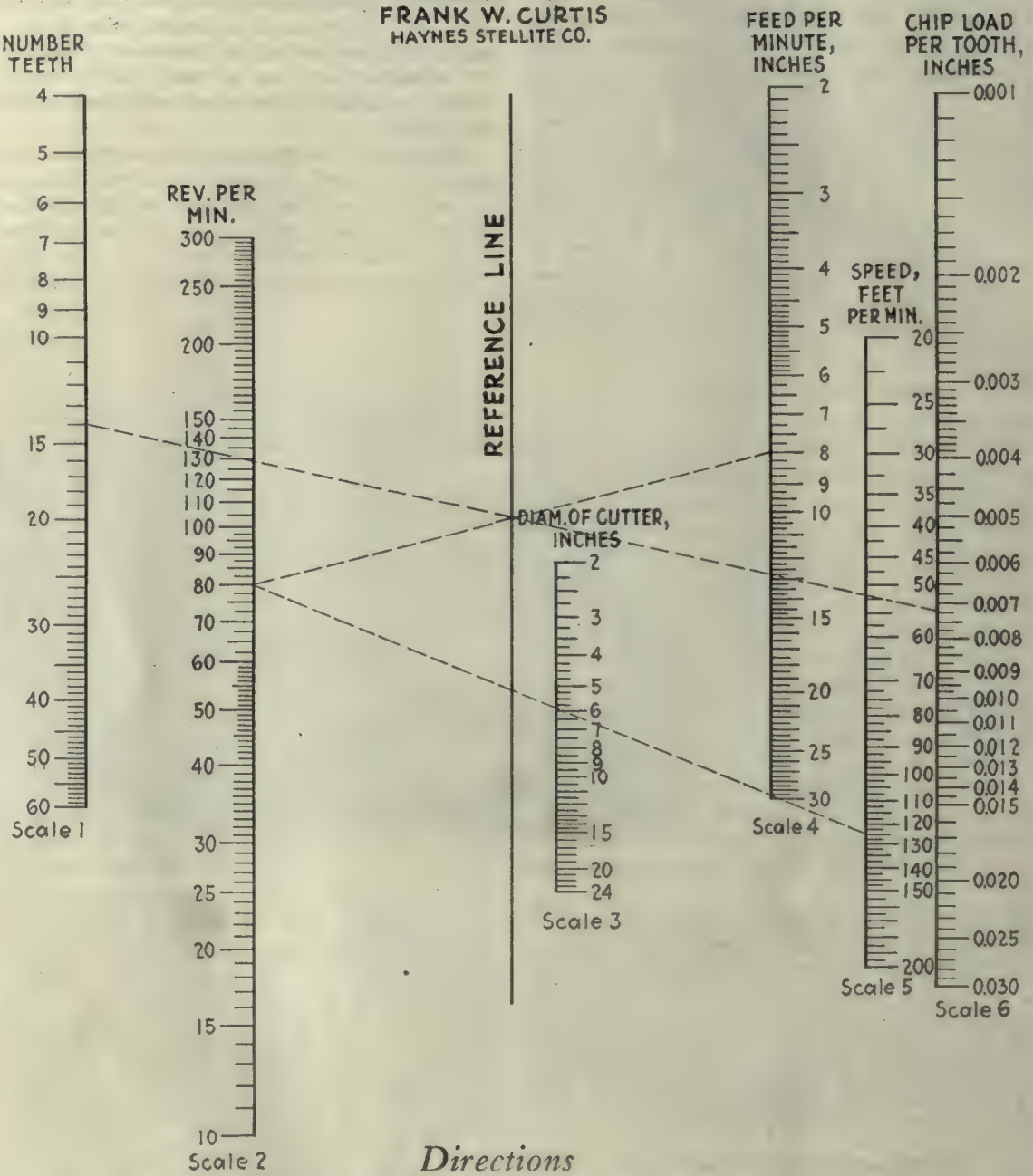
The author, in his position as constructional engineer in a large Eastern oil field, became strongly at variance with the method adopted in that field to value steel pipe. Upon the issue of new pipe to a well the system in vogue was to credit the well with the full value of the pipe. Later, upon subsequent withdrawal and removal from the well the pipe was valued at 90 per cent of its full value and, after being re-threaded, it was issued to another well as good and 100 per cent pipe. The above 10 per cent difference in value was debited against the well as charges for the use of the pipe and credited to the machine shop as "payment" for re-threading. This cycle of transfers continued until the pipe, either by wear or tear or by corrosion, became useless for drilling purposes. A final charge of 10 per cent of the first cost was then made against the last well and the remaining 90 per cent was credited to a scrap pipe account.

The above, apart from being an untrue and unfair allocation of cost, renders erections and constructions made from secondhand pipe prohibitive unless there happens to be a large amount of scrap pipe in hand. If a price proportionate to the condition of the pipe had been charged—for example 20 per cent—timber and such materials which actually are more expensive would not have had to be employed.

Depreciation enters, as it has been the endeavor of these few notes to demonstrate, into all engineering monetary calculations. A plant shrinks in value physically and economically and, until this is intelligently appreciated, satisfactory measures cannot be taken to avoid losses.

CHART FOR CALCULATING SPEEDS AND FEEDS OF SOLID AND INSERTED-BLADE · MILLING CUTTERS ·

PREPARED BY
FRANK W. CURTIS
HAYNES STELLITE CO.



Directions

(1)—To obtain table travel (Feed per Minute) connect the "Load per Tooth" Scale (6) with the "Number of Teeth" Scale (1). Then connect "R.P.M." Scale (2) through the point where the first line crosses the Reference Line, and carry over to Scale (4), which gives "Feed per Minute."

(2)—To obtain "Chip Load per Tooth" connect "Feed per Minute" Scale (4) with "R.P.M." Scale (2). Then connect "Number of Teeth" Scale (1) through the point where the first line crosses the Reference Line, and carry over to Scale (6), which gives "Chip Load per Tooth."

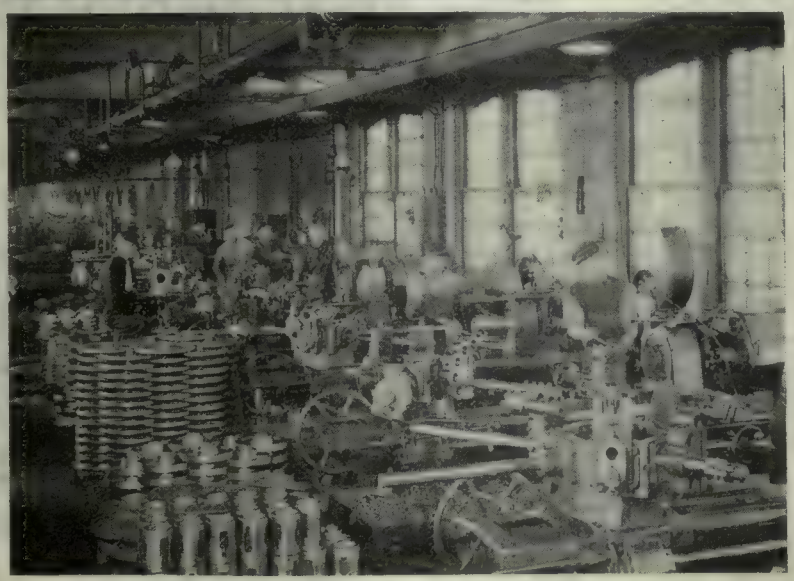
(3)—To obtain "Speed in Feet per Minute" connect "R.P.M." Scale (2) with "Diameter of Cutter" Scale (3) and read speed on Scale (5).

(4)—To obtain "R.P.M." connect "Speed" Scale (5) with "Diameter of Cutter" Scale (3) and read "R.P.M." Scale (2).

The chart is valuable for the following uses:

(1) Short cut for figuring speeds and feeds;
(2) For checking jobs in operation;
(3) For comparing operations (variations);
(4) For estimating purposes;
(5) For research work on milling cutters.





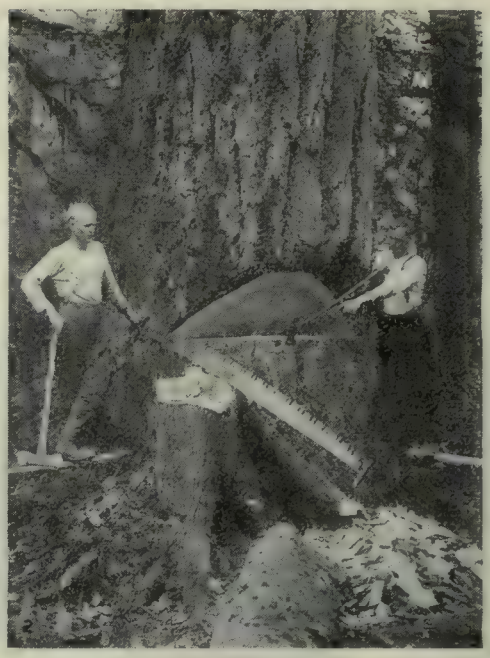
Where Machine Tools Are Made

The Warner & Swasey Company

Founded 1880

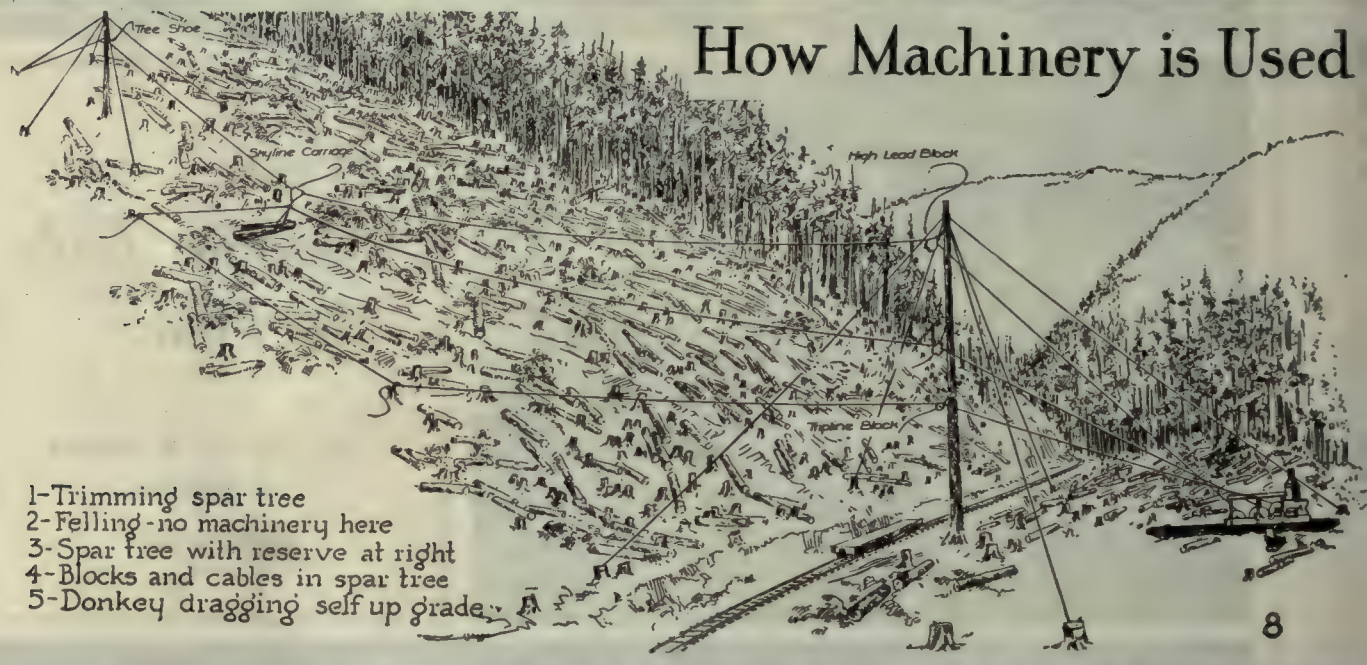








How Machinery is Used



1-Trimming spar tree
2-Felling-no machinery here
3-Spar tree with reserve at right
4-Blocks and cables in spar tree
5-Donkey dragging self up grade











in Big Timber Logging



6 –Runway logs driven through tree
7 –Double engined yarder and loader
8 –Diagram of side hill work
9 –Handling timber over a hill
10 –When the job is done

9



10







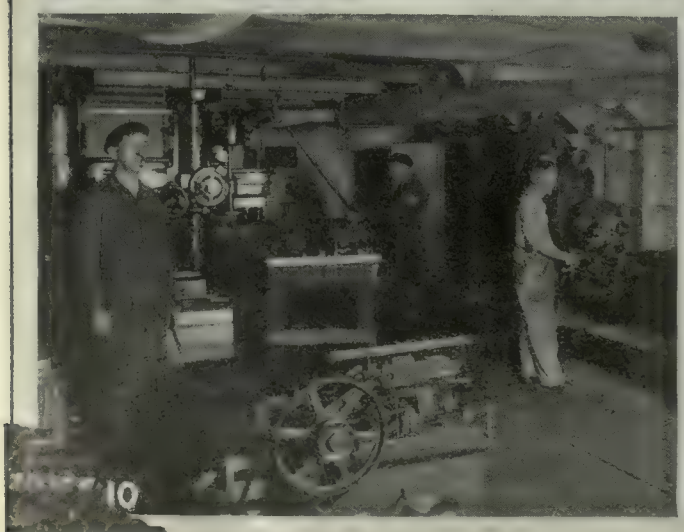
Machine Tools Afloat

The views shown herewith are from the Port repair shop of the S. S. Leviathan.

The equipment comprises the following machine tools:

Le Blond 33-in. x 14-ft. heavy-duty lathe. Racine power hack-saw. Lodge & Shipley 18-in. x 8-ft. geared-head lathe. 26-in. Stock bridge shaper. Morris radial drilling machine with 3-ft. arm. Le-Blond 18-in. x 10-ft. lathe. No. 35 Ranscombe grinding stand. All the machines but one are direct motor driven.

The Starboard machine shop is equipped with practically obsolete German machines which have not been replaced by ones of American manufacture.





It Pays to Replace—

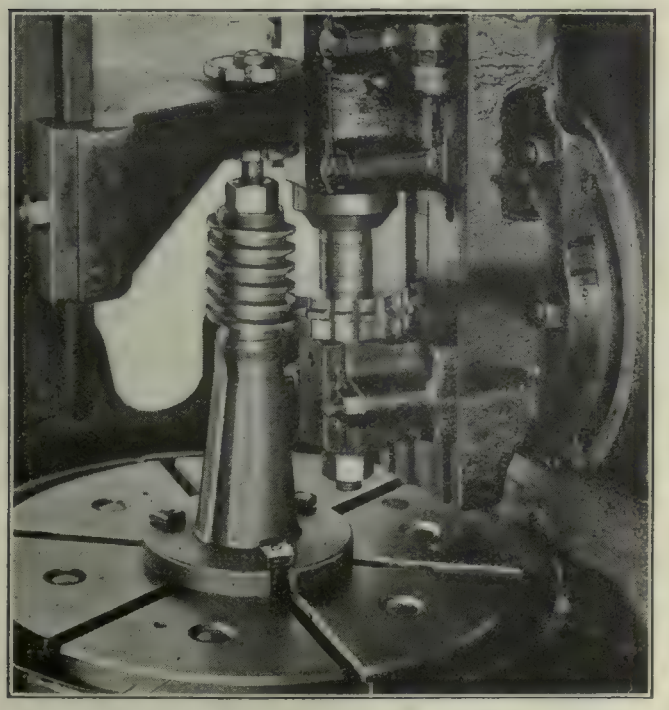
How a Shop Saved by Replacing Old Shop Equipment with New Equipment

These articles won honorable mention

By Thomas E. Warburton
General Foreman, Fitzgibbon & Crisp, Trenton, N. J.

ONE of our main products is a transmission mechanism for a rotary dump. In this transmission mechanism we were using a bronze worm, which was found not serviceable for the work it had to do, so it was decided to use a worm made of chrome-nickel steel. One worm was required for each dump and the approximate number used in a week's production was twenty-five.

Our usual method was to thread the bronze worms in an engine lathe which was a quick and cheap method. When we started to thread the chrome-nickel worms in the lathe, our troubles commenced. The material would drag and tear, and the length of time taken to finish the threading made the cost excessive. We could not



GEAR HOBBING MACHINE ARRANGED FOR HOBBING WORMS

think of a thread milling machine, as the only use we would have for a machine of that kind would be threading these worms. We had three Gould & Eberhardt gear hobbing machines, and seeing an article in the *American Machinist* describing a system Gould & Eberhardt had developed for hobbing worms on gear hobbing machines, we investigated the subject and decided to have one of our machines changed, so we could hob our worms.

We got everything ready for the trial, but were skeptical as to the promises of the builders of this improved hobbing system as to production. But after a few days the operator got used to the method of loading and unloading and he was producing, when necessary, three worms per hour, just as the builders of the machine guaranteed.

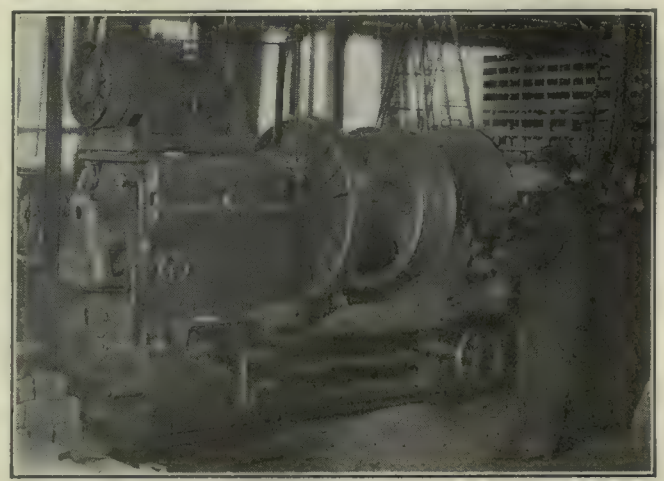
Today we can produce all the worms we require for our week's production in nine hours. The hobbing makes a good job, and we are well pleased with the change we made. The cost for making the change was approximately $340. If we had continued the old system of threading in the lathe, we would have had to purchase another lathe, but our shop being a small one we did not like the idea of expending, say, $1,800 when we could get the results required at considerably less cost.

The operator attends to three hobbing machines when he is hobbing worms, but when we cut the worms in the lathe, it required a skilled lathe hand to give his attention to one machine.

The moral of the story is this, it pays to investigate. Herewith is a photograph of the set up, ready for cutting the worms.

By Edwin C. Rosenberg
Factory Supt., F. Rosenberg Elevator Co., Milwaukee, Wis.

IN ORDER to increase production on a specially built "Advance" lathe having a cone-pulley drive, we decided to equip it with some type of variable speed direct-drive unit. Owing to the fact that we were unable to get direct current, we eliminated the direct motor drive, and a multi-speed a.c. motor would not give us the range in speeds that we required.



OILGEAR AND MOTOR MOUNTED ON LATHE

In going through the advertising section of the *American Machinist*, which we do with every issue, we came upon the advertisement of the Oilgear drive. We investigated this equipment at once and found it to be the ideal variable speed drive for our purpose. We placed the order within a week's time for one, type-M Oilgear transmission. We mounted this unit on a bonnet over the headstock, as shown in the illustration, and connected the transmission to the lathe spindle with a Morse silent chain.

The Oilgear transmission was driven with a 7½-hp. 1,800 r.p.m. squirrel-cage motor made by the Northwestern Mfg. Co. The motor runs continuously and the control for the transmission consists of the small wheel back of the face plate. Due to the fact that only short jobs are handled on this lathe, the control is within easy reach of the operator.

Ordinarily this size of lathe would require a 15-hp. motor for direct drive, but with the Oilgear equipment we are able to cut the production time 50 per cent, due to the great range of speeds, positive drive and instant control. Shutdowns have been eliminated, for, after more than a year's severe service no trouble has been reported.

By Thomas E. Warburton
General Foreman, Fitzgibbons & Crisp, Trenton, N. J.

AMONG other things, we make transmissions for power dumps in which there are four holes tapped ½ in. U.S.S., and four holes tapped 1¼ in. 20 threads. The holes were tapped by hand and, in addition, studs were inserted in the ½ holes, all the work being done by the piece. Many of the holes were not tapped straight and the studs would stand at an angle, requiring them to be straightened before the parts could be assembled. As the studs were heat treated and pretty hard, many of them were broken in straightening, causing trouble and expense in getting the broken ends out of the holes.

To get out of this trouble, we bought a Jarvis tapping and stud setting machine, equipped for drilling and tapping the holes and setting the studs in one setting of the work. This machine enabled us to cut the piece work price 25 per cent and, what is of greater importance, the holes are tapped straight, so that the studs stand at a right angle to the face of the work.

We have had this machine in use for nine months and we have not broken a tap in that time. Its use has saved us money, worry and uncertainty.

By Harry R. Carr
Inspector, Ward Motor Vehicle Co., Mt. Vernon, N. Y.

THE value of using the latest labor- and time-saving equipment was demonstrated at the plant of International Motor Co., Plainfield, N. J., where the writer was formerly employed as a block tester.

Wristpins were formerly ground on a standard type of cylindrical grinding machine, which necessitated their being put on an arbor and placed between the centers of the machine. All this took time and as the limits were very close +0.0001, —0.0002—the net production was about ten pins per day per machine.

As business grew it was realized that this method was entirely too slow and costly, so two Sanford centerless grinders were ordered. When put into service, these machines increased the production about 400 per cent and replaced five of the standard type of machines.

Another machine to be replaced at the same plant, was an old radial drilling machine which had been used for drilling and tapping crankcases. It was replaced by a new Cincinnati radial drilling machine of improved design and the production was boosted about fifteen per cent.

If new equipment would not save money, concerns like the International Motor Co. would not spend thousands of dollars to replace machines still capable of producing acceptable work.

Over-head Oxyacetylene Welding

By C. J. Nyquist

Over-head welding on steel or welding on the under side of steel plate or other articles of steel requires thorough knowledge of proper heat distribution and the homegenous spread of the welding material. Practice may enable the welder to make the material stick in place, more or less loosely adhering to the base metal, but sound over-head welding simply cannot be done unless the heat of the flame and every particle of the added metal are distributed in just the right way. The injurious so-called pool welding of steel is of course impossible in over-head welding on account of the position of the work. Utmost care must be used in handling the welding rod.

A discussion with steel welders who have practiced over-head welding is quite illuminating. Some declare that a very stiff flame facilitates welding over-head while other welders make special claims for certain choice welding rods, and some others rely on a more or less fancy manipulation of the torch. Good welding material is certainly always desirable, but high gas pressure is neither necessary nor conducive to good results. The idea that the molten material must be blown on or driven on to the base metal by force is quite erroneous, in fact, much better welding on steel, overhead or otherwise, is done with what is generally termed a soft welding flame.

A drop of hot steel will retain its round shape when deposited on a cold steel plate but when the plate is heated to the same or very nearly the same temperature as that of the deposited metal the spread is readily accomplished. In other words, when the base metal is heated sufficiently the added material will spread without difficulty.

Experienced welders know that by increasing the heat in any direction the molten metal from the welding rod may be made to follow the flame. They also know, or should know, that so-called chasing or pushing the weld metal or the attempt to force the molten or nearly molten weld metal forward results in overlapping and consequently in poor welds. While it is self-evident that the metal cannot for obvious reasons be heated to a liquid state when welding over-head, it is equally true that overheating of the weld metal (the added material) in all steel welding is responsible for many failures.

Successful over-head welding most certainly demands considerable practice, steady hands and the will to overcome difficulties but even more important than these is the proper application of the first principles of oxyacetylene welding—simultaneous and uniform fusion of the base metal and the weld metal.

From the *Journal of the American Welding Society.*

Casting Crown Brasses and Hub Plates in Place

By FRED H. COLVIN
Editor, *American Machinist*

A method which saves much machining and is giving good results on heavy locomotives—The molds and how they are handled—Casting the oil grooves

AMONG THE advanced practices at the Scranton shops of the Delaware, Lackawanna & Western Railroad is their method of casting the crown brasses in driving boxes and also the hub plates for taking the wear due to the side thrust of the driving wheels. This method saves a tremendous amount of fitting and is producing excellent results, even on the heaviest locomotives. It saves the machining of the driving box to receive the crown brass, and also the machining of the outside of the crown brass itself, as well as the pressing it into the driving box, and the application of a hub plate.

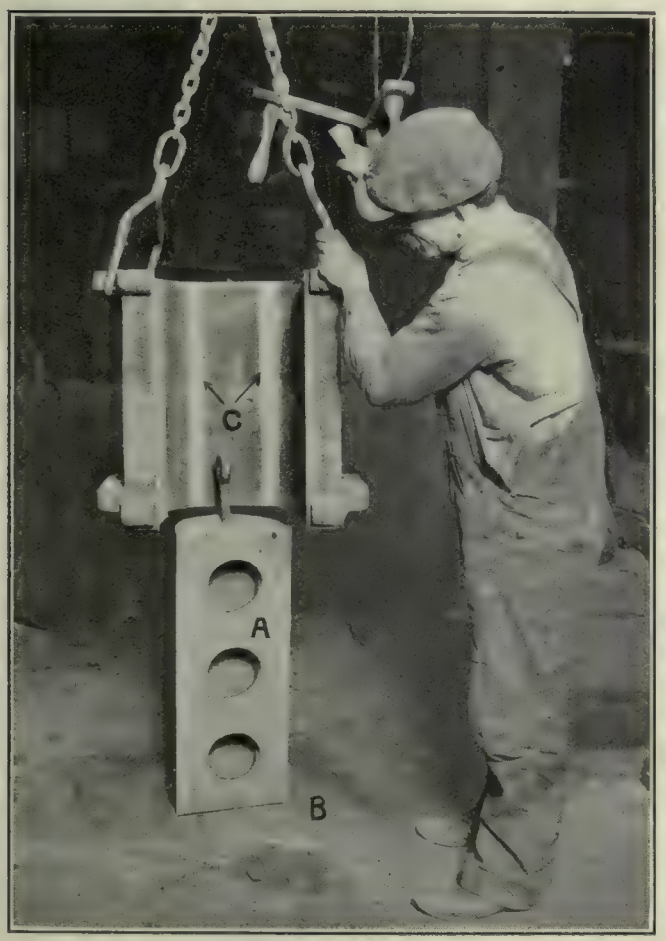


FIG. 1—LOWERING BOX OVER CORE.

By the method shown, both the crown brass and the end or hub plates are cast at the same time. The core or cast iron chill *A* is placed on the metal plate *B*, Fig. 1, the other side of the core or chill being plainly shown in Fig. 4. The driving box has two dovetailed strips planed in the top, as shown at *C*, and the end is also undercut to help hold the wearing plate on the end.

The box is then lowered over the core by a suitable hoist, as in Fig. 2. Side plates are put in the grooves shown in the core at *A* and *B*, and form the lower edge of the crown brass, preventing the metal from flowing in this direction. Then the retaining ring *C* is placed in the upper part of the turned portion on the end of the box, forming the mold for the wearing plate or hub plate on the end.



FIG. 2—SETTING UP PLATE RIMS.



FIG. 3—POURING THE BEARING



FIG. 4—CORE REMOVED FROM COMPLETED BEARING.

Other pieces are placed between the end of the ring *C* and the core itself and all thoroughly luted with fireclay, after the ring has been clamped in position, as shown in Fig. 3. This illustration shows the complete mold, and it will be noted that another core has been placed against the lower side of the driving box in order to steady it against movement should it be accidentally touched by the ladle. In Fig. 3 is shown the pouring operation and also the two side strips in position, these being held by keys or wedges at the upper end.

In Fig. 4, the ring has been removed, the keys and side pieces withdrawn and the core itself pulled forward out of the mold, so as to show the complete bearing in the driving box. This illustration also shows how the oil grooves are cast in place by ribs on the core. The ring may be seen at *A*, one of the wedges at *B*, and the two clamps at *C* and *D*, together with one of the small wedges *E* by which the clamps are held in position.

This method of casting crown brasses and hub plates at the same time has effected a considerable saving and is a marked advance in driving box work. The driving box shown is 12 in. in diameter by 20 in. long.

The core or cast-iron chill is first heated and coated with tar, and after each pouring operation it must be again coated with tar while still hot. After the mold is completed and ready to pour, crude oil is applied with a swab to prevent formation of gas holes.

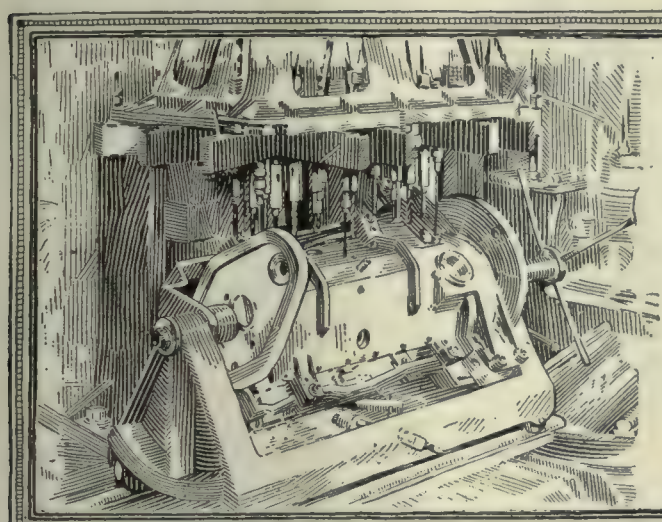
The Automotive Industry in Australia

The annual sales of motor cars in Australia now amounts to about 16,000 according to an average of the estimates and there is every reason to believe that the demand will continue to grow, especially when it is realized that the buying capacity of nearly every Australian is probably slightly higher than that of the average American says a report to the Department of Commerce from Consul H. H. Balch, Adelaide. Cars in Australia are used essentially for business purposes. Because of the great area of the country the farmers and pastoralists have found them indispensable.

In both the motor car and the motor truck trade, as well as in motorcycles, American makes predominate. American motor car dealers estimate that practically 75 or 80 per cent of the motor cars sold in Australia, are manufactured in the United States or in American factories established in Canada.

Motor car body-building and tire manufacturing under the stimulus of high tariff duties have grown to be very important industries in Australia. At present Adelaide is the seat of the motor body industry. One Adelaide plant alone employs over 800 men and now turns out approximately 10,000 motor bodies a year, valued at about 830,000 pounds sterling, which is about 60 per cent of all the motor bodies manufactured in the country.

Unlike the motor vehicle trade which, with the exception of motor bodies, must depend almost wholly upon foreign manufacturers, tire rubber manufacturing has become an important arm of Australian industry and about 50 per cent of all the tires and tubes sold in the country are the output of her own factories. The remaining 50 per cent are imported from the United States, France, Canada, England, and Italy. About half of the imported tires, or 25 per cent of all tires sold in the country come from the United States.



Tool Engineering

By

Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Indicating inspection gages for gears—Fixtures for determining accuracy of pitch circle—Determining smoothness of running—Inspecting gears by projection

IN ADDITION to the gear testing devices already considered, another fixture which is designed for testing the accuracy of the pitch line is shown in Fig. 561. In this example the base of the fixture *A* is of cast iron, and on it is mounted in a fixed position a stud *B* on which a master gear *C* is free to revolve. The other gear *D* which is to be tested is placed upon the stud *E*, which is mounted on a movable slide *F*. This slide can be moved backward or forward by means of the handwheel *G*, which operates the screw *H*. The coil spring *K* is placed between the boss *L* and the lug *M* in order to keep the gears in contact.

The slide *F* carries on one side a bracket *N*, on which is mounted a dial indicator *O*. The push rod of this indicator comes in contact with the end of the lever *P*, which is pivoted on a pin *Q* at its lower end. Adjustment for different sizes of gears can be readily obtained by a movement of the screw *R*, which can be adjusted by means of the knurled handle *S* and can be locked by the check nut *T*. When adjusting for various sizes of gears a master gear must be used to obtain the correct setting.

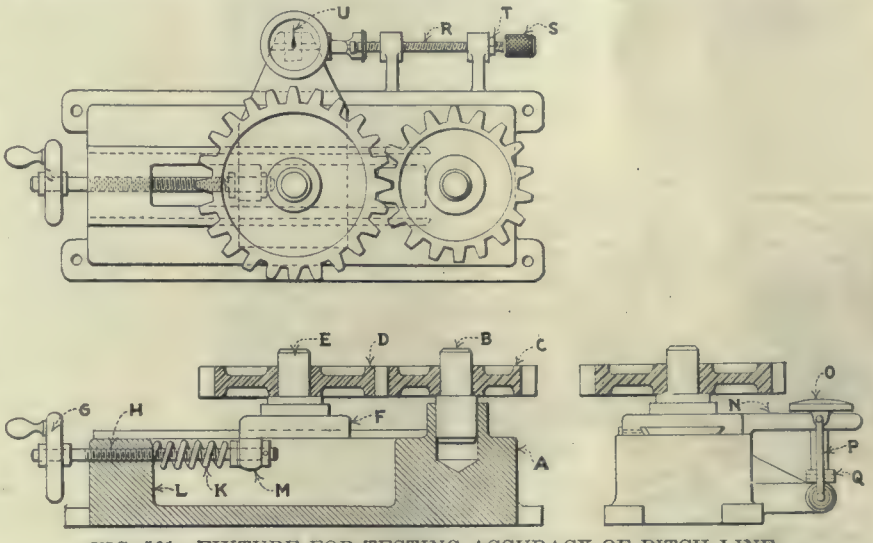


FIG. 561—FIXTURE FOR TESTING ACCURACY OF PITCH LINE

When the operator uses the fixture he places the gear in position as shown at *D*, and then moves the screw *H* forward until the spring *K* forces the gear into position. By revolving the gears in mesh the indicator pointer *U* will fluctuate both sides of the zero mark and thus show inequalities in the cutting.

This fixture is not a particularly expensive one and its adjustable features make it possible to adapt it to several sizes of gears. It is advisable to give a word of caution here in regard to the use of master gears. It is never advisable to attempt to determine the accuracy of the pitch circles of two gears at the same time. One of the gears should always be a master gear which has previously been tested and found to be correct. Otherwise the test will simply show inaccuracies in pitch lines, but will not tell which gear is incorrect.

Another method which can be used for determining errors in the accuracy of the pitch line and for imperfect teeth is shown in Fig. 562. This fixture is designed for testing a single gear, but the same principle can be applied to an adjustable fixture which can be so arranged that several sizes can be tested by making simple adjustments. The designer should remember that whenever it is desirable to test the rolling action of two gears, the errors which appear should be multiplied in order to make them more apparent. Unless a fixture can be so made that it will be sensitive and at the same time multiply inaccuracies, it is very little better than a hand test. It is easy to understand that the sense of touch is of little value in testing gears when running them together, because the "high spot" on a tooth can scarcely be detected by the operator. On the other hand, if the gears are so arranged that the high spot causes an appreciable fluctuation of a needle over a graduated scale, the error can be quickly detected.

Gears for certain kinds of work are often made in pairs, so that they must always be kept together and

For the author's forthcoming book. All rights reserved.

assembled so as to mesh in a certain way in the finished machine. The pinion and ring gear of an automobile are often made in this way, and it is usually advisable to purchase them in pairs in the event of breakage. Spur gears, however, are not usually paired, and if they are tested with master gears as suggested, there is usually little trouble in obtaining quiet gears.

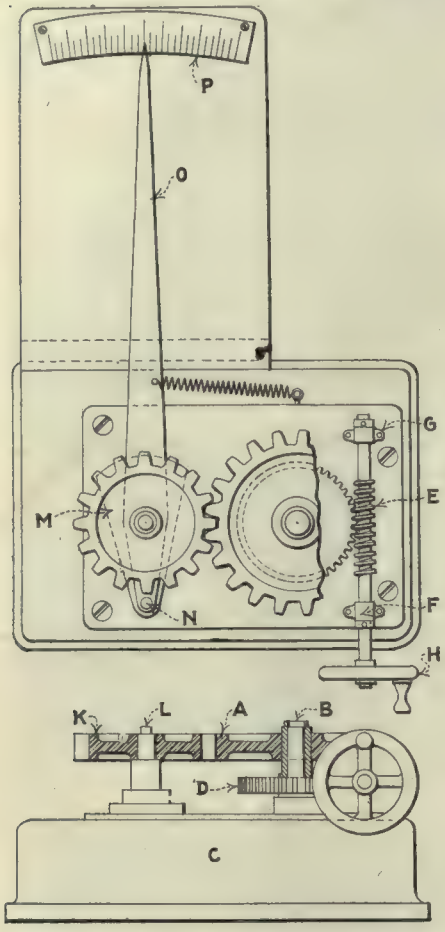


FIG. 562—TESTING FIXTURE FOR SPUR GEARS

Referring to the illustration, the master gear *A* is mounted on a stud *B* set in the base *C*. To this stud is keyed a gear *D*, which meshes with a rapid-action worm *E*. The worm shaft has bearings at *F* and *G*, and the handwheel *H* provides a means of propulsion. It will be noted that the worm has a steep pitch in order to produce a fairly rapid movement. The master gear *A* remains in position at all times while a certain set of gears is being tested. The other gear *K* which is to be examined for accuracy is placed on the stud *L*, which is mounted on a sector *M* pivoted at *N*. A long indicating pointer *O* extends to the graduated scale *P*.

It is apparent that when the handwheel *H* is turned the gear *A* will mesh with gear *K*, which will revolve on the stud *L*. As it revolves any high spots on the teeth will cause it to creep away from the master gear, and the amount of the fluctuation will be indicated on the scale *P*. The designer can adapt this principle to other varieties of gears, and can even make the fixture adjustable so that several sizes can be taken care of in the same fixture. Probably the easiest way to make the fixture adjustable would be to mount the worm and master gear on a slide so arranged that the center distance can be changed at will within certain limits.

We have previously shown several testing fixtures for determining the accuracy of the cutting of spur gears, and in order to amplify the subject and to show how other principles can be applied, we illustrate in Fig. 563 another type of testing fixture for a similar purpose. In this example the base *A* is of cast iron, and on it is mounted a stud *B* on which the master gear *C* is placed. The lower part of this stud carries a worm gear *D*, which meshes with a rapid-pitch worm *E*. One end of the shaft on which this worm is cut, carries a handwheel *F* by means of which the gear can be easily revolved.

The stud shown at *G* carries the gear *H* which is to be tested. After this gear has been slipped on the stud, a gear *K* of fine pitch is placed above it and the nut *L* tightened. A bracket *M* is arranged so that it will slide in the guides *N*, and its permanent location is controlled by means of a pin *O*, which enters the bushing in the base of the fixture. This construction is not shown in the illustration. On the bracket *M* the pinion *P* is mounted in such a way that it will mesh with the large gear *K*.

A steel disk *Q* is graduated into a number of equal divisions, as shown in the plan view. The pointer *R* travels around this graduated disk when the handwheel *F* is operated. The ratio between the gear *K* and pinion *P* should be made as great as possible and a ratio of 10 to 1 will produce good results. When the handwheel *F* is turned rather rapidly and uniformly, the pointer *R* travels around the disk quite rapidly; and due to the multiplication between the gear *K* and pinion *P*, any inequalities in the cutting of the gears are clearly shown by an irregular movement of the pointer. If gears are cut very accurately the movement of pointer *R* will be smooth and uniform, while if the gears are poorly cut the action will be quite irregular.

We have previously taken up the matter of inspection of thickness of tooth at the pitch line, depth of tooth and shape. These are all matters which are usually taken care of while the gears are in production. Unless trouble is found, they are frequently not tested at the final inspection. The procedure varies with different manufacturers, and each maker must be a law unto himself, according to the difficulties which he has encountered in manufacture.

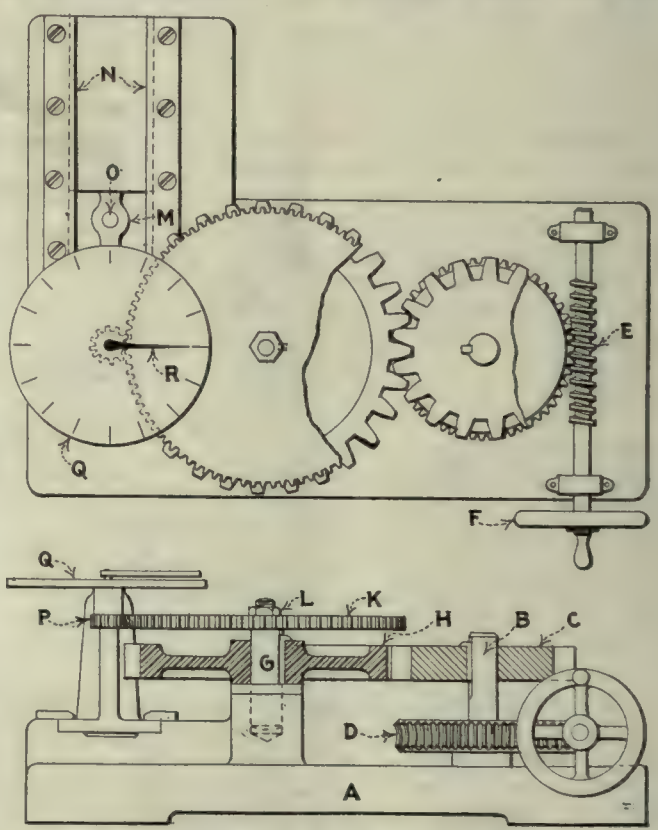


FIG. 563—FIXTURE FOR DETERMINING SMOOTHNESS OF RUNNING ACTION OF SPUR GEARS

No article on gaging would be complete without mention being made of a process quite commonly employed for comparing the shapes of gear teeth with a master tooth of accurate form and size. The use of instruments of this kind does not strictly come under the head of tool designing, and we shall make but brief mention of the matter, in order to give the designer an idea of the process. Briefly, the gear which is to be tested is set up in such a position that a beam of light will cause it to throw a shadow very greatly magnified, upon a screen suitably placed. On this screen can be placed an outline of the gear tooth as it should be if correctly cut; and by projecting the shadow upon it, irregularities can be easily determined and the cutting of the teeth perfected until the tooth approaches as nearly as possible to the ideal form.

The instruments used for the purpose of projecting the shadows are comparatively simple in their form, and we do not consider it necessary to illustrate them in this article. To those who are particularly interested we suggest that mechanical trade journals contain considerable information on the subject, and that particulars can be obtained directly from the manufacturers of the instruments.

Budgeting for Business Control

IN the past two years interest has been shown by business men and business organizations in applying budgeting principles for purposes of business control. The Chamber of Commerce of the United States has issued a pamphlet on the subject called "Budgeting for Business Control." The Boston Chamber of Commerce has published a study of business budget practice called "Budgetary Control for Business." There are budget committees of the National Dry Goods Association and of the National Electric Light Association developing budget systems for department stores and public utilities, respectively.

It appears that the budget idea may be applied to a great variety of businesses, and to almost every department of a particular enterprise. Complete budget systems are in successful operation in ice cream plants, hotels, magazine publishing plants, zinc mines, garment factories, banks, and agricultural implement, optical specialty, and metal product factories. Sales, purchasing, financial, production, and advertising departments are operated on a budget basis in a great number of establishments.

Objects of Budgeting

These objects are generally stated as the aims of budgeting:

1. To provide for the harmonious working of the various departments and activities of a business. Thus, for example, the sales program is adjusted to financial resources and manufacturing facilities.

2. To provide in advance for all foreseeable contingencies—that is, to ensure considered planning before doing. Sales programs may require new construction; new construction may demand additional financing; all of which will be taken care of, or, if necessary, such programs modified, in a properly devised budget system.

3. To provide a measuring rod with which to check results against expectations and estimates. The sales quota of the general sales manager becomes a promise to the company that certain volume of sales will be obtained during a given period. If such volume is not so obtained, the sales manager is called upon to justify this failure. What is true of the sales manager applies to each of his branch managers, to each individual workman. In other words, the budget supplies the basis for enforcing accountability.

It is in this connection perhaps that the budget works most directly for efficiency, since the aim of everyone in that organization where a budget plan is in force is not only to equal but to exceed the budget or estimate. The stakes of one month, season or year, when steadily maintained, are reset to some new and more difficult goal. A good executive, as well as an efficient employee, always "plays the game" to better his budget promise of performance.

Accurate forecasting, while valuable, is by no means the only justification for budgeting, for results under budgeting operation may be quite as helpful should performances vary widely from estimates. Thus, the actual selling expenses of a manufacturing concern were 11 per cent higher than the estimated selling expenses, immediately showing the executives of the company where there was a possible opportunity for economy.

Establishing a Budget System

Manufacturers who employ the budget method report that there is nothing rigid or inflexible about budgetry control, but that estimates are revised as business conditions warrant.

It is stated over and over again by those with experience that a budget system cannot be introduced overnight, but that it has to be a matter of growth and evolution, and that it is essential that the budget idea be "sold" to the entire organization.

All companies, we venture to say, do some budgeting, although the term "budgeting" may not be in use by them. "Budget systems," says Prof. D. E. Burchell of Harvard University, "are as old as business and probably older." A manufacturer expresses the same thought in a slightly different manner. "I am really surprised," he said, "by the amount of budgeting I have been doing all my life, though I never knew it."

Budgeting Not a New Scheme

A few common examples of budgeting will readily suggest themselves. The allowance for depreciation is in the nature of budgeting, for its purpose is to provide ratably in advance for the eventual loss in usefulness of equipment and buildings. Similarly, reserves for bad debts are a species of budgeting, for their object is to anticipate the loss likely to arise from uncollectible accounts. In both cases past experience is used as a guide to take care in advance of circumstances almost certain to arise—which, by the way, is a good description of the procedure called budgeting.

What, however, is new and significant about present day methods of budgeting is that business men have found it of great advantage to combine in a single, co-ordinated system all the odds and ends of adjustments they have been accustomed to make. By so doing, it is easier to place responsibility for results and to harmonize programs of numerous departments of a business.

From "Business Leaflets" published by the Metropolitan Life Insurance Co., New York City.

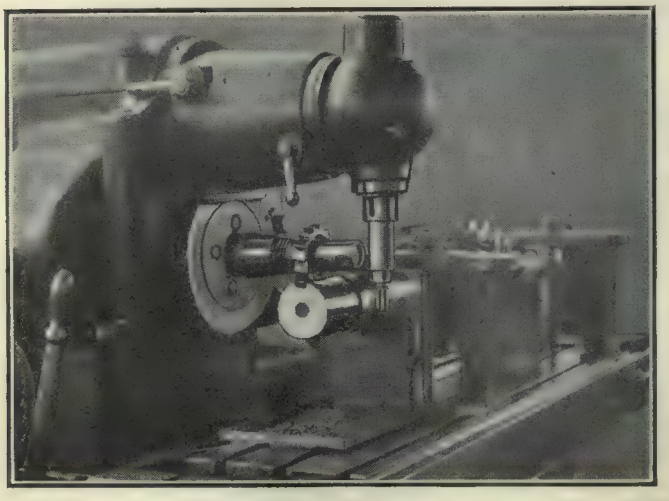
Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

An Unusual Milling Set-Up

By Tom J. O'Reilly

The illustration herewith shows a keyway milling operation in process in the plant of the Falk Corporation, Milwaukee, Wis. The machine is a Milwaukee No. 3-B horizontal milling machine with a vertical milling attachment. A plain milling cutter on a stub arbor



AN UNUSUAL MILLING SET-UP

is used for cutting the keyway to the required length, which is four in., then the table is lowered and adjusted to the ¾-in. end milling cutter. The end mill is used at the inner end of the keyway and cuts a square corner in the bottom of the keyway and forms a radius in the end. The plain milling cutter runs at a speed of 40 r.p.m., while that of the end mill is 120 revolutions per minute.

Interlocking Device for a Horn Press

By John Williams

The tapered cups shown in the accompanying cut are made by rolling them up from black sheet and lock-seaming the edges. Closing the seam is done in a horn press with the tools here illustrated.

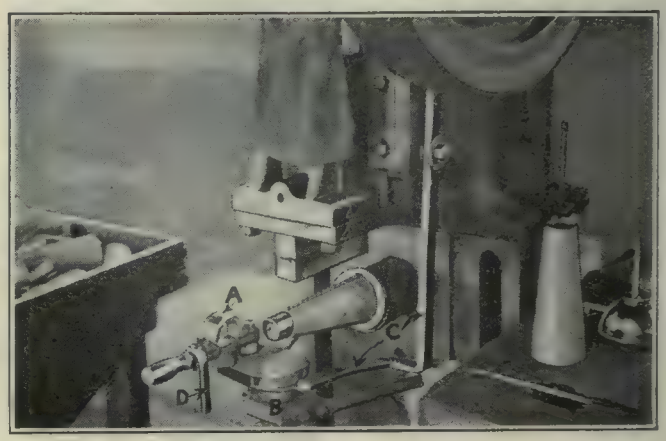
Because of slight variations in temper of the metal it is impossible to have the edges match exactly at top and bottom of the cup as they come from the rolls, and it is necessary to put the work under pressure endwise before finally closing the seam.

The arbor, or horn, is ground to a tight fit for the interior of the cups and when one of the latter is placed over it, it requires a considerable effort to force it back against the shoulder, straighten up the edges and draw the longitudinal seam firmly together. This effort is applied by the operator by means of the ring *A*, which swivels upon the supporting bracket *B* and is provided with a convenient lever handle.

The unusual feature of the tools is the method adopted to make sure that the press may not be tripped until the work is pushed back against the shoulder and the edges thereby straightened up. The lever *C* operates a latch in the tripping mechanism and is in turn operated by the projection *D* on the swivelling handle.

With a cup in place, the operator swings the handle until the ring contacts with the cup and forces it into its final place, at which time the handle has assumed a position at right angle to that shown in the picture. Besides pushing the cup to place against the shoulder, the ring also provides an outer support for the arbor.

When the handle has been turned as far as it will



TOOLS FOR CLOSING A SEAM

go, the edges of the cup have been straightened up and the projection *D*, bearing against the end of lever *C*, has withdrawn the latch in the tripping mechanism and the operator may trip the clutch by depressing the treadle of the press in the usual way. No amount of movement of the treadle will, however, accomplish this result unless the ring *A* is in its proper place.

Soldering Cast Iron

By C. F. Barton

Cast iron can be successfully soldered if care is taken in cleaning the work and the right acid and solder used. The cast iron must be thoroughly clean. The scale must be ground or chipped off and the surfaces thoroughly tinned.

The surfaces should be swabbed with muriatic acid in which zinc scrap has been cut, as is commonly used. Heat the soldering iron very hot, almost to a red. It is hard to get it too hot for this work.

Use a solder made up of 2 parts tin, 2 parts lead and 1 part zinc, both for tinning and for soldering the work.

For a harder solder to be used when the work is subjected to considerable heat, use 50 per cent more zinc. In other words, for the hard solder use 2 lb. of tin, 2 lb. of lead and 1½ lb. of zinc.

Soldering with the Electric Arc

By Milton Wright

In a shop manufacturing an electric specialty for which the demand was running to quantities that made intensive methods of production necessary, the job of soldering three electrical connections in each device was proving to be a stumbling block in an otherwise



FIG. 1—SOLDERING WITH THE ELECTRIC ARC

smooth and orderly progression of operations. Where other operations were so timed and calculated that each operative could give his or her entire attention to the doing of one thing, this one required the services of several boys and girls, with no assurance that the steady forward flow of work would not be interrupted without notice because of the failure to deliver the soldered parts to succeeding operations.

The first method made use of gas-heated soldering coppers, but the work was slow and the results more or less uncertain. Electrically heated coppers were substituted, with little improvement. Metal bench plates

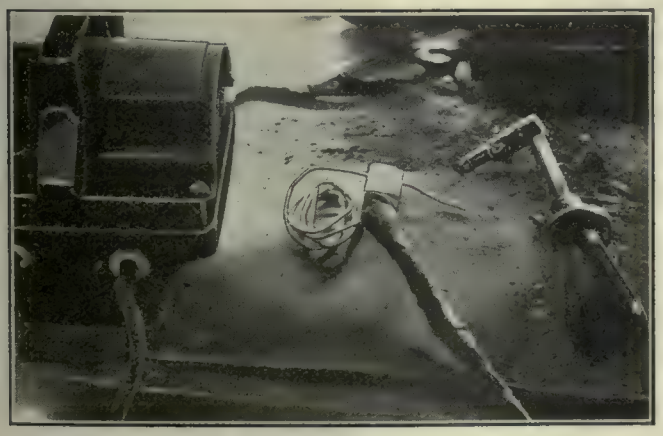


FIG. 2—ALL THE APPLIANCES THAT ARE REQUIRED

were installed before each operative, connected to one of the secondary leads of a small transformer and the soldering copper connected to the other so that the device to be soldered (which is entirely of metal) became a part of the electric circuit; but the results still left much to be desired.

On his way to the shop one morning, the superintendent in charge spied beside the roadway a stub of ordinary electric arc light carbon that had been discarded by some careless lamp trimmer. He had probably seen thousands of them before under similar circumstances, but this one contained the germ of an idea.

Arriving at the shop the superintendent rolled up his sleeves, connected the piece of carbon to one lead of the transformer and a piece of solder wire to the other, placed one of the devices to be soldered on a wooden block and touched the tips of his improvised electrodes together at the desired spot. There was a flash, a sizzle, a little curl of smoke as the arc formed and broke, and the job was done.

Bronze holders with wooden handles were made to take the carbons, spring clamps, also of bronze, into which a coil of solder wire could be set without delay were provided, and both were connected to the transformer. The operative places the point of carbon in contact with the spot to be soldered and touches the end of it with the solder. The flow of current instantly heats the solder nearly to the melting point so that when it is drawn slightly away from the work to form the arc it fuses with almost explosive quickness.

One boy and one girl now handle the work, and are not rushed. There is no waiting for coppers to heat and no imperfect joints due to insufficient heat. A row of the devices to be soldered is set up on the bench, flux applied with a small brush, and the joints gone over with the electrodes. It takes longer to apply the flux than to do the soldering.

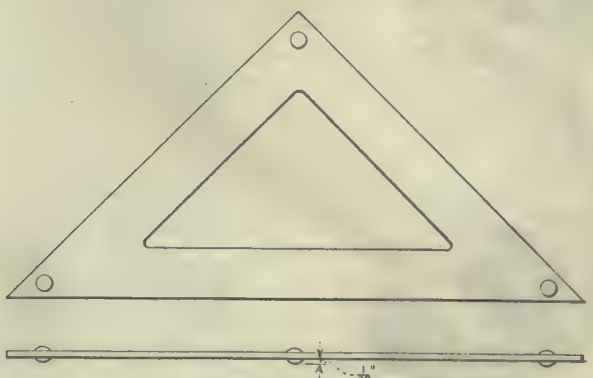
The operation is shown in Fig. 1, and Fig. 2 shows the tools; including the transformer. This latter is wound to deliver 6 volts with 110 volts on the primary terminals. Though small, it is big enough to supply current to a dozen workers if necessary, for not all of them would be drawing current at the same instant.

Improved Drafting Triangle

By E. J. Hanson

I have used the triangle shown in the accompanying sketch to advantage and pass the idea on to others who may be interested.

Holes are drilled in the corners of the triangle and steel balls are pressed into the holes. The triangle then



AN IMPROVED TRIANGLE

rests on the balls and its surface does not touch the drawing or tracing.

When making paper drawings the use of this triangle insures a cleaner drawing. There is less chance of blotting lines when tracing, and since the triangle can be used over wet lines, the time that is often wasted in waiting for ink to dry is saved.

Formula for Finding Root Width of Splineways—Discussion

By George E. Hodges

On page 775, Vol 58 of the *American Machinist*, Clarence D. Scrom gives his formulas for determining the root width of splineways. His methods are all right for the man with a table of trigonometric functions, a knowledge of "trig," and the time. There are cases where the shopman lacks these essentials, and in those cases the following method and formula used by the writer may be helpful.

$$W = 2C\left(R - \frac{\frac{T}{2}}{C}\right)$$

In this formula W is the required dimension, R is one-half the root diameter of the shaft, T is the thickness of the spline and C is a constant for shafts having a similiar number of splines. A table of these constants

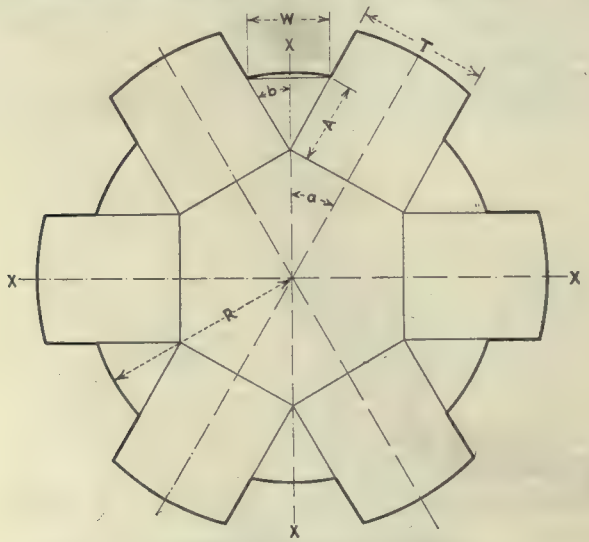
TABLE OF CONSTANTS FOR DETERMINING WIDTH OF SPLINEWAYS OF COMMONLY USED SPLINE SHAFTS

No. of Splines	Angle	C
4	45°	0.70711
6	30°	0.50000
8	22° 30′	0.38268
10	18°	0.30902
12	15°	0.25882
16	11° 15′	0.19509
20	9°	0.15643
24	7° 30′	0.13053

Use no more significant figures in C than necessary for the accuracy of the result desired.

is here given for commonly used shafts. The authority for the constants is the table of functions found in the "American Machinist Handbook."

The sketch herewith shows how the formula is arrived at. After locating the center of the figure by drawing the center lines X—X, a circle is drawn to represent the root circumference of the shaft. From



LAYOUT OF SPLINE SHAFT

the center of the circle, equally spaced radial lines are drawn to represent the center lines of the splines. Parallel to these center lines, lines are drawn representing the sides of the splines. If these latter lines are extended to meet, by joining the points a geometrical figure with equal sides may be drawn.

We now have a plane figure with equal known sides, and we seek the long diagonal. This value is then divided by 2 and the quotient subtracted from the radius of the root circle, the difference being the dimension A in the figure. It is also the hypotenuse of a right-angle triangle of known angles and one known side. By the geometry of the figure the angles a and b are similiar, and are directly related to the number of splines in the section. From this fact, we deduce that a table can be constructed which will show the sine function of commonly found angles.

To the average man in the shop the term sine function means little or nothing. The writer has had better results by telling those that have come to him that functions were constants, and trying to fix in their minds that being constants the values were more convenient to remember and apply. It is surprising how quickly the average man will pick up a commonly used constant and fix it in his mind.

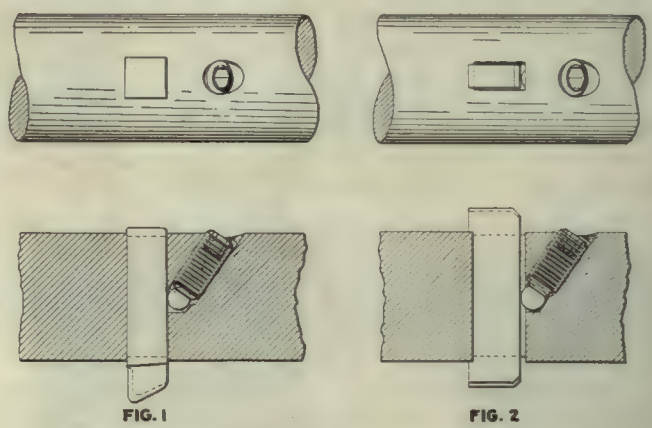
To use the table and formula given here requires but elementary knowledge of arithmetic. The formula requires a knowledge of geometry and trigonometry only for the proof of its theory. In a great many instances only one or two constants need be memorized by the user of the formula.

Holding Tools in Boring Bars

By F. Herstein

After considerable trouble with methods of holding tools in boring bars, the one shown in the sketch herewith was evolved.

The tool slot in the bar is made large enough to



FIGS. 1 AND 2—METHODS OF HOLDING TOOLS IN BORING BARS

receive the tool freely, and a hole is drilled at an angle greater than 45 deg. from the axis of the bar, so that the point of the drill just breaks through one side of the slot. The hole is then tapped and a steel ball inserted and backed by a safety setscrew having a cup point. Tightening the screw forces the ball against the tool and holds it firmly in place.

One of the advantages of this arrangement is that neither the ball nor the setscrew need be removed from the bar to change or adjust the tool, so there is no danger of their getting lost or mislaid.

As the opening of the hole into the slot is smaller than the ball, the ball cannot fall through.

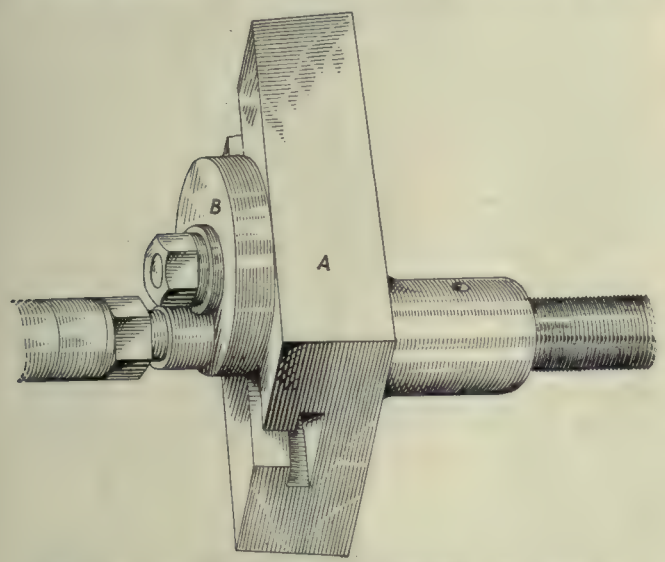
The method of holding a single pointed cutter is shown in Fig. 1, while Fig. 2 illustrates how a double ended cutter can be held.

Center-Aligning Device for Lincoln Milling Machine

By W. C. Adams

The sketch illustrates a device that I have applied successfully in many cases to overcome the difficulty not infrequently experienced in bringing the head and foot stocks of Lincoln milling machines into alignment. In the older styles of these well-known machines these two parts are separately adjustable, and unless skilled labor is employed in operating them the centers may be seriously out of alignment, with consequent trouble and spoilage of work.

In the sketch, *A* is a casting bored to fit over the tail



DEVICE FOR ALIGNING TAIL CENTER OF LINCOLN MILLING MACHINES

spindle, to which it is permanently fastened by means of a dowel or setscrew, or both. The face of this casting is machined and a T-slot milled through it at a right angle to the bore. The casting is fastened to the spindle with the T-slot in a nearly vertical position, though not necessarily exactly so.

A slide is made to fit freely in the T-slot and may be clamped in any position therein by means of a stud and nut. A disk, *B*, of hardened steel, fits over the stud in the same manner as a washer, and when the clamping nut is tightened it not only fixes the position of the slide in the T-slot but also clamps the disk against rotation. A hole is made near the edge of the disk to fit the pilot on the end of the cutter arbor.

When setting up the machine, the two spindles are adjusted to approximately the same level and tightened in the usual manner. The tail spindle is then moved forward by its screw and the disk and slide manipulated until the pilot on the end of the cutter arbor enters the hole in the edge of the disk; which is easy of accomplishment as at this time the slide is free to move up or down in the T-slot and the disk is free to turn on the stud. When the end of the arbor is entered in the hole a turn of the clamping nut tightens all parts in relative position.

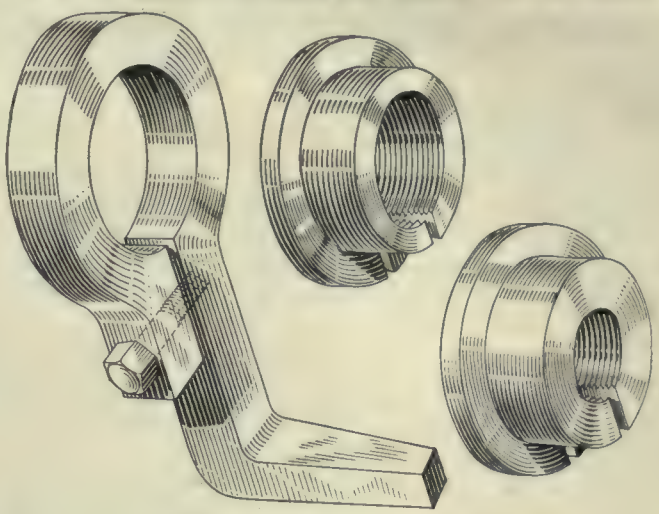
This device is of particular service in making minor adjustments of height, as by its use the arbor may be moved up or down for a considerable distance by merely loosening the clamping nut on the stud and allowing the disk to follow the position of the arbor as the latter is adjusted.

Clamp Dog for Holding Threaded Work

By G. A. Luers

The cut shows a lathe dog especially designed to hold work that has already been threaded without damage to the threads. It can be made up from any suitable piece of square sectioned stock.

After forging it to shape and tapping for the clamp-



DOG TO HOLD THREADED WORK

ing screw the dog should be "swung up" on the face-plate of a lathe and the body bored and reamed smoothly to a standard size.

Shouldered bushings are made to fit the various diameters and pitches of thread for which the dog is intended. The outer diameter of the bushings are all made to fit the bored hole in the dog, and they are slit lengthwise along one side.

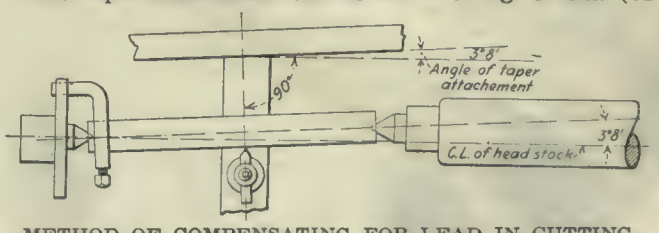
These dogs provide a firm grip upon threaded work and may be depended upon not to mar the threads. Smooth bored bushings may also be provided to hold polished shafts.

A Lead Compensator—Discussion

By C. G. Kranz

Referring to the article under the above title by Herbert M. Darling, published on page 65, Vol. 59, of the *American Machinist*, I herewith submit another way of handling the threading problem.

The taper attachment can be set to 3 deg. 8 min. (of



METHOD OF COMPENSATING FOR LEAD IN CUTTING THREADS

which the sec is 1.0015) and the tailstock set to bring the work parallel with the taper attachment, as shown in the accompanying sketch.

Should the irregular helix caused by the angular setting of the work and the driving by a dog be detrimental, a pair of narrow-faced bevel gears can be used for driving. One gear to be fastened to the lathe center and the other to the work.

American Machinist
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KENNETH H. CONDIT AND FRED H. COLVIN
Editors
September 27, 1923

The Machine Tool Builder and the Problem of Specials

IT MIGHT be thought that the problems of the machine tool builder discussed on this page during the last three weeks would be enough to keep any manufacturer occupied. Nevertheless we have one more to present, the matter of special sizes, equipment, parts, attachments and the like.

There is probably little profit in trying to place the blame for the existence of this problem on customer, dealer or builder. Each one contributes his share to the mess and the builder holds the bag.

The application of Secretary Hoover's simplified practice principles to the machine tool industry would undoubtedly solve the problem of the builders in short order but it would hardly satisfy the other parties at issue. Real manufacturing is as yet almost unknown in machine tools, the quantities produced are too small. Consequently it is hardly possible for a machine tool concern to adopt the attitude of most of the big automobile companies in refusing absolutely to accept orders for anything having the slightest variation from their standard product.

At the same time the filling of orders for special machines is an added expense for the machine tool builder just as it is for the automobile manufacturer although not to such a large extent. His production chain is broken just as is that of his larger contemporary. The expensive time of his administrative and engineering departments must be put in on the special job in addition to their work on the standard product.

No matter what the cost or the annoyance involved, special machines and attachments must be supplied by the machine tool people for many years to come. The average designer is more concerned with the correct functioning of his product than he is with making it easy to manufacture on standard equipment. Some attention has been paid to the latter feature in some of the more progressive shops where large scale manufacture is in vogue but there is still very far to go before the goal is reached.

As we see it, the fault of the machine tool builder has been in undercharging for work of a special nature. The customer fails to understand the expense involved in his demand. To him it seems like adding just a few more pounds of cast iron or steel to a standard machine and cast iron is certainly cheap enough. As a matter of fact it is so cheap compared to the other factors involved that the builder could well afford to make no charge for the raw material if he got a fair price for the skill and brains he has to put into the job. He *has* to get a fair price for the extra work entailed by special features if he is to stay in business and the customer must be brought to a realization of that fact.

New Demands for Railway Mechanical Executives

THE MECHANICAL executives of our railroads are confronted with many new problems. It matters little whether it is the superintendent of motive power, the master mechanic or the shop foreman, new problems are being presented every day on all progressive railroads. The problems of the executives differ, it is true, according to their work and responsibilities. But the new demands on motive power, the changes in locomotive design and the addition of new appliances make it very necessary that the mechanical department add greatly to its knowledge and experience.

Locomotives and rolling stock generally are getting heavier each year, which increases the problems of handling heavy driving boxes and other parts that were formerly moved by hand. The same is true of axles, crankpins and many other parts. Then, too, we now have alloy steels for connecting rods, crankpins, axles and the like, which not only affect machining operations but also require a knowledge of heat treatment as well, not forgetting the equipment necessary in both cases.

Steam pumps in place of injectors, stokers and boosters are all comparatively new mechanisms to be looked after. Then there are feed water heaters, superheaters and other appliances which are hardly machines and yet add work to the shop or roundhouse. The economical handling of these problems requires wide awake men, who must keep posted not only on the new locomotive equipment but on the best methods of repairing it and keeping it in service.

These demands will lead to the better and broader training of men all along the line. They will also give an added zest to the work of keeping these huge traveling power plants in first class order. And with proper management in the higher circles this change should result in securing a high type of man for railway shop executives, providing of course, the salaries are increased to compare with those in other positions of equal responsibility.

Men who want to keep abreast of the procession must study the best shop methods, not only in their own line, but in shops doing a somewhat similar class of work.

Mobilizing Industry for Emergencies

ALTHOUGH Congress in 1920 imposed upon the Assistant Secretary of War the duty of preparing plans for industrial mobilization, few of us have heard much about it. Considerable work has been done, however, by the fifty officers who were detailed to estimate the army needs in case of war. This inventory is now supposed to be complete for every branch of the service.

Practically the same staff is now investigating plant facilities with a view of knowing just what work can be done in different shops. With this data available, the work could be distributed so as to take a proportionate part of the productive capacity of all plants, rather than tie up some plants with war work and leave others idle or with only their regular product.

With this plan in operation the War Department hopes to eliminate the broker and middleman. It is giving special attention to the prevention of profiteer-

ing in all forms, believing it to be a fundamental principle of justice that one group should not profit while others give their lives or their health for the country's safety.

In order to prevent confusion and delay in an emergency it is proposed to induce Congress so to modify the plans regarding contracts that sample orders can be placed for special war material which is not commercial in any sense, at a price that will guarantee the manufacturer against loss. It is hoped to place small orders for munitions from time to time with a number of plants to be turned out according to specifications at their convenience but within a reasonable time. Such a plan would familiarize many plants with the peculiarities of such work and allow many mechanics to become acquainted with it.

It is believed that about three years will be required to secure a complete survey of the manufacturing facilities of the country, but when it is done the War Department will have data which will enable it to secure supplies of all kinds very quickly. Allowance is, of course, being made for changes which take place in plants and it is realized that such a list must be revised constantly to be of real service.

There is one point which seems to have been overlooked, or which at least is not made clear. We refer to the design of military apparatus with a view to its economical manufacture. With the design goes the question of tolerance and gaging, both absolutely essential if we are to secure any mechanisms rapidly and at a low cost.

Unfortunately few men who design guns, ammunition or other war material know anything of economical manufacture. Many of the designs are extremely difficult to machine and are given tolerances which are entirely unnecessary to secure proper functioning. The average designer of guns insists on making every part from a steel forging, which frequently involves unnecessary machining.

The War Department can take a great step toward securing munitions quickly if it will have men who thoroughly understand modern production, go over its designs with competent army engineers. In this way many unnecessary operations and much needless expense can be saved, both in such preliminary work as is proposed and in any emergency which may arise.

Proper functioning of a piece must always be the first consideration. But the elimination of tolerances which are needlessly close and the modification of design in accordance with the best machine practices will be a long step forward in real preparedness.

Federal Air Law Coming

THE need of a Federal air law has been pointed out many times and it is gratifying to note that more interest is being shown by various bodies in its enactment. The American Bar Association has indorsed the bill known as H.R. 13,715, introduced by Hon. Samuel Winslow at the fourth session of the 67th Congress.

The bill in question, known as the Civil Aeronautics Act of 1923, was prepared with the assistance of representatives of both governmental and civil aviation to establish a Bureau of Civil Aeronautics in the Department of Commerce and provide a basis for a Federal Air Code.

"Prolonged delay in enacting Federal Air Law," says a statement from the Aeronautical Chamber, "has been deplorable for three reasons. First, there has been needless loss of life and property on account of lack of proper certification of airworthiness of aircraft and competency of pilots. Second, the normal growth of a new and essential industry and utility has been arrested—insurance rates are high, and capital naturally is reluctant to flow into a business lacking proper legal status. The third reason—keenly realized by our War and Navy Departments—is that, as long as the growth of commercial aviation is delayed, just so long will our national defenses be impaired and the ultimate cost of restoring them be increased."

It is presumed that the equivalent of H.R. 13,715 will be introduced and passed immediately the new Congress convenes.

Have We Overlooked a Field for Machine Tools?

A LETTER from a reader who speaks with a feeling due to sad experience, points out what may be a new field for the makers of grinding machinery. According to the fond parent who writes us, the largest manufacturer of baby carriages, perambulators or buggies, depending in which part of the country you reside, sends out his product with turned axles, and rough turned at that. To add to the troubles of the aforementioned fond parent, there is a deep tool groove that tends to force the wheel against the clip which acts as a nut to keep the wheel from parting company with the axle, and rolling off on a journey all its own.

Anyone who isn't too old to remember when he trundled his own heir apparent over the bumpy sidewalks knows they were not frictionless. And if the hardy muscles of the stronger sex tire when the wheels turn hard, what of the average overtired mother with her precious, as she goes to market or elsewhere?

Then, too, we are told that the clips wear out or slip off, leaving nothing but moral suasion to keep the wheel in place. When this fails, and the mother has to push a three-legged carriage, home isn't all it might be until she cools off and recovers her poise.

With these facts staring them in the face it behooves the builders of grinding or other machines to come to the rescue and show the makers of baby vehicles how the bearings should be finished. Rough turning and deep grooves are as much out of date as the Indian method of carrying babies on the mother's back. Nor is it as small a field as might be supposed. For while in dull times big brother's baby buggy may be handed down to the new sister, nothing but famine, pestilence and earthquakes interferes with the supply of occupants for these vehicles.

The pushers of baby carriages, be they the fond mother, the proud father or the doting grandmother, are looking to the machine tool builders to improve the pushing qualities of their favorite vehicle. They will, we are sure, not be disappointed, when the members of the N.M.T.B.A. realize their opportunity.

Shop Equipment News

Gleason 8-Inch Bevel Gear Generator

An 8-in. bevel gear generator, for producing straight bevel gears on a mass production basis, is now being marketed by the Gleason Works, Rochester, N. Y. This is a single purpose machine and is different in appearance from the universal type of machine, although the same basic principle of generating the tooth is still used. The machine is shown in Fig. 1.

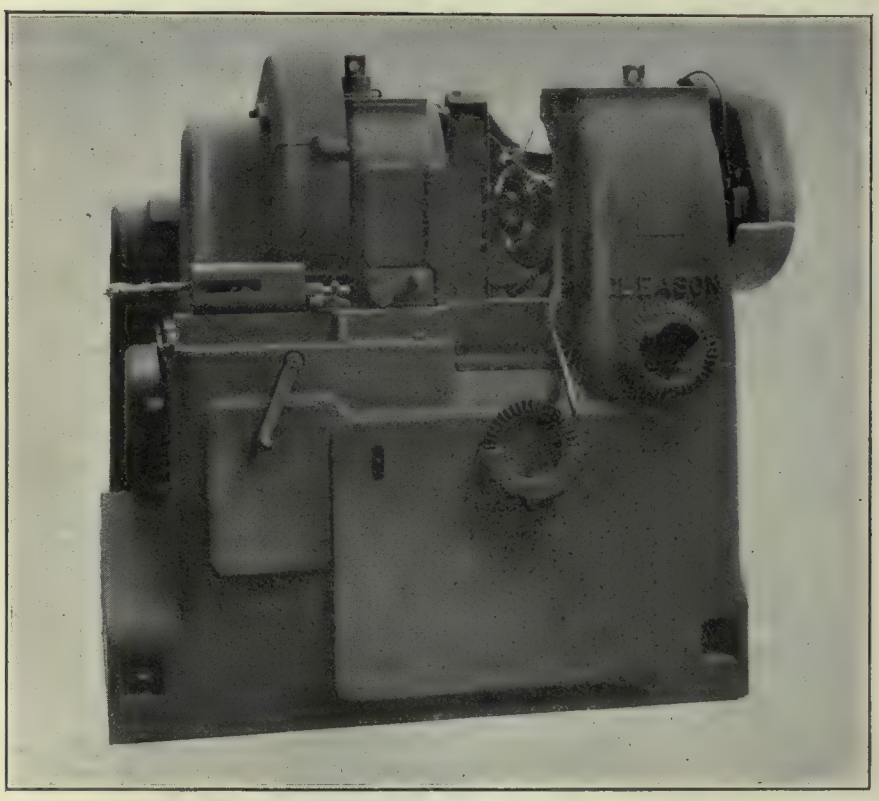


FIG. 1—GLEASON 8-IN. BEVEL GEAR GENERATOR

The tooth contour is developed by rolling the work and the tools relative to each other at a uniform pitch line velocity. The tools represent the adjacent teeth of a crown gear and, as they reciprocate, cut away the stock on the work, developing correct tooth profiles. The generating motion is obtained by a crown gear and segment, the generating roll being on the work-holding member.

The index is of the notched plate type operated by the generating roll, the index plates being hardened and ground.

The tool carrying unit is mounted on an upright which, instead of swinging about a center, is given a lateral movement by a cam to obtain the feed of the tools to the work. This arrangement permits the whole unit to be securely gibbed with simple adjustments for taking up the wear.

The clapper box is integral with the slide and the tool holder and clapper block are made of steel, the tool holder being hardened and ground. The relief movement for the tools during the return stroke is mechanically operated and positive in its action.

The amount of movement necessary for the relief of the tools is small, because the swivel pins on which the clapper blocks swing are behind the cutting edge of the tools, and almost in line with their travel. This small movement makes the machine quiet and steady in operation and, as the drive for the tools is arranged to have the effect of a draw cut, high tool speeds can be maintained with little vibration or noise. It is stated that the work produced has a very smooth and satisfactory finish.

The tool carrying slides are arranged to overrun the arms at both ends so that long continued operation on any one job will not wear a depression in the bearing surfaces of either part. One large gib on each slide takes up the wear for all directions. The tools are the same as those used on the 11- and 18-in. machines.

Every point on the machine requiring lubrication is oiled by a pump lubricating system, and there

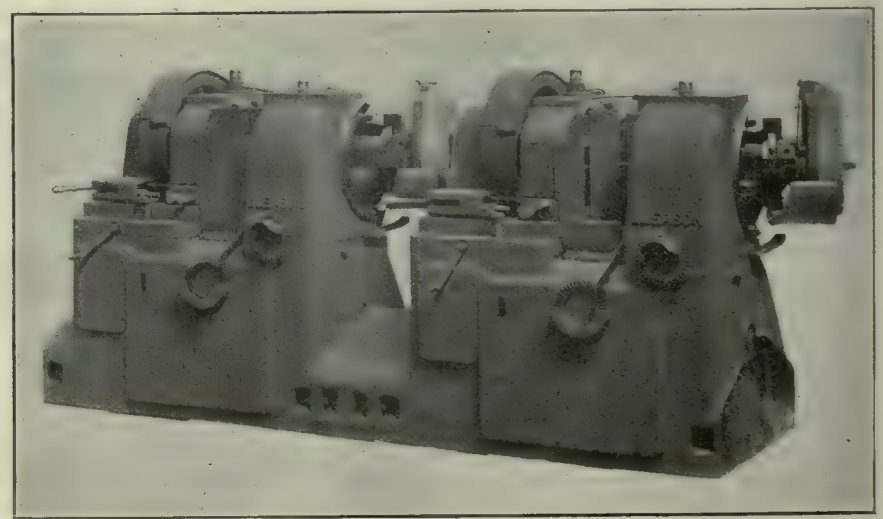


FIG. 2—TWO GLEASON GEAR GENERATORS IN A BATTERY

are two points for inspecting the oil flow in sight of the operator. Not only the rotating bearings but also the tool slides, hand adjustments, and such points as index plate notches and ratchet pawls are reached by this central oiling system. This system of lubrication is a feature of the machine.

The chips drop into a basket which, when full, may be tipped to drop the chips into a lower basket which may be removed at any time and dumped.

The lever control for starting is sensitive and the tools can be "inched" along if desired. When the machine reaches the reloading position, an automatic stop shuts down the machine by throwing out the friction clutch.

Two machines set up in a battery are shown in Fig. 2. The surfaces where the machines come together are planed parallel so that the joints will be true and tight. When set up in a battery, repair work or replacement of parts on any portion of the machines can be made without moving them.

The machines shown in the illustrations are arranged for motor drive, the motor being located at the back and driving the main drive pulley through a belt. A 3-hp. motor is required. The heavy rim of the main drive pulley gives considerable flywheel effect which is advantageous when starting. The power is transmitted to the main shaft of the machine by a friction clutch.

The work head, designed for differential gear and pinions, can be arranged to handle any such parts having a pitch angle between 29 and 61 deg. Each gear requires a crown gear and segment corresponding to its pitch angle, and an index plate for the number of teeth. The time for generating one tooth varies between 4 and 30 seconds.

The floor space required for the belt-driven machine is 54x44 in., the width being increased for motor drive by an amount depending on the motor used.

Buffalo 21-Inch Geared Drilling Machine

The Buffalo Forge Co., 490 Broadway, Buffalo, N. Y., is now marketing a 21-in. geared, upright drilling machine with gear-driven feed. The machine is of similar design to the 25-in. size, described on page 39, Vol. 51, of the *American Machinist.*

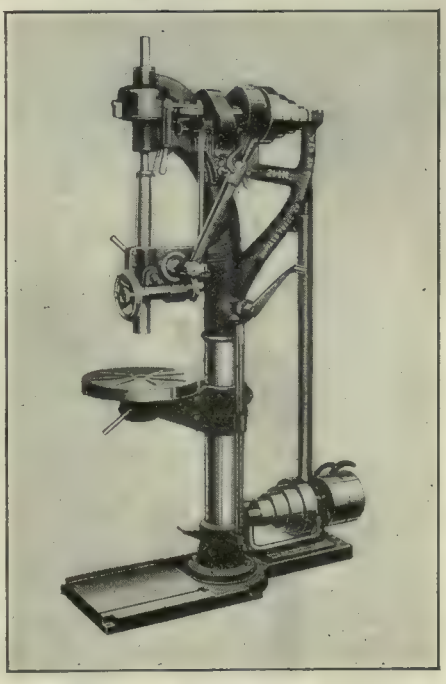
The noticeable departures from the former type are the use of a positive gear feed, and a frame brace between the lower pulley shaft and the upper part of the frame. The machine can, however, be furnished without the brace if desired.

By the use of back gears the machine has eight spindle speeds. The feed is operated by handwheel, ratchet lever or power. Three power feeds are available and all feeds may be obtained without stopping the machine. An adjustable trip is provided by which the power feed is automatically disengaged when the work has been drilled to the required depth. The main feed worm runs in an oil bath.

The back gears may be quickly engaged by means of a hand lever, after disengaging a knob in the driving gear. A lock screw holds the hand lever in place. All gears are enclosed and are bronze bushed.

The spindle is made of high carbon steel and accurately ground. The spindle thrust is carried on ball bearings, and the plain spindle bearings are split. The spindle has 12½ in. vertical travel, the maximum distance from the spindle to the base is 39 in., and from the spindle to the table, 22 inches.

The table is raised and lowered by a hand operated screw. The table arm is bored by the machine itself. The round table is 16½ in. in diam.,



BUFFALO 21-IN. GEARED DRILLING MACHINE

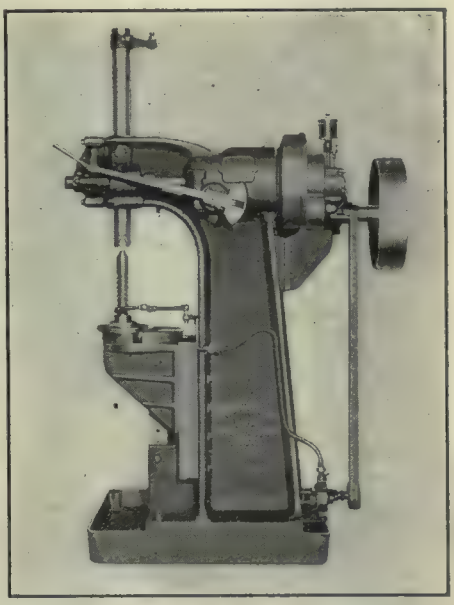
and the base is provided with T-slots for holding work. A tapping attachment can be furnished if desired.

The capacity of the machine is up to 1½-in. holes. The floor space required is 16x47 in., and the weight is 970 pounds.

Hercules Power and Broaching Press

The combination power and broaching press manufactured by the Hercules Mfg. Co., 446 E. Woodbridge St., Detroit, Mich., has recently been redesigned and the later model is now being marketed. The former machine was described on page 478, Vol. 53, of the *American Machinist.*

Power is delivered to the ram



HERCULES POWER AND BROACHING PRESS

through a series of steel gears and a double friction clutch, by means of which any pressure up to the capacity of the machine may be obtained. The capacity of the press is 15 tons. The ram is 36 in. long and 3 in. in diam., and the length of travel is 24 inches.

The fast speed of the ram is 50 ft. per min. up or down, the pressure feed downward being 84 in. per min. All speeds are controlled by one lever.

Broaches for this press are made with 60 deg. ends which fit in an adapter on the end of the ram. The machine is furnished with either belt or motor drive, and has an oil reservoir in the base with suitable pump and piping. The floor space required is 54x30 inches.

Gray Twin-Rail Long Reach Planer

The G. A. Gray Co., Cincinnati, Ohio, has recently placed on the market a twin-rail, long reach, heavy service planer which is intended for work requiring a longer reach than is available with the regular planer, combined with very heavy cutting.

As will be noted from Fig. 1, the rail is built up of two members securely bolted together and moving as one unit. The saddles have a solid bearing against the bottom of the lower member, an adjustable gibbed bearing on its top surface, and a supplemental bearing against its rear face. In addition, the saddles also have an adjustable gibbed bearing against the rear of the upper member of the rail. The top

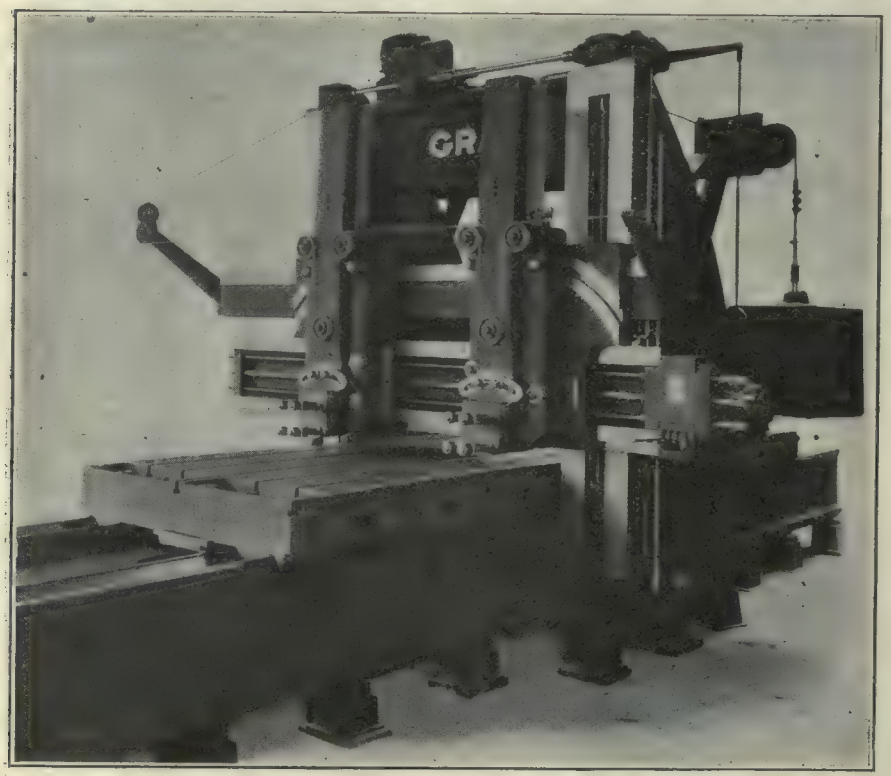


FIG. 1—GRAY TWIN-RAIL LONG REACH PLANER

and bottom bearings of the saddle are thus localized on the lower member, thereby securing the advantages of a narrow guide, while the bearing against the rear of the upper member gives the stiffness required by the long reach.

Three ball bearing rollers are provided in the top of each saddle, so that most of the weight of the heads comes on the upper rail member. This obviates deflection of the lower member, which remains straight and true, so that the head always moves parallel to the table top. At the same time the effort of moving the head is so reduced that the operator can easily set the head with the ordinary crank from the end of the rail.

The ram carriers can be swiveled on the saddles, and are bolted not only to the lower portion of the saddles, but also to a supplemental support near the top of the saddles. The steel tool boxes are mounted on the lower ends of the rams. The rams have rapid traverse as well as hand and power feed through the ram carriers. As the ram carriers can be swiveled, the rams have automatic feed in any direction.

To swivel the heads quickly, a simple and efficient method is employed. As shown in Fig. 2, a bar is slipped over the collars provided on the heads. The left-hand ram carrier is then loosened and the right-hand head is moved by the power traverse. This causes the left-hand ram carrier to swivel. Having secured an approximate setting with the power traverse, the operator can get an accurate setting by moving the head with the hand crank. He can then clamp the left-hand carrier, loosen the right-hand one, and swivel it to the desired angle by moving the left-hand head.

"Twin-purpose" taper gibs add to the rigidity of the heads while cutting. One of these gibs is provided between the ram and ram carrier. A turn of the handle in one direction positively adjusts the gib to the operating position, while a turn in the other direction securely locks the ram carrier throughout the entire length of the carrier. A similar gib is provided between the saddle and the rail.

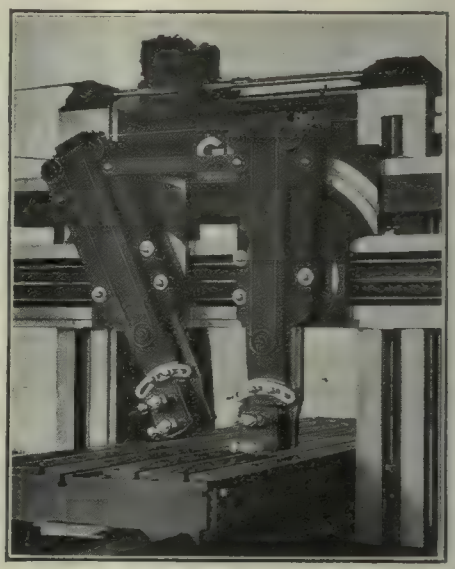


FIG. 2—METHOD OF SWIVELING HEADS ON GRAY PLANER

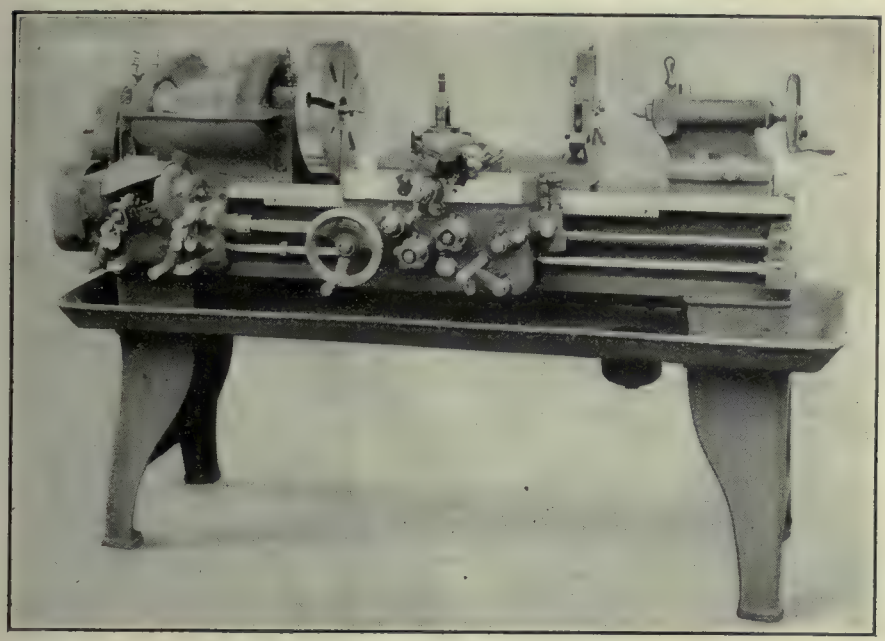
The rams and heads can be traversed by power by means of the usual single shift rapid traverse that characterizes the regular line of Gray maximum service planers, and which has been previously described on page 894, Vol. 55, of the *American Machinist*.

This planer is also equipped with the usual balanced helical driving system running in oil. Both the lower and upper members of the rail are clamped to the inside of the housings by independent rail locks. The rams and rail are independently counterbalanced and move easily. The table is provided with steel hold-down gibs, running its entire length and automatically oiled from the constant pressure forced lubricating system that oils the Vs. The bed is double length, so that the table never overhangs.

The bed weighs 14 tons, table and rack 10 tons, the housings 6 tons, the rail 6 tons, and the top brace 1 ton. In spite of this great weight, it is claimed the planer can be operated as easily and quickly as a small planer of the regular type. The capacity of the planer is 66-in. width, 44-in height, and 16-ft. length.

American 12-Inch High Duty Engine Lathe

The 12-in. high duty lathe, shown in the accompanying illustration, has recently been added to the line of machine tools manufactured by the American Tool Works Co., Cincinnati, Ohio. The lathe is built in four bed lengths ranging from 5 to 10 feet.



AMERICAN 12-INCH HIGH DUTY LATHE

A single back geared head, a quick change double back geared head, or an automatically oiled geared head can be furnished. The single back geared head provides 8 spindle speeds, and in the double back geared head 9 spindle speeds, both forward and reverse, are available. The change from second back gear to first back gear speeds is practically instantaneous through friction clutches that are self-adjusting for wear.

The geared head provides 12 spindle speeds in geometric progression, covering a range from 12 to 450 r.p.m. All gears in the head are steel, and all speed change gears are of alloy steel, heat-treated and hardened.

A range of 48 threads and feeds is provided. They are listed on a direct-reading index plate above the tumbler lever. The quick change gear mechanism forms a complete unit in itself and is fixed to the bed by means of a tongue and groove for permanently accurate alignment. All compounding in the feed box is done by taper jaw clutches.

All quick change gears are regularly made from 0.045 carbon bar steel. The cone gears are cut with Brown & Sharpe 20-deg. involute cutters, which form a pointed tooth slightly rounded at the top.

The lead screw is 1⅛ in. in diam. and has a thread of ⅛ in. pitch. The apron is made with the double wall section, which gives an outboard bearing for important studs and shafts. The rack pinion is heat treated and has stub teeth. A thread dial is regularly furnished.

The tailstock is of the two-bolt design, the rear bolt being carried to the top for convenience in clamping, and a double plug binder is arranged to clamp the tailstock spindle at any position without affecting its alignment.

The headstock spindle is made from a special hammered crucible steel stock. The spindle bearings on the cone-head lathes are lubricated by sight feed oil cups, the geared head being lubricated by an automatic oiling system. In this system the oil is pumped from a reservoir in the head to a filtering and distributing tank in the head cover, from which it flows by gravity through pipes to the various bearings.

This lathe swings 14½ in. over the bed and 8½ in. over the compound rest slide. The distance between centers with the 5-ft. bed is 28 in., and the hole through the spindle clears a 1¼-in. bar. The geared head driving pulley speed is 340 r.p.m., the diameter of the pulley being 10 inches.

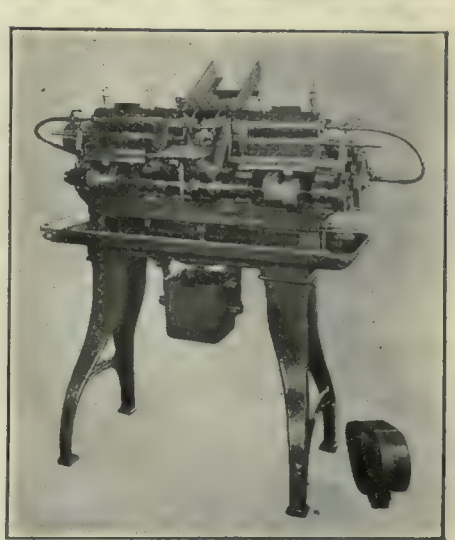
Motor drive can be furnished with the gear head lathe and the motor is regularly mounted on the head, driving the initial shaft through gears. A double friction countershaft is supplied with belt-driven lathes.

The regular equipment includes compound and steady rests and large and small faceplates. Other equipment such as taper, draw-in and relieving attachments, etc., can be furnished.

Grant Double-end Threading Machine

The Grant Mfg. & Machine Co., 90 Silliman Ave., Bridgeport, Conn., has placed on the market a machine designed for the purpose of threading both ends of small rods simultaneously. It will handle rods up to ⅜ in. in diameter and 9 in. in length. The threading is done by means of self-opening dies on opposed spindles.

The machine is entirely automatic in its movements, taking the rods from a hopper and discharging them when completed into a chute at the rear. The spindles are gear driven from a single shaft, fitted with a two-step cone pulley to receive the belt from a countershaft. The automatic features are actuated by cams upon a shaft that extends over the full length of the machine at the front, where they are easily accessible for the purpose of adjustment when changing diameters and lengths of work. The cam-shaft is driven through change gears.



GRANT DOUBLE-END THREADING MACHINE

The cams from which the forward and back movement of the sliding heads is derived are so constructed

that, in combination with the change gear train, the rate of movement of the heads may be made to synchonize with the lead of the thread being cut. The cams thus act as lead-screws to relieve the dies of the duty of moving the heads as they advance over the work.

The spindles are hollow and serve to convey a flood of oil or cutting compound to the dies. The fluid is delivered to the outer ends of the spindles through flexible tubes by a chain-driven oil pump.

The driving gears are enclosed and run in oil, and the dies are amply guarded to prevent oil from flying about. The machine stands in a pan which collects the oil and returns it through a strainer to the reservoir beneath. The reservoir swings upon trunnions and is easily accessible for cleaning.

The floor space occupied by the machine is approximately 2 x 5 ft., and the net weight is 1,000 pounds.

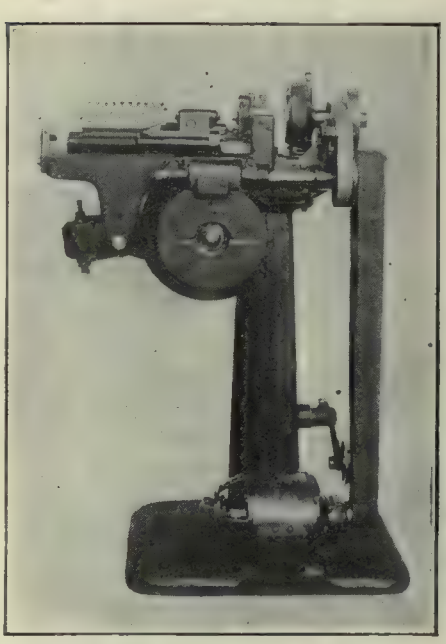
Langelier Taper Pin Swaging Machine

The Langelier Mfg. Co., Providence, R. I., has just completed and placed on the market a machine for making small taper pins by the swaging process. It is automatic in its operation, taking the wire from a coil, straightening it, swaging the taper, and cutting off the pins at the rate of 35 pins per minute. One end of the pin may be rounded if desired.

A pedestal supports a horizontal frame carrying at one end a No. 0, A.S. type, Langelier swaging machine. The remaining upper surface of the frame is machined to form the guiding ways for a double sliding head, which is gibbed thereto. The main portion of the sliding head carries, at the end next to the jaws of the swaging head, a device for gripping and holding the wire, and at the other a simple roll straightener. Midway between these two parts is the secondary member, which is the feeding device.

The two parts of the sliding head derive their movement from face cams upon the worm wheel below the frame, and though both move in the same direction at a given point of a cycle, the feed slide precedes the main slide by a definite amount. Both the holding and the feeding devices are made somewhat after the fashion of a spring collet.

At the beginning of a cycle the



LANGELIER TAPER PIN SWAGING MACHINE

feeding collet grips the wire and, as this part of the slide moves forward, a predetermined length of wire is projected from the holding collet. The latter then seizes the wire and the main slide moves forward, feeding the projecting wire to the swaging dies. When the swaging is completed the main slide recedes far enough to bring the finished pin, still attached to the wire, out of the dies. It then stops and releases its hold.

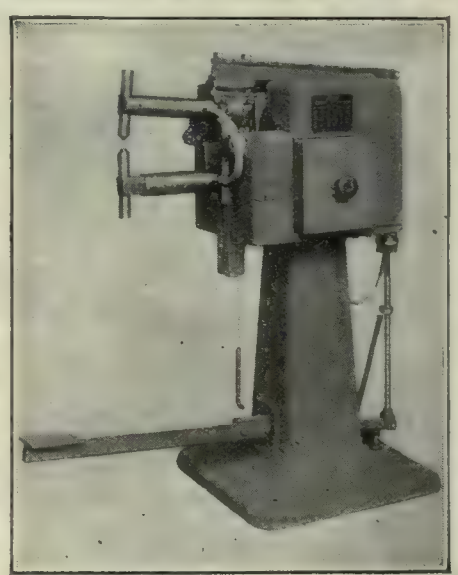
The secondary slide continues its movement until the swaged pin is drawn back into a pair of cutting-off dies which cut it off to the desired length. The cutting-off dies consist of a pair of bushings placed tandem with the cutting faces abutting, through which the wire passes. A slight sidewise movement of one of the bushings, produced by a cam, severs the pin from the wire. The next advance of the feed slide pushes the completed pin out ahead of the wire and projects a length sufficient for the next pin.

This machine makes pins from 0.032-in. diam. wire in any length up to ½ in. It may be adapted to other sizes and greater lengths by making gripping collets of a size to suit the wire and changing the cams. The machine occupies a floor space of 2x3 ft. and weighs approximately 900 pounds.

Thomson Model-100 Spot Welder

The Model-100 spot welder has recently been added to its line of welding equipment by the Thomson Spot Welder Co., Lynn, Mass. Several improvements over former equipment have been incorporated in the latest design.

As shown in the illustration, the machine is operated by a pedal which actuates the mechanism through a coiled spring on the vertical link. When properly adjusted, it is stated that the operator cannot apply the current until pressure has first been applied to the electrodes. The current is automatically cut off through further pressure on the foot pedal, after the material has reached the proper heat. The switch is quickly adjusted for various pressures.



THOMSON MODEL 100 SPOT WELDER

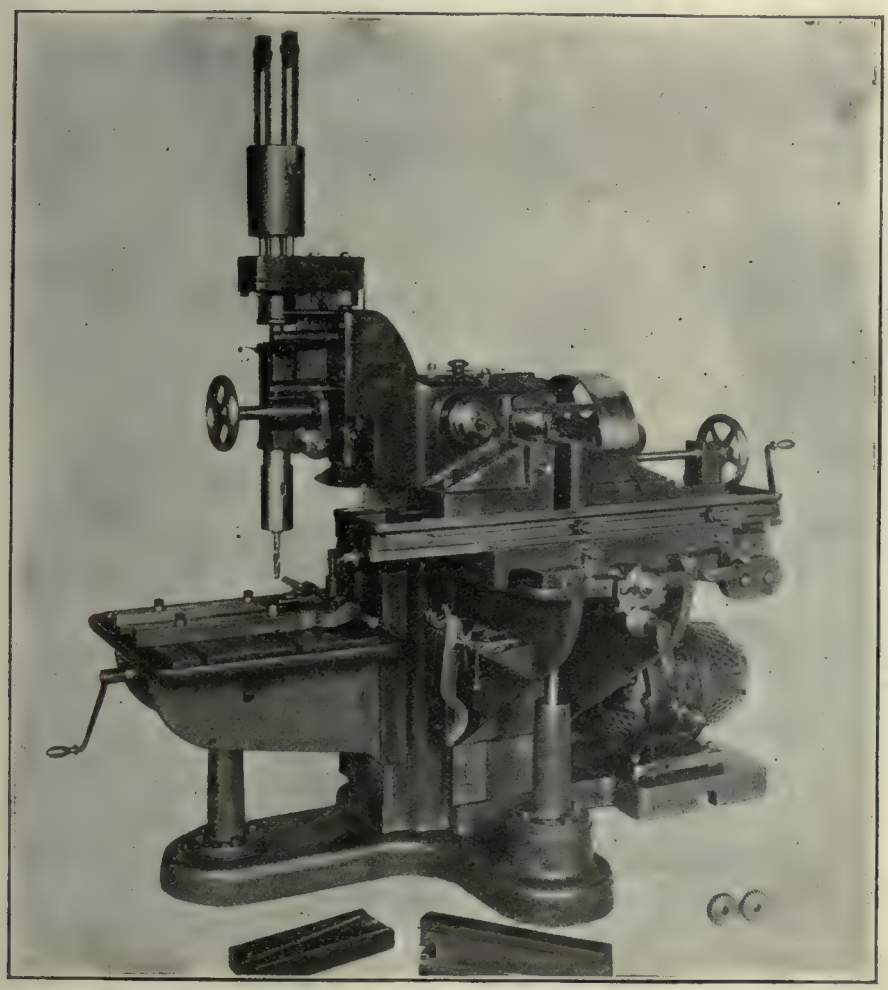
The primary coil is built to stand high temperature, so that the machine may be used for continuous production or operated at an overload. The transformer is of the "split-core" type which makes possible the removal of primary coils without dismantling the transformer. The capacity of the transformer is 25 kw. An improved design of secondary lead and terminal connections has been installed.

The standard length of horns is 12 in., but either 18- or 24-in. horns can be furnished. The horns are water cooled and may be used in raised or lowered positions. The maximum drop of the horns is 9 inches.

The machine will weld two pieces of steel ⅜ in. thick or two pieces of brass or aluminum ⅛ in. thick. The floor space required is 48x20 in., and the height is 50 in. The net weight of the machine is 1,000 pounds.

Harrington Wedge Block Slot Milling Machine

A machine designed especially for machining the T-slot in locomotive driving box adjusting wedges, is now being marketed by the Harrington Co., 17th and Callowhill Sts., Philadelphia, Pa. As shown in the accompanying illustration, the tool is a combination drilling and milling machine.



HARRINGTON WEDGE BLOCK SLOT MILLING MACHINE

One side of the machine is equipped with a drill spindle provided with hand and power feed and an automatic trip. Two holes on close centers are drilled in each wedge block, and the block to be drilled is placed between the guide strips and pushed back against the first of the adjustable end stops. This stop is adjusted so as to properly locate the first hole. After the first hole is drilled the first stop is raised, and the wedge block is pushed back against the second stop for drilling the second hole. The two holes can be seen in the wedge block on the floor at the left.

The milling side of the machine is provided with two parallel spindles, running at different speeds and driven by spiral gearing flooded by a bath of oil.

The milling table knee has a vertical adjustment, and carries a compound table which can be moved in and out parallel to the axis of the spindles and also transversely, at right angles to the axis of the spindles. The transverse motion is secured through power feed, and an automatic trip for stopping the feed at any predetermined point is provided.

A specially designed vise, which holds the wedge blocks with a narrow edge uppermost, is mounted on the table. The sliding jaw is quickly clamped by a hand wheel and screw, and a clamp over the top of the jaws can be used to prevent the work from raising. The depth of the T-slot is set by means of an adjustable stop.

The left hand spindle, rotating rapidly, drives a straight end mill, and the slowly rotating right hand spindle drives a T-slot cutter so that both cut at about the same surface speed.

The table is fed from left to right. The end mill first removes the metal left by the drilling operation and the T-slot is then cut in as the work is fed towards the right.

The machine is built with a base extension for mounting the motor, which is belt-connected to the machine. The motor should preferably be of the adjustable speed type to give a range of spindle speeds for cutting different materials. Four feeds can be obtained by means of constant-center change gears.

It is claimed that the use of this machine materially reduces the cost of production as well as increases the output per man-hour. The machine is so compact that comparatively little floor space is required.

Scully-Jones Self-Aligning Reamer Holder

A self-aligning reamer holder for use in turret lathes and drill presses has recently been developed by the Scully-Jones Co., 2012 West 13th St., Chicago, Ill., and is now being marketed. The holder is intended to make it possible to obtain the accuracy of hand reaming with machine power, the construction of the holder being such that the reamer can shift sideways as well as swing at an angle in any direction in order to align itself with the work.

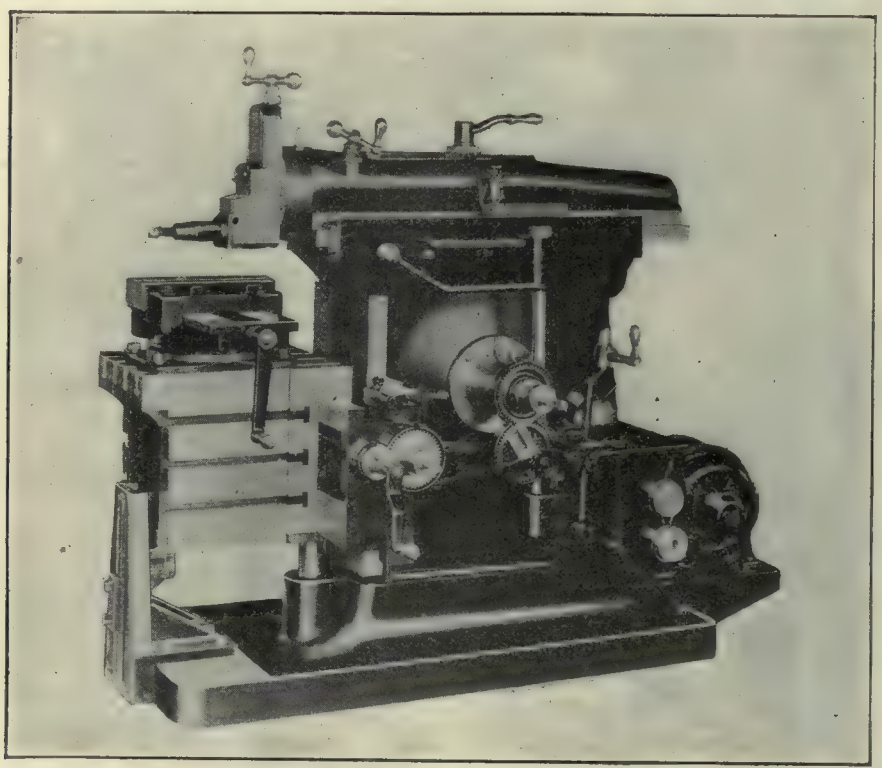
The reamer is held in a collet that is controlled through a driver plate and universal joint, the drive plate being supported by a ball that allows the collet to swing freely in any direction. A ball thrust between the collet and the drive plate allows free movement of the reamer sideways, to conform with any angular irregularities in the alignment of the machine spindle with the work. All parts are of hardened steel, nicely finished.



SELF-ALIGNING REAMER HOLDER

Averbeck Balanced-Ram Shaper

The Steel Products Engineering Co., Springfield, Ohio, has recently added a 28-in. and a 32-in. size to the line of Averbeck shapers which it manufactures. In addition to this, the 20- and 24-in. sizes formerly made only with cone pulley drive, are now furnished with the single pulley, constant speed drive used on the larger shapers, and all four sizes may be motor-driven.



AVERBECK BALANCED-RAM SHAPER

The single pulley drive mechanism includes a selective type gear box, by means of which eight cutting speeds are available, ranging from 6 to 103 strokes per min. For motor drive the motor is mounted on an extension of the base at the rear of the machine, as shown in the illustration, and is connected to the drive shaft by a silent chain.

The balanced rocker arm construction which has been a feature of these shapers is incorporated in the larger sizes also. The lower end of the rocker arm is pivoted to a lever which is fulcrumed in the column, the opposite end carrying a counterweight. This arrangement is intended to counteract the weight of rocker arm and ram upon the ways and thereby reduce friction.

The ram is of heavy, braced construction, internally ribbed, and has long wide bearings with full-length gibs for taking up wear. The usual stroke adjustment is provided. The tool head swivels through an angle of 160 deg. and is suitably graduated. The tool slide has a taper gib and is fitted with a locking device. The feed screw carries a double collar, one keyed to the screw and the other a slip collar graduated in thousandths.

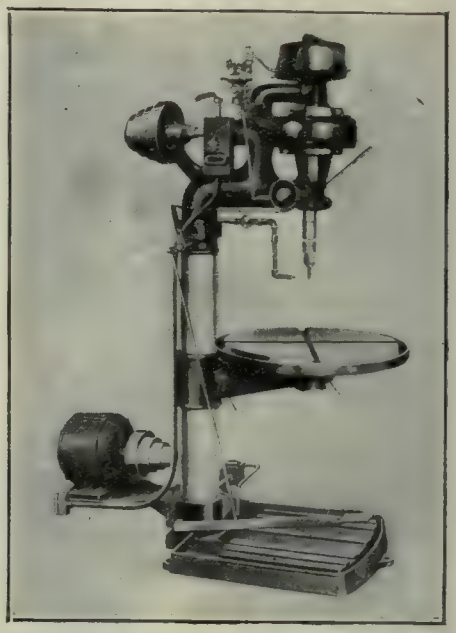
The table is of box form with T-slots machined from the solid. It is mounted upon a cross rail of heavy construction, which may be bolted directly to the frame of the machine to secure extra rigidity. The elevating screw for the cross rail is of the telescoping type. The outer bearing for the table consists of a casting with a vertical slot, in which a bracket carrying a roller may be set. The height of the roller is adjusted so that it is in contact with the outer edge of the table.

A heavy-pattern vise is provided which has a graduated swivel base of large diameter. The vise can be clamped on both sides of table as well as the top.

The power cross feed provides 16 feeds ranging from 0.008 to 0.125 in. per stroke. Two adjustable dogs are arranged to stop the feed action at any desired point in either direction, and stationary stops disengage the mechanism at the extremes of table travel. A 2 to 1 quick return is also provided.

Gaterman Pneumatic Oscillating Tapping Machine

A pneumatic control for the oscillating motion of the tapping machine manufactured by the W. Gaterman Mfg. Co., Franklin and 15th Sts., Manitowoc, Wis., has recently been developed to replace the electromagnetic control formerly used. The electrically controlled machine was described on page 980, Vol. 55, of the *American Machinist*.



GATERMAN PNEUMATIC OSCILLATING TAPPING MACHINE

The oscillating action is the same as with the electric control, the oscillations of the tap being started when the torque on the tap reaches a desired amount. The oscillating movement continues until the resistance is overcome, but it does not occur unless the resistance offered by the work exceeds the torque for which the driving mechanism has been set. The desired amount of torque is set by the spring balance in the head.

It is claimed that tap breakage is greatly reduced by the use of this machine and that the speed of tapping is increased. It is especially adapted for rapid work in tapping blind holes.

It is said that the pneumatic control delivers greater pressure on the clutches than the former control so that the capacity is increased.

The machine is built in different sizes, the No. 8 having a capacity from ¼ in. to ¾ in. A suitable air compressor for plants where compressed air is not available can be furnished.

News Section

A. S. M. E. Machine Tool Research Committee Meets

On Tuesday afternoon, Sept. 18, in the Mason Laboratory at New Haven, the members of the special committee on research in the machine tool industry, of the American Society of Mechanical Engineers got together for their first meeting. B. F. Blood of the Pratt & Whitney Co. was elected chairman and C. B. LePage, assistant secretary of the society, acted as temporary secretary.

After considerable discussion the form and substance of a progress report to be made to the society at the annual meeting in December were decided upon. The report is intended to cover the present status and future problems of the art of cutting metals.

Those present were A. E. Bellis, president, the Bellis Heat Treating Co., New Haven; B. H. Blood, general manager, the Pratt & Whitney Co., Hartford; K. H. Condit, editor, the *American Machinist;* E. F. DuBrul, general manager, the National Machine Tool Builders' Association; M. D. Hersey, physicist, the Bureau of Mines; L. H. Kenney, the U. S. Navy Yard, Philadelphia; and Prof. Boston of the University of Michigan and Mr. Yamasaki of the Imperial Japanese Navy who sat in as guests.

New Ford Truck Is Contemplated

A two and a half ton truck with a Fordson engine is expected to be added to the Ford Motor Co.'s line late this year. At present executives are not prepared to discuss plans for this new model, which are held in abeyance pending the introduction of the new one ton truck, equipped with cab and body, deliveries on which will start the latter part of this month or early in October. Present indications are that the heavy truck also will be built complete with body so as to allow of low delivery costs of a complete vehicle to the purchaser. As in the case of the light truck, there will be a standard convertible body. For requirements where the standard body would not be suitable the purchaser will consult, as formerly, the commercial body builder.

Canada Exporting Many Autos

That Canada now leads any other British country in its export of automobiles is shown by figures for the twelve months ended August, compiled by the Bureau of Statistics. The total exportation of freight and passenger automobiles for the twelve month period was 61,543 valued at $31,241,727 as compared with 26,549, valued at $14,885,844 in the corresponding period last year.

The total shipment of passenger automobiles for the twelve month period ended August was 53,520 valued at $28,344,700 as against 24,600 valued at $14,001,980 in the same period last year. Freight automobiles exported during the twelve month period totalled 8,023 valued at $2,897,027, compared with 1,949 valued at $883,864 in the preceding twelve months.

In August this year 4,245 passenger cars valued at $1,731,776 were sent out of the country as compared with 2,716 valued at $1,586,924 in August, 1922. There was also a considerable increase in the August exports of freight automobiles which totaled 1,480 valued at $521,118 as against 133 valued at $57,798 in the same month last year.

The total value of automobile parts exported during the twelve month period was $3,379,670, compared with $1,407,644 in the same period last year. August exports of automobile parts totalled in value $286,456 as against $134,105 in the corresponding month last year. The United States was the best customer for automobile parts, the value of the exports to that country being $64,537.

Coal Report Is Presented

In its final report on the coal situation presented to President Coolidge, the Coal Commission, headed by John Hays Hammond, recommended that a division in the Interstate Commerce Commission be created to exercise administrative and quasi-judicial functions over the coal industry, such as the gathering of facts and other activities essential to protect the public.

The report is to a great extent an elaboration of previous expressions of the commission, but it touches upon the terms of the strike settlement negotiated by Governor Pinchot, and asks the question whether the operator, carrier and distributor will absorb the 10 per cent wage increase. It also attacks the Pennsylvania tax on anthracite coal and suggests an excess profits tax to reach the hard coal operators.

No Anthracite Competition

"The fundamental evil in the anthracite industry is that of monopoly—the treatment of limited natural resources as if they were like other private property," it says. "Reliance on competition without supervision has resulted in persistence on a permanent level of high prices above which extortionate increases were made whenever a suspension of mining or other disturbances gave rise to the phenomenon of premium coal. In the anthracite industry, we have secured stability—which is desirable—but it has been at high cost to the consumer and has made anthracite a luxury fuel. The public is just now concerned as to whether the increase of 10 per cent in the wages of anthracite miners is to be 'absorbed' by operators, carriers and dealers, or passed on to consumers, just as it was outraged by the abnormally high prices of last Winter. But as shown in the report on anthracite, underneath these exceptional surface fluctuations there is a rising flood of costs and of prices which does not recede with the fall in the prices of commodities in general.

Urge Wage Revision of Miners

"The special report on anthracite discloses that there are such inequalities in the wages of miners as to require a thorough revision of the entire wage scale, some miners obtaining wages much higher than are paid in other comparable occupations, while others fall far short of what is needed to furnish a living American standard. It discloses that, together with these relatively low wages and unsatisfactory living conditions of many of the miners, including those who derive least benefit from the recent 10 per cent increase in wages, there are excessive royalties and differential profits. Limitation of margins to a reasonable return on legitimate investment and the elimination of monopoly profits, whether in the form of royalties, operators' and dealers' margins, or freight rates, are perfectly reasonable demands of the public."

Long Bodied Truck on the Market

A new model in a two ton truck with a wheelbase of 191½ in. has been added to the regular line of the General Motors Truck Co. of Pontiac, Mich.

The new model was added by the company to meet the demand of lumbermen, furniture dealers and moving van operators for a truck which would cart a long body but at the same time not demanding an excessive weight.

Francis Fenwick Dead

A dispatch has been received as we go to press announcing the death of Francis Fenwick head of the firm of Fenwick Freres & Co., representatives in France of many of the well known American machine tool builders.

Mr. Fenwick has been in declining health during the past several months and the immediate cause of his death was heart failure.

Milwaukee Has Better Business Than Last Month

It already is certain that the volume of business booked by manufacturers of metalworking tools and machinery in the Milwaukee territory during September will represent a moderate increase over the August volume. There is nothing in the trend of business indicative of brisk activity but as a rule expressions heard in the trade contain nothing of pessimism. In some quarters no marked increase is expected until after Jan. 1, while the majority of makers and dealers as well look to see a moderate and steady improvement in sales from this time forward, as a continuation of the rising curve since midsummer dullness marked the low point.

The summary of Milwaukee industrial conditions prepared for its patrons by the largest bank of the city describes the situation as follows: "Reports of industry and trade in Milwaukee for the month of August were somewhat irregular. Significant variations, beyond those attributable to the season, have been lacking during the past Summer. Certain industries, particularly machine shops and foundries, have been affected by the prevailing hesitation in trade. Variation in the number of persons employed by the larger firms has held within narrow limits. In August, as in July, there was a slight net increase in employment, for which iron and steel and automotive and allied lines were chiefly responsible. The increase among large iron, steel and machinery firms was rather generally distributed."

The summary also says a considerable improvement in bookings of orders developed through August and the first half of September. This was most apparent in automobile parts and accessories, electrical goods, etc.

Makers of milling machines find that the demand for their products is at least as good as at any time in the past year, and express hopefulness that there are better things ahead for this branch of the machinery industry. The bulk of business has been with the automobile industry, which is again a more active market factor than for two to three months while the majority of interests were rearranging manufacturing specifications for their new season. No round lots have been sold in recent weeks, although it is understood several of the large producers are soon coming into the market for more than a few tools at a time. Ford, Chevrolet and Buick are most often mentioned.

Tool needs among manufacturers of electrical appliances and devices are gradually approaching a commanding position. The industry has been developing rapidly but hardly equal to the absorption of its output, and big things are looked for among manufacturers of shop equipment suited to the electrical goods.

Industrial construction is of small volume, and with a few exceptions manufacturing interests are doing little more than making small additions and rearranging present structures to secure whatever additional capacity their patronage requires for the present.

Steady Progress in Canada

There is every indication of continued improvement in the demand for machine shop equipment in Canada and prospects are good for Fall business in this line. In the principal industrial centers including Montreal, Toronto and Hamilton, metal workers continue to be well employed, and one manufacturer recently reported his sales for the last six months to be approximately $4,000,000 ahead of the same period last year with enough orders on the books to keep the plant running at capacity for several months.

Viewed in its entirety, industry throughout the country is holding steady, with improvement in many lines. The automobile trade has been well employed and the production of the cheaper lines of cars is at capacity. An Ontario automobile manufacturing firm of considerable magnitude had net sales for the first six months of this year of $21,141,777, as compared with a total for the same period in 1922 of $17,422,531, and the orders booked are today in condition to keep the plant running at capacity for several months.

The iron and steel industry has displayed a strong undertone of confidence in the future. The pig iron and steel markets have shown continued firmness. Foundries are receiving more orders and electrical manufacturing firms have been well employed.

Notable among the groups of industries which are maintaining high operating records or are increasing them are the pulp and paper industry and mining. In these two branches conditions have improved steadily. Much new capital has gone into both industries during the past year, for the establishment of new companies and expansion of those already operating.

During August, construction contracts awarded in Canada amounted to $27,488,700, compared with $25,187,500, a year ago. Business building amounted to $7,762,500, or 28.2 per cent, while industrial building totaled $1,778,500 or 6.5 per cent.

Quiet Week in Buffalo

The Buffalo machinery market at the present time seems to be reacting slightly to the somewhat encouraging activity earlier in the month and the latter part of August. It is fairer to say that the market is spotted. Some report that July was the dullest month of the year, that August was much better than July and that a bunch of orders came rolling in during the first half of September promising that the month would be far better than August.

On the other hand there are several who are decidedly pessimistic. One dealer claims that September is showing up worse than August and that he cannot see any big business ahead for the next three or four months.

A representative of a steel products firm selling cold rolled steel put the situation this way: "Business is normal, but disappointing because of the fact that a great many men in this line expected a whole lot more business this Fall than they seem to be getting or are likely to get. I can't say that the outlook is discouraging or alarming, it is just disappointing to those who looked for a record season."

Purchases of railroad machinery continue fairly good. One firm has had enough orders on its books, largely for railroad equipment, to run its plant through the slump of July without reducing personnel or lessening activity in any way. The same firm has enough orders ahead now so that the success of the season is assured. For instance, it is working on five or six carload orders of machinery for the South at the present time, mostly for agricultural implements and light machinery equipment.

Better Inquiries in Pittsburgh

Although there have not been any strong indications of an increased buying movement in the Pittsburgh district, the machine tool market is more encouraging in that a certain sentimental feeling is abroad that business is on the verge of a big uplift. Inquiries are far more numerous than they have been for several weeks, and those at the base of the inquiries are more in earnest than for some time that deals may be put through. As to the nature of these inquiries, they dwell mostly upon small tools or for small groups of tools, the only large list before the trade being that of the Pennsylvania R.R., which has been enlarged during the past two weeks. It is understood to be getting ready to buy for other points than in the immediate Pittsburgh district.

Used Machinery Active

While a number of plant machinery sales are reported in the past two weeks, it appears as if there is more activity in the used machinery market, specific instances being the sale of three 27x18-in. lathes to a Philadelphia user, a 36x29-in. lathe to a manufacturer in Canton, Ohio; a 42-in. boring mill and a 5-ft. radial drill to a concern in Iowa; a 100-lb. hammer to Minnesota; a pipe machine to a dealer in Youngstown, Ohio; a 5-ft. radial drill to a user at Greenville, Pa., and a 20-in. shaper to users just outside the city. Most of these sales were made by an interest that recently purchased several tools at the submarine base sale of equipment by the United States Navy at Boston, Mass. Sellers of used machinery in the district report that buyers are looking for good machines, and will make purchases here and there, if offered at reasonable rates. Among the awards recently was a 5-ton crane to a derrick builder. It is expected that formal announcement of crane awards by the Pittsburgh Plate Glass Co. will be made shortly, an Ohio builder being the successful bidder.

The Homestead Valve Manufacturing Co., of Homestead, Pa., manufacturer of quarter turn valves, has announced a merger with the Protected Seat Valve Co., of Pittsburgh. W. R. Schuchman is president of the first named company, which will manufacture a full line of check and angle valves.

Detroit Machine Tool Men Expect Busy Fall Season

Increased output from automotive plants in Detroit is continuing to have its influence upon the machine tool market here. Expansion prorams to care for greater production are being announced in some quarters and are being planned in others. An extraordinary number of changes in departments and manufacturing establishments indicate an extensive field for machine tools within the coming months.

One Detroit firm is preparing a formal announcement of two new machine tools which will be placed on the market soon.

Car loadings, which are hitting a higher figure each week, the inauguration of new train service, both freight and passenger, and the employment figures reflect a healthy condition.

During the week ending Sept. 18 members of the Employers' Association reported 215,830 employees, a decrease of 57 since the previous week when 215,887 were employed. The slight decrease is taken as evidence that the employment situation is becoming steady. A slight movement of Negro labor back South is noted with the approach of colder weather.

Attention during the past week has been focussed on the hearings held before the Interstate Commerce Commission Examiner and the Michigan Public Utilities Commission on the proposal of the Michigan Central Railroad to increase switching charges in Detroit. The Michigan Manufacturers' Association, the Detroit Board of Commerce, and the Milwaukee Junction Manufacturers' Association have united in opposing the increases which it is estimated will add more than a million dollars a year to Detroit's freight bill.

Executives in the machine tool industry look for a prosperous Fall and Winter. Comparisons show that Detroit has regained its normalcy, and there is every indication that business will remain stable.

Better Conditions in New England

Production in the New England territory is generally at a good rate and it is the opinion that business will steadily improve with the passing of the Summer months and the resumption of normal business. Interviews with twelve sales managers in this district brought forth statements of optimism in eleven cases and the general tone of the manufacturers was to the effect that a reasonable amount of improvement may be anticipated.

One Hartford machinery manufacturer has at present enough orders on hand to keep his factory busy for the next six months. Also this same manufacturer reports a sizeable amount of inquiries arriving each day and his prospects for expansion are considered very good. Railroads and glass makers are his two main purchasers.

There are other lines of industry also among the potential customers, but they are of lesser importance.

Many Sources Ready to Purchase

For turret machinery and mortisers made in New Britain, it is reported that the percentage of sales resulting from inquiries is running higher than is customary and that the demand is a trifle stronger than is usual at this time of the year. The automotive industry and manufacturers making electrical appliances are good customers of small and medium sized riveters, according to a Hartford manufacturer of these machines and the outlook for the Fall and Winter is most encouraging.

But one manufacturer in the Hartford-New Britain district reported that business was not up to better than usual conditions. He stated that he had just completed a trip through the New England states and had found buying curtailed and many dealers reducing their stocks on hand. However, he added that it was not probable that things would take on as bad an outlook as in 1921.

Generally, the New England district appears to be in a good condition with improvement anticipated in most sections. Railroads and the automotive industry are buying and hope is expressed that general industries and the textile trade will join the purchasing group before long.

Buying by Railroads in Chicago

The machinery trade in Chicago has not shown any material change during the past week. Some rather sizable railroad business is still in sight. The Burlington R.R. has not closed on its rather large list which has been outstanding several months but it is reported today that purchases will be made in the near future. The Elgin, Joliet & Eastern R.R. has placed orders for a 30-in. planer, an axle lathe, a car wheel lathe and a 44-in. boring mill. The Southern Ry. has asked bids on two large turret lathes. The Chicago & Northwestern R.R. is in the market for machine shop equipment, some small tools and a 20-ton crane for its shops at Madison, Wis. The Erie R.R. has placed an order for a 15-ton Hulett unloader. The Norfolk & Western R.R. has purchased a 20-ton locomotive crane. The Seaboard Air Line has placed an order for two 100-ton bushing presses. The Pennsylvania Ry. has purchased a 90-in. wheel quartering machine. The Central Railroad of N. J. has ordered a locomotive axle journal turning lathe and a car wheel borer.

A pig iron buying movement would quickly absorb present stocks and result in a shortage of iron, according to iron men in the Chicago district. For several months furnaces have been obliged to pile iron, and the general opinion has been that there is a surplus stock, but this is proved erroneous by a canvass made by a large selling agency recently. The canvass shows that if all the furnaces in the country had been obliged to suspend operations the surplus stocks on hand would not have run the country twelve days. This, the report says, is a narrow and perilous margin.

During the last two or three weeks production of steel has dropped four points to around 76 or 77 per cent, and there is a possibility that even lower figures will be reached within the next few weeks. However, most of the larger producers have sufficient business on their books to insure fairly heavy operating schedules for several months at least.

New York's Future Encouraging

There was no improvement in the New York market this week, according to dealers, but there was also no backward step, making the score even with always a chance of improvement within the near future. Expressions of hope for the very near future were expressed by most of the sellers interviewed and every confidence was expressed for the Fall and Winter seasons.

That the trade is at the present marking time is not surprising. Many sales have been completed within the past month—a larger number than is expected for the August-September period—and this is the lull that follows upon the flurry of buying.

Railroads have been practically the only buyers in the New York district during the week with the exception of the Western Electric Co. that made rather extensive purchases for its Kearney, N. J. plant.

But the future holds out every reason for improvement. The automotive industry is resuming full time operation and inquiries are out from many of the shops for machine tools. Makers of electrical equipment are getting ready to enter the market, it is rumored, and large orders are expected to be the result. General industries are working at a higher percentage of capacity than was expected and expansions seem inevitable in many lines.

Used machinery dealers report improvement during the past week but are still dissatisfied with conditions.

Improvement Noted in St. Louis

There has been some increase in the number of inquiries received by machine tool manufacturers at St. Louis but beyond that very little improvement has been noted in the market. Many shops are still working on part time schedule and are having no difficulty in keeping abreast of their orders.

The railroads are buying only what they need, as are other lines of industry. There is no expansion in the equipments of machine tool users. All buying is for present demands only.

One lathe builder shipped two or three lathes to the Southwest last week and said that things were looking up a bit as to inquiries, but that orders actually closed were scarce.

The Medart Mfg. Co., maker of overhead power transmission machinery, reports that its business is fair and that it has an inquiry pending for a large order.

The labor situation generally is better

here and in the machine shop industry in particular there is no complaint as to the number of mechanics available and no difficulty over scales of wages is being encountered.

Collections are reported as somewhat better. One firm stated that collections were good with it and attributed the condition to the fact that it has aggressive collectors.

The automotive industry is still active and various factories buy what they need in the machine tool line, but of course these needs are limited.

Woodworking machinery is moving at a fair rate.

Personals

JAMES W. HOOK, for the past six years president of the Allied Machinery Co. of America, has resigned that position to enter the manufacturing field, and on Oct. 1 will become associated with the Geometric Tool Co. of New Haven, Conn., as vice-president and general manager.

GEORGE R. WOODS, manager for R. S. Stokvis & Sons. Whitehall Building, New York City, has returned from a vacation spent in the Megantic Preserve, Maine.

WILLIAM W. PEACOCK is now associated with J. L. MCCARTNEY in the Pittsburgh office of the Niles-Bement-Pond Co., New York. He was formerly with the Pittsburg office of the Motch & Merryweater Machinery Co., Cleveland.

M. S. PALMER will represent the brass goods companies of Manning, Maxwell & Moore, Inc., in the New England district. His office will be at 5 Watson St., Boston.

E. C. REBESKE, who recently was elected president of the Standard Gage Steel Co., Beaver Falls, Pa., is also secretary and treasurer of the Union Drawn Steel Co., of the same place.

F. A. CROSELMIRE of Newark and New York City, has been appointed vice-chairman of the contest board of the American Automobile Association, according to an announcement made by Joseph Mack of Detroit, chairman of the board. Mr. Croselmire will have supervision of the New York office of the board.

JOHN ROLLINS, representative of William Marples & Sons, Ltd., tool makers, Hibernia Works, Sheffield, England, is now in Montreal, Canada, and is calling on the trade in the interests of his firm.

OTTO M. RAU of Philadelphia, and DR. FREDERICK H. NEWELL of Bradford, Pa., have been appointed consulting engineers on the Pennsylvania Giant Power Survey, authorized by the Legislature to study natural resource conservation. Mr. Rau is a power specialist and formerly was connected with the Edison General Electric Co. of New York. Dr. Newell has a long record of engineering service. He has written extensively on scientific subjects.

E. C. RICKS, of Pittsburgh, a coke oven machinery manufacturer, has purchased the Evans Mold & Foundry Co., of Uniontown, Pa., and hereafter will specialize in the manufacture of parts for mining machinery.

EDGAR BLOXHAM, Paris representative of Sleeper & Hartley, Inc., 335 Chandler St., Worcester, Mass., is visiting in the United States and is also on a purchasing trip for Paris manufacturers. He states that the future looks encouraging in France.

Business Items

The H. P. Townsend Manufacturing Co., Hartford, Conn., will occupy its new building in the course of two weeks. It adds 4,500 sq.ft. of floor space.

The American High Speed Chain Co., 225 E. South St., Indianapolis, Ind., has moved into its new plant which gives it nearly double capacity.

New machinery is being installed in the National Spring & Wire Co.'s factory at Albion, Mich. The company expects to begin operations shortly.

National Cast Iron Pipe Co., of Birmingham, Ala., has opened an office in the A. G. Bartlett Building, Los Angeles, Calif.

The Waterhouse & Lester Co., 534-548 Howard St., San Francisco, Calif., operating on the Pacific coast since 1851, in the vehicle and automotive equipment business, has entered the machine tool field. The company has taken over several of the lines carried in the Pacific coast territory by Eccles & Smith, who have discontinued operations in that field.

The Bethlehem Steel Co. has ordered from the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., electrical equipment to replace a steam drive for a 30x48 in. Universal plate mill in its Lackawanna plant, located near Buffalo, N. Y. The value of the order is about a quarter of a million dollars.

Federal incorporation has been granted in Canada to the Western Steel Products, Ltd., with headquarters in Winnipeg. The capitalization is fixed at $2,000,000. The president of the company is H. Ormond, and the vice-president and general manager, H. C. McMartin whose place of residence is 1167 Grosvenor Ave., Winnipeg.

The Oakland motor car factory at Pontiac, Mich., expects to increase its capacity to 500 cars per day when the $2,000,000 alterations now well under way are completed.

Construction has been started on the new home of the Detroit Auto Specialties Co., one of the Hupp Motor Car Corp.'s subsidiaries, which will more than double the company's manufacturing area. The new building, which is to be 504 x 120 ft., is being erected at Mt. Elliott Ave. and Dunn Road, in the rear of Hupp's main plant. Completion is scheduled for about the first of the year, following which the present location of the Hupp subsidiary at Hamilton and Milwaukee Aves. will be abandoned, it having recently been sold.

The Jones & Laughlin Steel Corp., of Pittsburgh, Pa., is tabulating bids for 12 or 15 crane installations, including those for a new bar mill.

Many New Freight Cars in Use

The railroads of the United States during the month of August placed in service 19,167 new freight cars, as well as 362 new locomotives. They also had on order on Sept. 1, with deliveries being made daily, 72,906 new freight cars and 1,517 new locomotives.

During the month of August, the railroads placed in service 7,478 new coal cars which brought the total number placed in service from Jan. 1 this year to Sept. 1 to 46,659. They also placed in service during the month of August, 6,726 new box cars. From Jan. 1 to Sept. 1 new box cars placed in service totaled 46,154.

The railroads in August also placed in service 3,743 new refrigerator cars and 478 new stock cars.

Of the new freight cars on order on Sept. 1, box cars numbered 31,807; coal cars 29,203; refrigerator cars 6,989 and stock cars 3,079.

New locomotives installed during the first eight months this year totaled 2,583.

Will Discuss Coal Problems

America's coal problem will be brought before the engineers of the nation at Rochester, N. Y., Oct. 12 and 13, when, it is announced by President Mortimer E. Cooley, the executive board of the American Engineering Council of the Federated American Engineering Societies will convene for a discussion of industrial and scientific questions.

Of chief interest will be a report of the Federation's Committee on Coal Storage, which has been conducting a study in co-operation with 107 local committees all over the country. Characterizing the investigation, a statement by the Federation declared that the engineers "are not viewing the storage of coal as a practice which should be adopted on any basis other than that of sound economic judgment."

Less Freight in Holiday Week

Loading of revenue freight for the week which ended on Sept. 8 totaled 928,858 cars. This was an increase of 105,611 cars over the corresponding week last year, and an increase of 179,306 cars over the corresponding week in 1921.

Due to the observance of Labor Day, and also the suspension of operations in the anthracite coal region, the total for the week of Sept. 8 was a decrease of 163,709 cars under the week before, when loadings totaled 1,092,567 cars, the greatest for any one week in history.

Loading of merchandise and miscellaneous freight, which includes manufactured products, totaled 541,371 cars. This was a decrease of 80,839 cars compared with the week before, but was an increase of 48,413 cars over the corresponding week in 1922, and an increase of 88,178 cars over the same week in 1921.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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WHEN in Chicago last Tuesday and Wednesday every business man that I met asked the same question. They wanted to know "What is the matter with Wall Street?"

They were all busy and optimistic, but having been taught that the action of the stock market anticipated the advent of good times or the reverse they were at a loss to understand its persistent lethargy at present.

That the tone of the New York Stock Exchange has a profound influence upon the minds of business men in this country is to be admitted. Those who operate there are mistakenly supposed to be super-sagacious if not clairvoyant. The business done there is the subject of lengthy reviews that are published in every important city along with the quotations of all the more active securities, and though they may not be speculators it is as impossible as it would be unwise for merchants and manufacturers to ignore an influence so noticeable.

For this reason I think the most substantial service that I can render to the readers of this letter is to point out why the stock market is no longer to be relied upon as a barometer whose rise or fall indicates the approach of storm or fair weather in the commercial world. When it first came to be so regarded it was the place in which most of the uninvested capital of the country found employment either in loans on Stock Exchange collateral or in the purchase of Stock Exchange securities.

Now there are many other ways in which the capitalist can use his money profitably and there are a score of cities where the local investment market is almost as important as was that of New York in the not distant past. With the aid of the underwriting machinery that has been so perfected in recent years hundreds of millions of new securities are distributed each month among multitudes of investors all over the country.

In this work thousands of banks are enlisted. The securities are offered to those who have credit balances with these banks. They do not have to resort to the Stock Exchange to invest their money and most of the stocks and bonds thus put away stay put. The Liberty Bond campaigns opened the eyes of bankers to the buying power of the small investor and it has been intensively cultivated.

Marginal speculation has been discouraged and disparaged, while investment has been encouraged by every legitimate device. Thrift is preached, the alchemy of compound interest is advertised and the bucketshops that have recently welched are held up as examples of what one may expect from any stock broker.

As to the larger capitalists—the very rich men whose operations used to make or unmake values on the Stock Exchange—the income tax has destroyed their initiative. One of the richest men in the country, who is known to have been a very bold speculator, has just announced his retirement. He says that because the government takes half his profits and leaves him to pay all his losses there is no inducement to assume the risks involved and he has quit.

This is the view of many wealthy men who used to trade largely in stocks. They have retired and put their money in tax exempt securities.

> "These conditions are reflected in a record freight tonnage, with railroad earnings to correspond and bank clearings that are equally satisfactory . . . . Facing these facts, continued prosperity would seem to be indicated with the probability of great activity as France, Germany and Great Britain progress in the formation of the economic and industrial entente toward which they appear to be moving."

And finally there are the Federal Reserve Banks. In the old days the New York banks carried a preponderant share of the nation's bank reserves. To be safe they had to keep large cash reserves and secondary reserves that were still larger. These secondary reserves were chiefly loaned on Stock Exchange collateral, supposed to be instantly convertible. It was practically the only way in which a secondary reserve could be invested. An enormous fund was thus placed at the disposal of the stock market.

Now this is all changed. The banks keep but little cash on hand. Their reserves are their balances with the Federal Reserve Bank, where they can rediscount their commercial paper in an emergency. Secondary reserves are no longer necessary and Stock Exchange loans are not sought as previously because they cannot be rediscounted.

As a consequence the Stock Exchange speculator has to pay more for his money and he is correspondingly handicapped and discouraged. These changes are for the most part desirable, but they explain why the stock market has ceased to be a barometer of the nation's business and why its tone may be safely disregarded if it is not in harmony with the many other more important factors that make up the economic complex.

These remarks are prompted by the weakness of the oil stocks last week. Those among whom they were distributed under cover of the stock dividends declared last year have been selling them because the large production of oil is supposed to have made the business of refining petroleum and distributing its products unprofitable.

Logic suggests the reverse and the *denouement* will probably prove that logic is right, but the speculator whose margin is running out can not be logical, and the losses of those who had been persuaded to buy "the oils" has weakened the whole stock market.

But the movement is not significant otherwise, and with all the other indicia of business pointing to fair weather it seems unreasonable to expect rain because a section of the stock market is beclouded.

The Federal Reserve statement shows a gain of $11,000,000 in gold holdings and a rise of 1.3 per cent in the reserve ratio which now stands at 77.2. Trade continues active in almost every quarter.

For reasons peculiar to each of them, cotton, sugar, and coffee are all strong and higher. Even copper and leather, the two laggards among the commodities, are looking up. Wheat is recovering from the blow dealt it by the discovery of the Canadian surplus. A further increase in building activity is reported.

These conditions are reflected in a record freight tonnage, with railroad earnings to correspond and bank clearings that are equally satisfactory.

Facing this array of facts continued prosperity would seem to be indicated with the probability of great activity as France, Germany and Great Britain progress in the formation of the economic and industrial entente toward which they appear to be now moving under the duress of the national debts with which they are burdened.

Increased Surplus of Freight Cars

The railroads on Sept. 7 had 67,651 surplus freight cars in good repair and immediately available for service if necessary according to reports filed by the carriers with the Car Service Division of the American Railway Association.

This was an increase of 1,092 cars compared with the number of surplus freight cars on Aug. 31.

On Sept. 7 the car shortage amounted to 10,211 cars, an increase of 770 cars since Aug. 31.

Of the total number of surplus freight cars, 13,501 were coal cars, an increase, due to the suspension of anthracite mining, of 9,579 cars within approximately a week. Surplus box cars totaled 45,245.

Progress Recorded by Machine Tool Exhibit

Well attended exhibit at Mason Laboratory, Yale University—The passing of many familiar machine tools and factory accessories—Exhibit to be yearly event

THE third annual Machine Tool Exhibit, held at the Mason Laboratory of Yale University Sept. 18 to 21 inclusive, reflected the growing enthusiasm of the machine and tool builders of New England for an annual display that shall be representative of that industry and section. The exhibition was even more diversified and comprehensive than last year. By unanimous vote, it was decided to make the exhibit an annual affair.

Unlike many exhibitions of machinery, this one is confined almost wholly to machines and tools that are used for the purpose of constructing other machinery capable of turning out duplicate parts that formerly required hours to complete in less than the same number of minutes.

A feature of the industry brought out by the display is the tendency toward the design of special purpose machines adapted to finish in one single continuous operation machine parts that have hitherto required the services of several machines and which must pass through many individual operations, all dependent more or less upon the skill that the operative could bring to his work.

The absence of countershafts and other overhead construction was also noticeable, nearly every machine shown having its individual driving motor attached to and often hidden within the base. The advantage of this condition can best be appreciated by one who is familiar with the maze of belts and pulleys that only a few years ago constituted a necessary auxiliary of the average machinery building plant.

Compact Designs

Many of the larger machines exhibited displayed the tendency toward compactness of design and unit construction. A machine that formerly would have required hours or even days to erect and put in running condition can now be swung into place suspended from a single eye bolt from the overhead crane and may be in full operation within ten minutes from the time of depositing it on the floor.

Unit construction permits any important group of parts to be removed for repairs or adjustment by merely withdrawing the holding bolts instead of the entire dismantling of the machine.

Precision and production seem to be the keynotes of modern machine tool building. Even the toolroom lathe and milling machine, though retaining all the versatility of their immediate predecessors and possessing many additional features besides, are now made of such massive proportions as to be capable of aborbing more power to an individual unit than formerly served to drive a whole machine shop and without in any way lessening the accuracy of their product.

The geared head and constant speed drive have practically supplanted the familiar cone on all the larger machines and in many cases where the driving belt is retained it is enclosed. On none but the smaller tools was the old cone and belt in evidence.

The rapidity of the use of the machine tool industry as a whole was well brought out by informal talks in the lecture room of the laboratory showing the achievements of the pioneers and tracing the line of descent from them to the prominent machine tool manufacturers of the present day. The speakers were Joseph W. Roe, Professor of Industrial Engineering at New York University, and Guy Hubbard of the National Acme Co. of Windsor, Vermont. Mr. Hubbard himself is a direct descendant of one of these pioneers.

Old Time Machine Shown

To illustrate the fact that modern production machinery has been developed almost within the memory of a single generation, there was shown upon the screen a picture of the first automatic—commonly misnamed the "automatic screw-machine"—ever built. It was designed by the late Christopher M. Spencer. In active charge of one of the exhibits on the floor was found a man who actually assisted Mr. Spencer in its construction.

What is believed to be the first milling machine ever constructed, built in 1810 by Eli Whitney, was shown in the lecture room—not a picture but the actual machine. The first of the "Lincoln type" milling machines, a Windsor, Vt., product, was also shown.

An innovation was introduced on Thursday evening in the shape of an actual demonstration on the floor of the lecture room of several of the machines selected for the purpose from among the exhibitors. The power driven helve hammer of the High Speed Hammer Co., the "Triplex" combination bench lathe, milling and drilling machine, the Bullard "Contin-U-Matic," and the new Hendey 14-in. tool room lathe were chosen.

Mr. Moore, engineer of the High Speed Hammer Co., gave an informal talk on the problems of riveting as encountered by machinery manufacturers and demonstrated the applicability of his hammers to the riveting of anything that could be riveted by hand. He brought out the fact that such diverse materials as comparatively hard steel and fiber were successfully riveted and that the machine was also regularly applied to the cutting of glass.

The Triplex machine was capably demonstrated by John Cetrule, sales agent of the Triplex Machine Tool Co., who put the machine through its paces and showed its adaptability to a very wide range of small machine and tool work.

Constant Bullion, engineer for the Hendey Machine Tool Co., described the applicability of the Hendey 14-in. tool-room lathe to many odd and peculiar jobs that would ordinarily require a milling machine, as well as its versatility on the ordinary run of regulation lathe work.

Because of the weight of the Bullard Contin-U-Matic—it weighs 12 tons without the tools—Mr. Blanchard, the demonstrator, was obliged to apologize for not bringing the machine into the lecture room with him, and had to resort to the projecting lantern and screen to show its construction and operation. Despite his handicap, he was able to give his audience a very comprehensive idea of its capabilities.

Floors Crowded

Interest in the exhibition as a whole was amply evidenced by the crowds of spectators that thronged the floors during the afternoons and evenings. Not a few of the machines shown were in actual production, work having been brought in from the factories where the machines were in regular operation before the exhibition was opened and to whence they were returned after it was closed.

Two resolutions were passed by the exhibitors. One was to Yale University expressing appreciation of the interest shown by that institution in its contributions to the exhibit and the use of the Mason Laboratory and the other was to William Smith Mason and George Grant Mason, the donors of the laboratory to Yale University. C. F. Oswald of the Standard Safety Manufacturing Co., New Haven, Conn., was the chairman of the Resolution Committee for the Exhibitors.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb....	$0.0337	$0.0337	$0.0285
Cold finished shafting.....	per lb....	0.0433	0.0428	0.0373
Brass rods.....	per lb....	0.17	0.1741	0.1666
Solder (½ and ½)	per lb....	0.276	0.276	0.2283
Cotton waste...	per lb....	0.1225	0.1231	0.1458
Washers, cast iron (½ in.)...	per 100 lb.	4.66	4.66	4.00
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100...	3.08	3.08	2.96
Lard cutting oil	per gal...	0.575	0.575	0.575
Machine oil....	per gal...	0.349	0.349	0.36
Belting, leather, medium.....	off list....	37%	37%	44½%
Machine bolts up to 1x30 in.	off list....	49½%	44¼%	53¼%

What's Going to Happen to Germany?

With the mark defunct and labor clamoring for more pay, industry is handicapped almost beyond the powers of recovery—The import and export question

BY OUR BERLIN CORRESPONDENT

GERMANY has passed through a series of internal convulsions, which have shaken her economic structure down to the ground work. Every business man in the country was well aware that the stabilization of the mark would evoke quite an economic revolution. That almost the identical effect expected from this event would be produced by hypertrophical inflation has been anticipated by no one. Outwardly the upheaval has found expression in labor unrest. Strikes and acts of violence in factories which, although much more serious and numerous than the public was led to believe, was mostly confined to threats. Inwardly, however, a most radical and rapid change has prepared itself, completely altering all existing relations in the cost and price problem. The evolution toward the gold standard pent up so long, as outlined in these columns (*American Machinist*, Vol. 59, No. 6, page 234h), which under a certain continuity of conditions would have taken many months to develop fully, has enacted itself with amazing swiftness, almost with the force of an explosion, thereby widely overrunning all carefully mapped out confinements. The whole edifice of inflation has come down with a crash.

Through the dust stirred up thereby it can already be recognized that the German industry emerges from the jumble in an entirely new situation. The privileged position it has occupied up to now in the matter of cost has clearly become history. Henceforth it will have to take its stand alongside of its foreign rivals, competing with them on level ground. How this happened may here be briefly chronicled as the most momentous development in Germany's eventful post-war experiences.

The Turbulent Currency

The chief organic causes were the breath-taking mark depreciation and the insufficient appropriation of foreign funds to the import trade which seriously impaired importation. A considerable dearth resulted, closely followed by a gigantic tidal wave of prices which in the case of all necessities of life created a situation affording an excellent playground for all latent destructive forces. The finishing touch was supplied by comparatively so insignificant a matter as the temporary shortage of banknotes. While this happened, the problem of stabilized wages was still on its march yet requiring a good deal of delicate handling before it could be brought into a secure harbor. The inevitable result was that it got out of control and broke bounds, while employers and employer's representatives were still haggling over matters of detail. All the good intentions on both sides to settle the problem in a fair spirit taking due regard of the difficulties resulting to the industry have been swept away by the onrush of unloosened elementary forces. The functionaries of the unions and the industrialists, both badly frightened, beat a hurried retreat falling back upon the line of least resistance which could be nothing else than full accession to the workmen's demands. It was clearly beyond the union's power to help the industry establish wage rates, keeping at a certain ratio below the pre-war level as they had promised to do. Cost of living which the unions have insisted upon as a standard of adjustment having surpassed the pre-war level, matters have automatically been carried beyond. The apprehensions of the industry in this respect have indeed been realized quickly.

Wages and the Cost of Living

Cost of living being a direct function of wages, the spectacle of a rapid reciprocating movement between the two is afforded. Instead of the mad chase between the mark rate and prices, prices and wages have engaged in a simultaneous spurt with the mark rate merely standing by, fairly at rest. Peculiarly enough publicly controlled prices like those of coal, iron, transportation and communication in general, can now be discerned as the prime movers. The policy of keeping these basic prices at an artificially low level, preserved for so long as a boon to the German industry has evidently been given up.

> "In industrial circles it is declared that the German industry cannot compete on foreign markets at a pre-war rate of wages, not to speak of a higher one. In the Berlin machine tool industry the opinion was heard that the highest rates this industry could afford to pay are 75 per cent of the pre-war equivalent which opinion seems to be shared by manufacturers in general."

A striking illustration is afforded in the matter of coal prices. The price of the lowest grade of Ruhr coal has been fixed at a level, which at the date of adjustment corresponded with an amount of 59 gold marks per metric ton. In 1914 this price was from 12 to 12.40 marks. The present price contains an allowance of 33⅓ per cent to the mines as advance compensation of any losses they might sustain by money depreciation during the time intervening between the delivery and the receipt of payment. On top of that a further 30 per cent of the total is added by way of a coal tax. The former percentage amounts to 11.40 gold marks and the coal tax to 13.60 gold marks, which alone is more than what this grade of coal cost in 1914. The present price of coal which is now understood to be stabilized in its relation to wages and other cost influencing factors is 390 per cent higher than the pre-war price. The times of cheap German coal are evidently past. It has within a few weeks climbed to the top of the price scale of all coal producing countries.

Less strongly pronounced is the change with regard to iron and steel prices that have been adjusted at a level approximately 60 per cent above the pre-war level. This, however, happened when coal prices were still in the beginning of their precipitate movement. The ratio to pre-war parity that iron prices will eventually assume is presumably much higher. Cost of freightage has some time ago surpassed the pre-war level. This condition is perpetuated by the new system, of keying it to the gold standard. In this instance also the new level of coal prices has not found time to take effect. As coal constitutes about 40 per cent of operating expenses, the railroads have to further increase the basic rates of freightage since the administration is now determined to cut out its enormous deficit. The leaks provided by the system of granting respites for the payment of freightage, amounting in times of mark depreciation to a considerable discount will be stopped at the same time.

Taking into account the price level of coal, iron and freightage as the basis of general price adjustment of manufactured goods present conditions seem to point to a future level at least 100 per cent above the pre-war average. How much of this growth is of permanent nature and how much of it is due to the general heedless rush and capable of receding will be seen by future experience. This will be determined by the ratio to pre-war parity at which wages will ultimately settle. The categories of labor leading in the wages dispute for the reason of their strongest position are the printers and miners.

In industrial circles it is declared that the German industry cannot compete on foreign markets at a pre-war rate of wages, not to speak of a higher one. In the Berlin machine tool industry the opinion was heard, that the highest rates this industry could afford to pay are 75 per cent of the pre-war equivalent which opinion seems to be shared by manufacturers in general. Strong efforts are at work openly and behind the curtains to screw wages back to this level. The manufacturers' organizations have strongly prevailed on their members to come to the rescue of the state finances with all gold funds available on the understanding that food stuff should be imported on a large scale for the purpose of lowering prices and incidentally the index of living cost. Since the latter has been adopted as the standard of wage stabilization it seemed to be the obvious thing to take up the manipulation of wages from this angle.

Trade Unions Back Manufacturers

In such efforts the manufacturers are secretly backed by the trade unions. The latter have chiefly the unemployment question at heart in which respect their interest naturally coincides with that of the manufacturers. The country has to export or it cannot pay its imports in which case the lines of industry dependent on imported raw material must suffer. This is only one side of the business aspect. The de-

pression resulting from a serious contraction of the export business must, in view of the greatly impaired domestic purchasing power, be considered quite general.

This is shown by the experiences of last Spring when the industry was faced by similar conditions which then were produced by a rather sudden improvement of the mark rate with serious consequences to business. Had it not been for the fact that manufacturers continued to sell at unchanged export prices which then were ruinous, in the expectation of a further downslide of the mark, the effects to business would doubtless have been pronounced still more sharply. Conditions now are quite different. A further aggravation of the mark rate will not help since wages will follow immediately. That such effects in the present case are not overrated is evidenced by reports from all parts of the country, almost signalling a collapse of business.

From the general confusion of opinions it is apparent that the German manufacturers cannot at pre-war wages produce and sell at pre-war prices and that the relation between the two has materially changed. This could be observed in all cases where the sales price has been put on a gold mark basis, thereby making its relation to the pre-war standard more evident than the paper mark price permits. In the case of measuring tools and small tools, this gold price approximates the pre-war price at a rate of wages of about one-half of the pre-war average. It is generally accepted more or less as a fact that if given equal wages, the sales price must be now at least twice the pre-war price.

Still there is no doubt that costs are generally enhanced in comparison to pre-war times. This is usually ascribed by manufacturers to lower efficiency of labor, the large amount of unproductive labor manufacturers have to carry and to the fetters of official control, requiring a good deal of wasteful "red tape." As regards efficiency of labor, opinions of manufacturers are divergent. While some speak of a 50 per cent efficiency others declare that pre-war efficiency has been reached. In the other two respects they quite concur. It is a fact that the volume of production per head has dropped to about one-half. Whether the excessive number of employed is pre-eminently due to the new labor legislation or also to conditions still under the control of management is more or less irrelevant. The question must be how to dispose of the number of employed, dispensible under the rules of strictest economy, called by the late Rathenau the "invisible army of unemployed." The German industry has not been able to rid itself of it during periods of exceptional prosperity. How to do it in times of heavy depression with an ever increasing visible army of unemployed is the great and most serious problem of the future.

Trade Catalogs

Adjustable Speed Motors. The Reliance Electric & Engineering Co., Cleveland, Ohio. The Reliance type AS adjustable speed motor is described in detail and illustrations show the motor and its parts. Tables of ratings are also contained in the booklet.

Rolling Mill Machinery. Mesta Machine Co., Pittsburgh, Pa. A well bound booklet, mostly illustrations, showing the plant and the product of this company, has recently been issued. The booklet is unusual and shows exceptional views of its mammoth machinery.

Electric Conduction Heaters. The Cutler-Hammer Manufacturing Co., Milwaukee, Wis. Various machines with this product as a part of them are shown in an eight-page folder. Descriptive matter, cuts and tables are used as means of illustration.

Thermit Rail Welding. The Metal & Thermit Corp., Equitable Building, New York City. The new pamphlet issued brings up to date the whole subject of thermit rail welding to cover the many recent improvements in economy and efficiency. The pamphlet includes detailed instructions, accompanied by illustrations and drawings, showing steps in making the improved thermit rail weld which has greatly reduced the cost per joint. Improved apparatus used in connection with thermit rail welding, such as the self-luting mold box and the new lightweight double-burner preheater which have greatly accelerated the speed of operation, is described in detail for the first time, as well as illustrations showing results of a ten years' service test of the thermit rail weld, also rail bending and drop tests. Instructions for using thermit for welding compromise joints, constructing frogs and crossings and repairing loose arms of switches have also been included in complete form. At the end of the pamphlet is a discussion of the theory of rail joints.

Combination Automatic Piston and Piston Ring Machine. Potter & Johnson Machine Co., Pawtucket, R. I. There is a general description of the 2-P combination automatic piston and piston ring machine contained in this booklet of sixteen pages. Diagrams and half-tone illustrations are also contained therein.

Dial Indicators and Gages. Frank E. Randall, Waltham, Mass. Two pamphlets describing these two products are being sent to the trade. Illustrations and descriptions are contained therein.

Sprue Cutters. The Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill. A circular with a picture of the Milwaukee sprue cutter, its specifications and details of the machine has been mailed out by this company.

Open Ratchet Braces. The Consolidated Tool Works, Inc., 296 Broadway, New York City. Various styles of ratchet bit braces with weights and measurements of each have been described in recent circulars.

Reamers, Chucks, Collets, Turret Lathes and Attachments. McCrosky Tool Corp., Meadville, Pa. A catalog of this corporation's products with specifications, illustrations, charts and descriptions has been issued.

Industrial Trucks and Tractors. Crescent Truck Co., Lebanon, Pa. The economy and efficiency of electric industrial trucks and tractors in warehouses and manufacturing plants are pointed out by this catalog. There are many convincing illustrations contained in the booklet and fac-similes of letters received from users.

Portable Electric Tools. The Hisey-Wolf Machine Co., Cincinnati, Ohio. Hand drills, motor drills, grinders, reamers, buffing lathes, and other types of portable tools electrically operated are illustrated and described in this catalog. Specifications and information regarding the tools are also given.

Slight Decrease Shown in Living Cost

The cost of living in the United States on Aug. 15, 1923 was 61.6 per cent higher than in July, 1914, according to figures just collected by the National Industrial Conference Board. Between July 15 and Aug. 15, 1923, there was a decrease of three-tenths of one point or two-tenths of one per cent. Between July, 1920, when the peak of the rise in the cost of living since 1914 was reached, and August, 1923, the cost of living dropped 42.9 points or 21 per cent.

Pamphlets Received

Some Compressive Tests of Hollow-Tile Walls. Technologic Paper No. 238. Department of Commerce, Bureau of Standards, Washington D. C. Price, five cents. The various tests that were recently made by Herbert L. Whittemore, mechanical engineer, and Bernard D. Hathcock, laboratory assistant of the Bureau of Standards are embodied in this pamphlet.

The Service of Organized Industry. By Julius H. Barnes, U. S. Chamber of Commerce, Washington, D. C. An address delivered by Mr. Barnes who is the president of the United States Chamber of Commerce, at the annual meeting of the National Association of Insurance Agents, held in Buffalo, Aug. 22.

Proceedings of the Ninth Annual Meeting of the International Association of Industrial Accident Boards of Commissions. U. S. Department of Labor, Bureau of Labor Statistics, Washington, D. C. The official copy of all of the proceedings of the meeting which was held Oct. 9 to 13, 1922, are contained in this pamphlet.

Intermediate Training for High School Graduates. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. The curriculum and an outline of the studies that are taken up are explained in this pamphlet. It is illustrated with pictures of graduating classes and class rooms with students engaged in different pursuits.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Small stationary motors, two to twelve hp. Papendrecht, Netherlands. Purchase and agency. Reference No. 7761.

Automobile accessories. Berne, Switzerland. Agency. Reference No. 7752.

High tension magnetos. 1,000 carburetors, engine parts and general motor accessories. Sydney, Australia. Purchase. Reference No. 7753.

Kerosene oil engines. Dublin, Ireland. Purchase and agency. Reference No. 7686.

Woodworking machinery. Hongkong, China. Purchase. Reference No. 7702.

Forthcoming Meetings

Association of Iron and Steel Electrical Engineers. Iron and steel exposition, Buffalo, Sept. 24 to 28. John F. Kelly, secretary, Association of Iron & Steel Electrical Engineers, 708 Empire Building, Pittsburgh, Pa.

National Safety Council. Twelfth annual congress at Buffalo, N. Y., Oct. 1 to 5. All meetings will be held at the Statler Hotel. Headquarters, 168 No. Michigan Ave., Chicago, Ill.

American Society for Steel Treating. Annual convention at Pittsburgh in connection with the International Steel Exposition, Oct. 8, 9, 10, 11 and 12. W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio, national secretary.

Society of Automotive Engineers. Production meeting at Cleveland, Ohio, Oct. 25 and 26. Headquarters, 29 West 39th St., New York City.

American Gear Manufacturers Association. Fall meeting, Mountain House, Lake Mohonk, N. Y. Oct. 25, 26 and 27. T. W. Owen, secretary, 2,443 Prospect Ave., Cleveland, Ohio.

American Management Association. October 29, 30, and 31. Hotel Astor, New York City.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8. Headquarters, Grand Central Palace, New York City.

New and Enlarged Shops

Machine Tools Wanted

Colo., Colorado Springs—W. L. Tomkin, 11 Red Rock Ave.—drill press, lathe and emery stand for garage at Picher, Okla.

Fla., De Land—J. E. Fearington & Son (garage)—lathe, drill press, bench tools and oven to bake enamel.

Ky., Maysville—Wold Mfg. Co.—drill press, lathe, etc., for the manufacture of motorcycles.

Md., Cumberland—F. C. Dreyer, 23½ North Mechanic St.—engine turning lathe with tools, chucks and countershaft, 18 in. swing, 9 ft. 6 in. between centers (used).

Mass., Boston—McCulloch Mfg. Co., 216 High St. (machinists)—heavy duty lathe, planer, shaper, bull-dozer, drill press and miscellaneous machine tools to enlarge shop.

Mass., Cambridge—Dixon & Fallis, 3 Dock St. (pattern makers)—screw cutting lathe with compound rest, 26 in. swing, 12 ft. bed (used).

Mass., Waltham—J. L. Thomson Mfg. Co., South St. (manufacturer of riveting machines and hammers)—large and small metal working tools, including lathes, planers, shapers, bull-dozer, drills, reamers, etc., for proposed machine shop.

Mich., Detroit—Detroit Torch & Mfg. Co., 12141 Cardoni Ave.—general machine shop equipment to enlarge plant for the manufacture of brass goods.

Mo., Joplin—City Garage, 2nd and Joplin Sts., A. C. Cox, 2402 Picher St., Purch. Agt.—tool post grinder.

Mo., St. Louis—L. Inserra, 813 North 8th St.—lathes, emery wheel, etc., for garage and repair shop.

N. Y., Bath—H. Ford, West Steuben and Howell Sts.—equipment for garage and repair shop, to replace that which was recently destroyed by fire.

N. Y., Buffalo—J. Battaglia, 325 Connecticut St.—garage and repair shop equipment.

N. Y., Buffalo—P. A. Dunn, 647 East Ferry St.—equipment for proposed small factory for the manufacture of Ford units and small machine parts.

N. Y., Buffalo—W. Sperling, 589 Linwood Ave.—equipment for garage and repair shop at 1689 Main St.

N. Y., Clifton Springs — Sommers-Farnsworth Motors, Inc., D. F. Sommers, Purch. Agt.—equipment for garage (new).

N. C., Littleton—Wollett & Son (lumber)—pulleys, hangers, portable key seating machine, one 60 or 70 in. shavings fan, cyclone dust collector, complete dry kiln outfit, filling room equipment for 7 in. bandsaws, side grinder and iron lathe, about 16 in. swing, 10 ft. bed.

O., Amherst—Cleveland Stone Co.—one 14 in. and one 16 in. lathe, drilling machine, slotting machine, shaper, milling machine and 4 ft. radial drill.

Okla., Oklahoma City—Beeman Co. (machine shop)—12 to 16 in. lathe, quick change gears.

Okla., Picher—Amer. Machine Wks., F. Scott, Purch. Agt.—lathe.

Okla., Picher — Rabb & Powell Supply (machine shop), C. Powell, Purch. Agt.—lathe and mine hoist.

Okla., Picher—A. W. Jaeger—drill press and wood planer for blacksmith shop.

Okla., Picher—Picher Welding Co., W. Johnson, Purch. Agt.—emery wheel, stand, drill press and lathe (used).

Okla., Zineville—S. Alfrey—drill press, vise, hand tools and chain hoist for garage.

Pa., Carbondale—Hendrick Mfg. Co.—one 300 ton hydraulic press, also one geared press, Bliss 74½ B or similar.

Pa., East Pittsburgh — J. Pommersheim, Genl. Delivery—26 to 30 in. swing lathe.

Pa., Erie—Northern Equipment Co., V. V. Veenschoten, Purch. Agt.—24 in. New Era type vertical Bullard boring mill.

Pa., Harrisburg—Harrisburg Pipe & Pipe Bending Co., Herr St. near 10th St.—one hydraulic press, 4 column, 1,000 to 1,500 tons capacity, for piercing billets.

Pa., Hazleton — J. Schultz — complete garage and repair shop equipment.

Va., Lick Run—B. Thorman—drill press and bench tools for carpenter and blacksmith shop.

Va., Richmond—Grace St. Motor Co., 3 West Grace St.—drill press.

Va., Richmond—Harris & Hansel, 206 North Main St.—drill press and lathe for automobile repairs.

Va., Richmond—Harrison Auto Repair Co., 400 North Henry St.—lathe and drill press.

Va., Richmond—J. R. Layne, rear of 318 A West Grace St.—lathe, drill press and bench tools for automobile repair shop at Latonia, Fla.

W. Va., Wellsburg—Grotz Mould & Machine Wks. (glass house machinery), H. S. Grotz, Purch. Agt.—two engine lathes, 24 to 26 in. swing, from 8 to 10 ft. between centers, quick change gear preferred; one cylinder grinding machine for automobile cylinders; one horizontal hand press, for taking out armature shafts, 10 ft. long, armatures about 36 in. diameter; 16 in. back geared shaper (used preferred).

Wis., Antigo—Reed Bros.—drill press, boring machine, gasoline storage tank and pump for garage.

Wis., Janesville — Janesville Tool Mfg. Co.—special machinery and small tool room equipment for the manufacture of special tools and dies.

Wis., Madison—Purcell-Bluteau Co., 434 West Gilman St. (repair shop)—heat treating furnaces and machine for grinding bearings.

Wis., Milwaukee — H. M. Eicholtz, 200 Pleasant St. (machinist)—one large turret lathe (used preferred).

Wis., Ripon—C. Kuehn—machine shop equipment, including drill press, lathe, small tools, etc., to replace that which was recently destroyed by fire.

Ont., Alfred—P. Laniel—drill press for garage.

Ont., Casselman—A. Sauve—machine shop equipment.

Ont., Cornwall—W. Seymour—automobile repair shop equipment.

Ont., Embrun—H. Peladeau—regrinding machine for garage.

Ont., Vankleek Hill—J. Harlsin, Main St. equipment for automobile repair shop.

Que., Arundel—J. Simon—drill press and shrinker for blacksmith shop.

Que., Montreal—J. D. Choquette, 1053 Cremane Blvd.—complete garage and automobile repair equipment, also gasoline tank.

Que., Montreal—Cylinder Grinding & Auto Parts Co., Ltd., 146 Mountain St.—emery wheel and small lathe.

Que., Montreal—N. Fortier, 125 Leclaire St.—complete equipment for garage and repair shop.

Que., Montreal—Garage Laramee, 664 Belanger St.—small—lathe and machine for regrinding.

Que., Montreal—E. Morrissette, 228 Marquette St.—complete equipment for automobile repair shop.

Que., Poltimore—J. Tomkiewitz—lathe for garage and blacksmith shop.

Que., Ste. Anne de la Perade—G. Guertin—automobile repair shop equipment.

Que., St. Barthelemi—C. A. Vincent—garage equipment.

Que., St. Casimir—T. Perron—automobile repair shop equipment.

Que., St. Stanislas de Champlain—A. Galipeau—small machine shop equipment.

Que., Sayabec — A. Levesque — garage equipment.

Machinery Wanted

Ill., Belvidere—Keene Belvidere Canning Co., H. K. Fanderberg, Purch. Agt.—canning and conveying machinery.

Ill., Chicago — Chicago & Northwestern R.R. Co., 226 West Jackson Blvd., F. J. Berck, Purch. Agt.—20 ton crane for shops at Madison, Wis.

Ill., Chicago—Howard Material Co., 79 West Monroe St.—machinery, including conveyors, crushers, sorters, etc., for gravel pit at Afton, Wis.

Ill., Chicago—Tuthill Bldg. Material Co., 131 West 63rd St.—one industrial crane.

Ill., Freeport—W. T. Rawleigh Co., 101 South Liberty St.—belting, shafting, etc., for proposed $100,000 power plant.

Ill., Rockford—Natl. Lock Co., 1930 7th St.—traveling crane.

Kan., Girard—W. L. Burket (cleaning plant)—DeVasher cleaner and extractor.

Kan., Osage City—J. Morse—5 x 8 in. Kesley printing press.

Md., Colgate (Baltimore P.O.)—Atlantic Sign Corp., 5th St. and Maxwell Ave.—steel shears, 52 in. wide, to cut metal 14 gage and heavier.

Mass., Boston—R. H. Wisbach Co., 1123 Commonwealth Ave. (manufacturer of automobile bodies)—wood and metal working equipment, including wood turning lathe, planer, matcher, saws, shears, drills, reamers, hacksaw, pulleys, belting and shafting, for new plant on North Beacon St.

Mass., Clinton—Clinton Carpet Co., F. Heathwood, Supt.—machinery for addition to plant.

Mass., Dorchester (Boston P. O.)—J. F. Williams, 143 Norfolk St.—10 x 15 in. Miller printing press and feeder (used).

Mass., East Braintree (Boston P. O.)—East Braintree Bleachery & Dye Wks., H. McCusker, Supt.—bleaching and dyeing machinery for proposed addition to plant.

Mass., East Cambridge (Boston P. O.)—Forge & Miller, 29 Otis St.—16 in. swing wood turning lathe (used).

Mich., Highland Park (Detroit P. O.)—Ford Motor Co.—mechanical equipment for handling parts and assembling automobiles for proposed plant at Dallas, Tex.

Mich., Iron Mountain—Ford Motor Co., E. G. Kingsford, Mgr.—woodworking machinery, including boring machines, mortiser, planer, bandsaw and circle saw, for the manufacture of automobile bodies.

Mich., Iron Mountain—School Bd., E. P. Eilertson, Clk.—wood turning lathes, bandsaw, sanders, planer, bench tools and benches.

Miss., Macon—County Supervisors, J. A. Tyson, Clk.—hammer for 1,500 hp. pile driver.

Mo., Joplin—Busy Bee Shoe Shop, 307 Joplin St., F. K. Davis, Purch. Agt.—dust collector for shoe finishing machine.

Mo., Joplin—Jest-A-Mere Print Shop, 1220 Main St., R. H. Biddle, Purch. Agt.—job printing press.

Mo., Kansas City—Ben Franklin Press, 805 Oak St., J. D. Howard, Purch. Agt.—14 x 22 in. Colts job printing press.

Mo., Kansas City—Peet Bros. Mfg. Co., 17th and Kansas Sts. (soap)—machinery and equipment to enlarge plant.

Mo., St. Louis—J. Kickham Boiler Wks., 815 South Bway.—emery wheel with motor.

Mo., St. Louis—Monsanto Chemical Co., 1701 South 2nd St.—one iron slush plate and frame or recessed filter press, 30 in. with closed delivery, equipped for thorough washing, press with 30 chambers, making 2 in. cakes preferred.

N. Y., Batavia—Batavia Iron Wks., Clinton St., F. W. Allen, Treas.—machinery for the manufacture of iron and steel parts for cars, etc.

N. Y., Buffalo—De Long & Wenrich, 204 Chester St.—equipment for bakery.

N. Y., Buffalo—E. E. Lipp, 996 Genesee St.—equipment for proposed laundry.

N. Y., Buffalo—Trico Products Co., 624 Ellicott St., J. Oisher, Mgr.—equipment for the manufacture of metal stampings and automobile accessories.

N. Y., Buffalo—Vneeda Woodworking Co., 806 Jefferson Ave.—machinery for cabinet work, also for the manufacture and repair of furniture.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Iron and Steel—Pig-iron stocks accumulating; market weak. Iron and steel scrap adversely affected by weakness in pig iron. Fair volume of new buying in fabricated structural steel, particularly for schools and commercial buildings. Plate demand somewhat slower. Prices hold firmly to the $2.50 base for plates and shapes; bars, $2.40 per 100 lb., f.o.b. Pittsburgh.

Declines—Prices tendency downward in non-ferrous metals. Tin weaker; lead quiet. Dullness gradually forcing zinc prices downward. Copper, however, shows indications of a stronger tone.

No advances reported.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$28.05
Northern Basic	25@26
Southern Ohio No. 2	26.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	31.00
BIRMINGHAM	
No. 2 Foundry	24.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	26.75
Virginia No. 2	30.17
Basic	26.00
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	27.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	26.90
Basic	26.90
Bessemer	27.90

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5.00@5.50

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.95	4.45	5.05
Nos. 22 and 24.	3.75	5.00	4.50	5.05
Nos. 25 and 26.	3.80	5.05	4.55	5.10
No. 28	3.85	5.15	4.65	5.20
Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00	5.15	4.70	5.35
Nos. 12 and 14.	4.10	5.25	4.80	5.45
Nos. 17 and 21.	4.40	5.55	5.10	5.75
Nos. 22 and 24.	4.55	5.70	5.25	5.90
No. 26	4.70	5.85	5.50	6.05
No. 28	5.00	6.15	5.80	6.35

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	62	50½	⅜ to 1¼	30	13
LAP WELD					
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	28	13
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	60	49½	¾	28	12
2 and 3	61	50½	1 to 1½	30	14
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded.	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ⅛-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
⅛	$0.09	50%	⅞	$0.16	35%
⅛ to ¾	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.65	3.90	4.55
Cold finished flats, squares	5.15	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 5/32, 8.35c.; 1/8, 7.85c.; 5/32 to 1/4, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.00
Tin, 5-ton lots, New York			42.25
Lead (up to carlots), St. Louis	6.75	New York	7.50
Zinc (up to carlots), St. Louis	6.40	New York	6.87½

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.20	27.00	25.50
Antimony (Chinese), ton spot	8.35	10.50	7.50
Copper sheets, base	21.75	22.00	23.00
Copper wire, base	16.00	19.25	16.25
Copper bars, base	20.25	22.50	19.50
Copper tubing, base	24.50	27.50	23.00
Brass sheets, base	18 00	23.00	18.75
Brass tubing, base	23.00	28.50	20.50
Brass rods, base	15.75	18.50	15.75
Brass wire, base	18.50	23.00	.....
Zinc sheets (casks)	10.25	10.45	.....
Solder (½ and ½), (case lots)	29.50	27.75	20.00
Babbitt metal (83% tin)	52.00	53.00	40.00
Babbitt metal (35% tin)	25.00	17.00	17.00
Nickel (ingot and shot)	29.00	.....	35 00
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.75	11.75	12.00
Copper, heavy, and wire	11.25	11.25	11.25
Copper, light, and bottoms	9.50	9.25	10.25
Lead, heavy	5.75	5.50	5.75
Lead, tea	4.75	4.25	4.75
Brass, heavy, yellow	7.00	....	7.25
Brass, heavy, red	9.50	9.50	9.00
Brass, light	5.50	5.25	6.50
No. 1 yellow brass turnings	6.50	6.00	7.00
Zinc	3.75	3.00	4.00

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$25.10	$19.50	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.40	17.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	12.60	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13¼x13¼, per lb.	11.00	36.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	.95	1.06	1.14
White lead, dry or in oil	100 lb. kegs.	New York, 14.00	
Red lead, dry	100 lb. kegs.	New York, 14.00	
Red lead, in oil	100 lb. kegs.	New York, 15.50	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.25@4.75	
Coke, prompt foundry, Connellsville	per net ton	5.25@5.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40-10%	50-10%	45-5%
1½ and 1¼x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	25-10%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30-10%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	40-10%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30-10%	45%	40-5%
Bolt ends, with hot pressed nuts	40-10%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 7/16 and smaller	60%	.....	....
Semi-finished nuts, ½ and larger	55%	65–10%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	0.50	2.75	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	50-10%	50–10%	60%
Rivets, tinned	50-10%	50–10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1½ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30–10%	30–10%	30–10%
Heavy grade	20–5–2½	30%	20–5–2½%
Rubber and duck:			
First grade	50–10–5%	50–10%	40–10%
Second grade	60–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20

N. Y., Caledonia—Brayer Basket Plant, N. L. Brayer, Purch. Agt.—machinery and equipment for the manufacture of baskets.

N. Y., Canisteo—Dairymen's League, B. Whiteman, Pres.—equipment for proposed $40,000 shipping station.

N. Y., Fredonia—Fredonia Steam Laundry Co.—equipment, to replace that which was destroyed by fire.

N. Y., Geneva—Premier Mill Corp., S. K. Nester, Jr., Purch. Agt. special machinery for the manufacture of a grinding device to reduce solids to filter paper fineness.

N. Y., Horseheads—C. Evendon—equipment for cider mill and garage, to replace that which was destroyed by fire.

N. Y., Jamestown—Industrial Wet Wash Laundry, 300 Steel St., J. Blagbrough, Purch. Agt.—equipment for proposed addition to plant.

N. Y., Jamestown—Jenkins & Carlson, Arcade Bldg., North Main St., H. P. Lintner, Treas.—job printing equipment.

N. Y., Niagara Falls—Ryder Mfg. Co., S. M. Ryder, Purch. Agt.—machinery for small plant for the manufacture of specialties, to replace that which was destroyed by fire.

N. Y., North Tonawanda—Bilt Rock Board Corp., E. R. Maltby, Pres.—machinery and equipment for the manufacture of patent wall board.

N. C., Burlington—Queen Anne Textile Co., W. H. Morton, Adams, Mass., Pres.—equipment for proposed $1,000,000 cotton mill.

N. C., Winston-Salem—S. C. Park, et al. —grinding, screening machinery, etc., for proposed $75,000 mica mill.

O., Akron—Anaconda Copper Mining Co. —machinery and equipment, including furnaces, for proposed $500,000 factory unit at Bettes Corners.

O., Bellefontaine—C. A. Willis Ice Cream Co.—equipment for the manufacture of ice cream.

O., Dayton—Dayton Veneer Co., 700 South Bway, J. W. Frye, Pres.—woodworking machinery to enlarge plant.

O., Toledo—Sunshine Baking Co., 1905 Canton St.—equipment to replace that which was recently destroyed by fire.

Okla., Devol—M. L. McClure—newspaper press and equipment.

Okla., Marlow—J. C. Nance—paper cutter and job press, both Chandler & Price make; linotype and Miller feeder.

Okla., Tulsa—Tulsa Cotton Mills Co., D. Hunt, Pres.—textile machinery, including 18,000 spindles, 750 automatic looms, dyeing machinery and finishing equipment.

Pa., Johnstown—Lorain Steel Co.—two heavy frog and switch planers.

Pa., Lehighton—Carbon County Advocate —presses and equipment, to replace that which was destroyed by fire.

R. I., Shannock—Columbia Narrow Fabric Co.—machinery and equipment for new weave shop.

R. I., Woonsocket—Jules Desurmont Worsted Co., Water St.—picking, carding and spinning machinery for addition to plant.

Tenn., Johnson City—Amer. Phalanx—linotype machine, cylinder press and job press.

Tenn., Memphis—Purity Oil Co., Monroe Ave., E. H. Cannon, Purch. Agt.—machinery and equipment for oil station

Va., Blackstone — Nottoway Shook Co., Inc.—planer and circular saw for woodworking plant.

Va., Portsmouth—Southern Brake Shoe Co.—machinery and equipment for proposed brake-shoe foundry.

W. Va., Hinton—Hinton Silk Mills—machinery to equip silk mill.

Wis., Antigo—Langlade County Lumber Co., c/o R. C. Dempsey—bandsaw, rip and cross cut saws.

Wis., Appleton—Riverside Fibre & Paper Co.—special paper machines, belting, etc., for new finishing mill.

Wis., Beaver Dam—Wadhams Oil Co., A. O. Vinz, Mgr.—gasoline storage tanks and pumps for filling station.

Wis., Independence—Independence Tobacco Warehouse Corp., J. A. Markham, Pres.—conveyors, etc., for proposed warehouse.

Wis., Madison—W. S. Bradley, 315 North St.—machinery and equipment, including dryers, for new wet wash laundry at 6 North Charter St.

Wis., Madison—Mead & Seastone, Journal Bldg.—15 ton hand operated traveling crane for power plant at Caldron Falls.

Wis., Madison—C. T. Rieder, 635 University Ave.—large tire vulcanizer, air compressor and free air equipment for tire repair shop.

Wis., Milwaukee—Milwaukee Coke & Gas Co., 187 Greenfield Ave., A. Bruens, Supt.—special machinery and equipment for proposed $50,000 benzol plant.

Wis., Racine—B. Lawson, 401 Lake Ave. —emery wheels, stands, electric drilling machine and one air compressor.

Wis., Rio Creek — Rio Creek Builders' Veneer & Woodwork Co., M. Bank, Pres.—veneer press, planer, sticker, mortiser and sander for proposed $40,000 factory.

Wis., Ripon — H. H. Tucker — canning machinery, including cookers, sealers, conveyors, etc.

Wis., Sheboygan — Danish Pride Milk Products Co., 608 North 8th St.—milk canning machinery, testers, sterilizers, etc., for proposed $55,000 condensery at Cashton.

Wis., Sheboygan—Phoenix Chair Co., Virginia and South 11th Sts.—equipment for new curing kiln.

Wis., Stratford—Stratford Canning Co.—canning machinery, conveyors, belting, shafting, etc., for proposed $45,000 plant.

Ont., Alfred—S. Bourgeois—blacksmith shop equipment.

Ont., Arnprior—A. F. Campbell & Son—planing mill equipment.

Ont., Cornwall—Atchison & Co.—planing mill machinery.

Ont., Cornwall—Fallow Bros., Water St., A. Fallow, Purch. Agt.—polishing and cutting machinery and tools for marble works.

Ont., Fournier — P. Tranchemontagne (manufacturer of carriages)—woodworking machinery.

Ont., Gowganda—Castle-Tretheway Mines, Ltd., M. D. Kennedy, Mgr.—complete milling plant.

Ont., Merritton—Garden City Paper Co.—complete equipment for proposed $400,000 paper mill at St. Catherines.

Ont., Pembroke—B. E. Eggert, 365 Christie St.—forge, anvil, etc., for blacksmith shop.

Ont., Renfrew—J. Donahue—blacksmith shop equipment.

Ont., Toronto—West Dome Consolidated Mines, Ltd., H. O. Pellatt Bldg., Bay St.—machine drillers for underground work for mines at South Porcupine.

Que., Lac des Ecorces—R. Painchaud—sawmill machinery.

Que., Lachute—J. Simon—blacksmith shop equipment.

Que., Mica—Mica Mine, J. B. Lalonde, Purch. Agt. — hammers, drill and air compressor.

Que., Mont Laurier—R. Demers—puncher, vise, emery wheel, etc., for garage.

Que., Montmagny—A. Belanger, Ltd., C. Belanger, Purch. Agt.—machinery for the manufacture of stoves.

Que., Montreal—Globe Printing Press, 124 St. Paul St., W.—presses and paper cutter.

Que., Quebec—Canadian Dirigible Headlight System, Ltd., c/o W. Stoleo, 3 Aberdeen Ave.—machinery for the manufacture of articles and devices for steam and electric railways.

Que., Quebec—J. V. Dore, 260 St. Helene St.—blacksmith shop equipment.

Que., St. Ours—G. Chapdelaine—general equipment for blacksmith shop.

Metal Working Shops

Calif., Bakersfield—The trustees of Kern County Union High School Dist. will receive bids until Oct. 15 for the construction of shop buildings. C. H. Biggar, Bank of Italy Bldg., Bakersfield, Archt.

Me., Bar Harbor—The Bureau of Yards & Docks, Navy Dept., Wash., D. C., will receive bids until Oct. 10 for the construction of a garage, also repairs to administration building for Radio Station, here.

Mich., Detroit—A. Kahn, Archt., 1000 Marquette Bldg., is receiving bids for the construction of a 1 story, 193 x 208 ft. foundry and warehouse for the Great Western Smelting & Refining Co., Russell St.

N. Y., Brooklyn—The 83rd St. Constr. Co., c/o H. A. Weinstein, Archt., 375 Fulton St., will build a 1 story garage on Cedar Pl. Estimated cost $50,000.

O., Cleveland—The Gabriel Mfg. Co., 1407 East 40th St., manufacturer of automobile bumpers, has had plans prepared for the construction of a 2 story, 80 x 150 ft. factory. Estimated cost $60,000. C. Foster, Mgr. H. E. Shimmin, 2031 Euclid Ave., Archt.

O., Cleveland—I. G. Kohn, 640 Guardian Bldg., awarded the contract for the construction of a 1 and 2 story, 60 x 126 ft. garage and commercial building at 2027 East 105th St. Estimated cost $50,000. Noted Sept. 13.

Pa., Ambridge—The Standard Seamless Tube Co. is receiving bids for the construction of a 1 story, 80 x 500 ft. and 20 x 80 ft. addition to mill building. Private plans. Noted Aug. 24, 1922.

Pa., Bustleton (Philadelphia P. O.)—The R. A. Erwin Motor Co., Bustleton and Welsh Rds., will soon award the contract for the construction of a 1 story, 80 x 184 ft. garage. Estimated cost $35,000. C. H. Fries, 8239 D St., Fox Chase, Phila., Archt.

Pa., Clearfield—W. B. Holmesk, Jr., is having plans prepared for the construction of a 2 story, 50 x 100 ft. garage on Merrill and Williams Sts. Estimated cost $40,000. Private plans. Noted Apr. 5.

Pa., McKeesport—The Peters Packing Co., 922 Rose St., is having plans prepared for the construction of a 6 story, 25 x 70 ft. garage and addition to packing plant. Estimated cost $175,000. C. Stattler, Weehawken, N. J., Engr.

Pa., Oil City—The Reimann Co., 5 East Front St., will build and award separate contracts for the construction of a 2 story, 136 x 198 ft. garage. Estimated cost $65,000.

Pa., Pittsburgh—J. E. Dwyer, Archt., Forbes Murray Bldg., will build and award separate contracts for the construction of a 1 story, 60 x 180 ft. garage on Forbes St. for A. J. Diebold, 5621 Aylesboro Ave. Estimated cost $40,000.

Pa., Pittsburgh—The Pittsburgh Malleable Iron Co., 34th and Smallman Sts., awarded the contract for the construction of a 1 story, 95 x 260 ft. mill building. Estimated cost $50,000.

Pa., Wilkes-Barre — V. Purdsminici, 86 Seneca St., awarded the contract for the construction of a 2 story, 20 x 40 ft. garage and service station.

Tenn., Memphis — F. J. Rice is having plans prepared for the construction of a 77 x 146 ft. showroom, parts and repair shop, etc., on Butler St. between 2nd and 3rd Sts. Estimated cost $25,000. Mahan & Broadwell, American Bank Bldg., Memphis, Archts. Halloran-McLean Tractor Co., 650 Marshall St., lessee.

Va., Richmond—Davis Bros., Inc., 2510 West Main St., are having plans prepared for the construction of a 1 story, 75 x 170 ft. garage on Marshall and Clay Sts. Estimated cost $15,000. Private plans.

Wash., Hillyard (Spokane P. O.)—The Western Fruit Express Co., 1505 Pioneer Bldg., St. Paul, Minn., is having plans prepared for the construction of a repair shop for refrigerator cars, here. Estimated cost $150,000. F. G. Luth, Mechanical Supt. Private plans.

Wis., Manitowoc—The E. W. Krug Mfg. Co., 918 South 19th St., awarded the contract for the construction of a 1 story, 80 x 90 ft. machine and repair shop.

Wis., Mondovi—W. Hardy will receive new bids late this fall for the construction of a 2 story, 40 x 100 ft. garage. Estimated cost $40,000. Private plans. Former bids rejected.

Wis., Plymouth—The Plymouth Phonograph Co. plans to build a 2 story, 60 x 160 ft. factory. Estimated cost $60,000. F. D. McIntyre, Secy. Engineer or architect not selected.

Wis., Poskin—The D. & H. Sure Grip Brake Co. plans to build a 2 story, 60 x 90 ft. factory for the manufacture of brakes for Ford cars. Estimated cost $50,000. A. Delegard, Mgr. Engineer or architect not selected.

See the SEARCHLIGHT SECTION *Pages* 128-137

American Machinist

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Unusual Machine Work in Seattle

By FRED H. COLVIN
Editor, *American Machinist*

Special turnbuckles and crankshafts—A portable slotting machine built by the Seattle Machine Works and some of the unusual work that has been done by it

THOSE who are accustomed to building a regular product of small or moderate size, and in quantities which warrant special tools and fixtures, would be as much out of place in the average Pacific coast shop, as the old time mechanic would be in a modern automobile factory. The all round mechanic, with modern ideas has a great field in the far west, and is likely to hold his own for many years to come.

When it comes to variety of work it is difficult to find a shop which seems to attract it more than the Seattle Machine Works, Seattle, Wash., of which Eric Johnson is the guiding spirit.

Just to give some idea as to the variety of work that comes along, Fig. 1 shows two types of turnbuckles, those in the foreground being of unusual construction. The right- and left-hand nuts are rectangular slabs of steel held together by heavy round bars, which are shouldered on the inside and riveted on the outside.

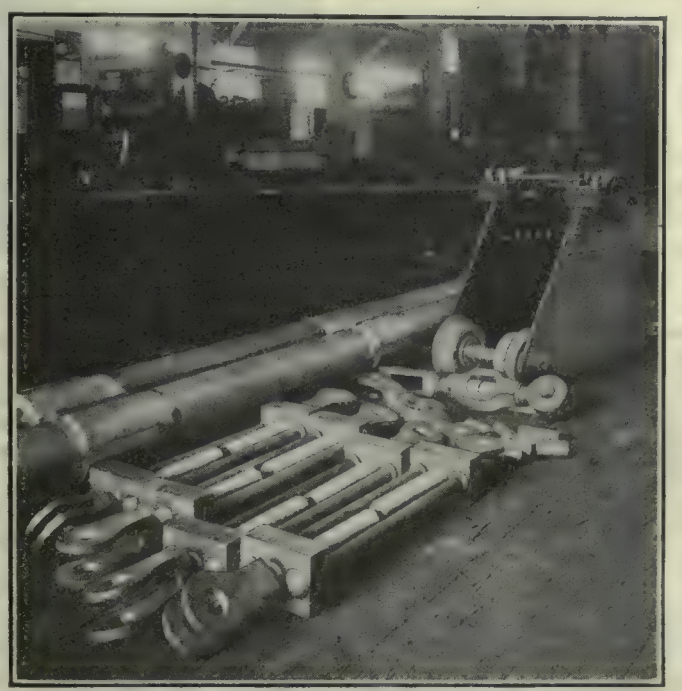


FIG. 1—TURNBUCKLES AND OTHER ODD WORK

Just behind the turnbuckle are two large shafts, while at the right is a heavy trolley for a special traveler. Contrast with these, the three-throw crankshafts shown in Fig. 2, finished all over, with dovetailed projections for holding counterweights to the crank webs. The shafts also have the thrust rings turned next to the flange.

Another crankshaft job is shown in the lathe in Fig. 3, being of a very different type from those shown in the previous illustration. As will be seen this crankshaft is very long and slim and has to be carefully supported for turning. The method of supporting in the steadyrest is to use the split disk *A*, which runs in the steadyrest and can be moved along the shaft so as to be close to the pin being turned. The disk for locating the different throws is shown at *B*, and the bolt *C*, used as a jack, helps to prevent spring due to the end thrust. A jib crane on a post behind the lathe makes it easy to handle work in and out of the lathe.

In common with other Seattle firms, this company handles a large amount of marine work, much of which runs into large sizes. And in many cases the surfaces to be machined are very difficult to get at with the ordinary types of machine tools. In order to facilitate surfacing work on pieces of this kind, the company built a special portable slotting, or vertical planing machine, Figs. 4 and 5, which has proved very useful. It consists of a heavy bed of sufficient length to handle most work at one setting. On this is mounted a tool or driving head which carries an 8-in. square bar having a long stroke, driven and controlled by suitable gearing.

One use of this machine is shown in Fig. 4, where it is mounted on a large casting for the bed of a marine engine. The slotting machine is held in position by means of substantial clamps. The timbers are set at an angle to help prevent vibration and steady the whole combination. The left side and bottom of the upper pedestal have been planed, and the machine is shown at work on the lower bearing. Even though the bar is 8 in. square, there is bound to be considerable spring with such a long overhang, so the angle plates *A* are used to support the tool against the thrust of the cut.

The method of holding the angle plates is rather interesting. Beginning with the jack *B*, below the lower pedestal, next comes jack *C*, and the block of wood above it, holding the angle plates to the lower pedestal, while the braces *D* take the thrust of the tool bar and

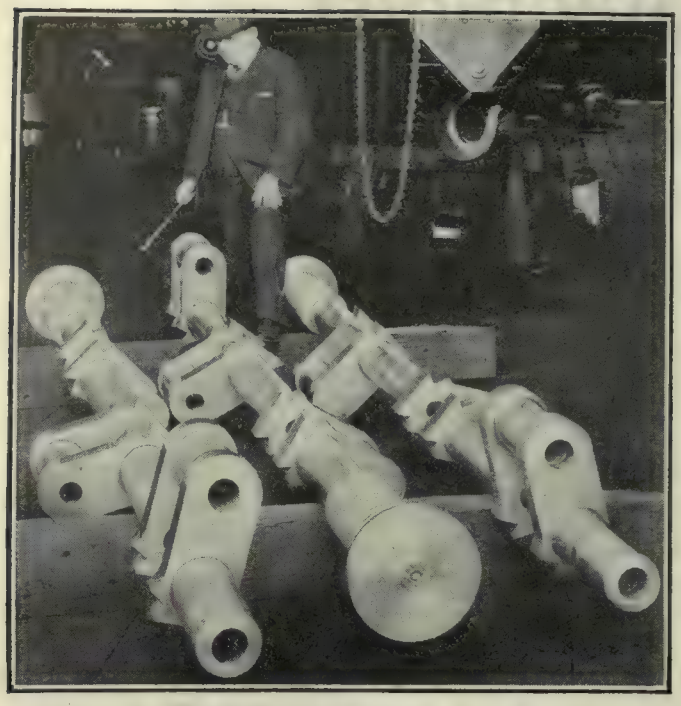


FIG. 2—THREE THROW CRANKSHAFTS READY FOR COUNTERWEIGHTS

transfers it to the upper pedestal. The end of the bar bears against the edge of the upper angle plate, which supports it, an extension tool holder being used to reach the lower surfaces. This extension tool head can be turned to cut a radius in the corner of the pedestal jaw.

Another Use for a Portable Machine

Quite a different use of this portable machine is shown in Fig. 5, where it is machining the outside of the hub surrounding the propeller shaft on a rudder frame for a large ship. Here the frame of the machine is mounted on a circular base so that it can be revolved in order to plane the outside of the hub.

The method of swinging the frame of the machine to plane the outside of the hub is interesting in itself.

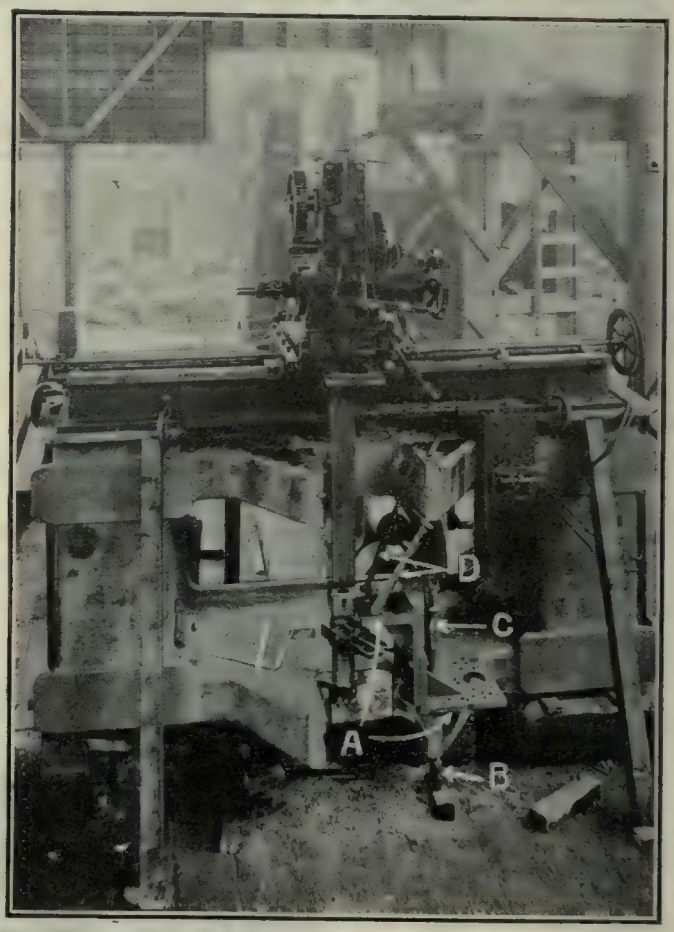


FIG. 4—SLOTTING PEDESTALS WITH SPECIAL MACHINE

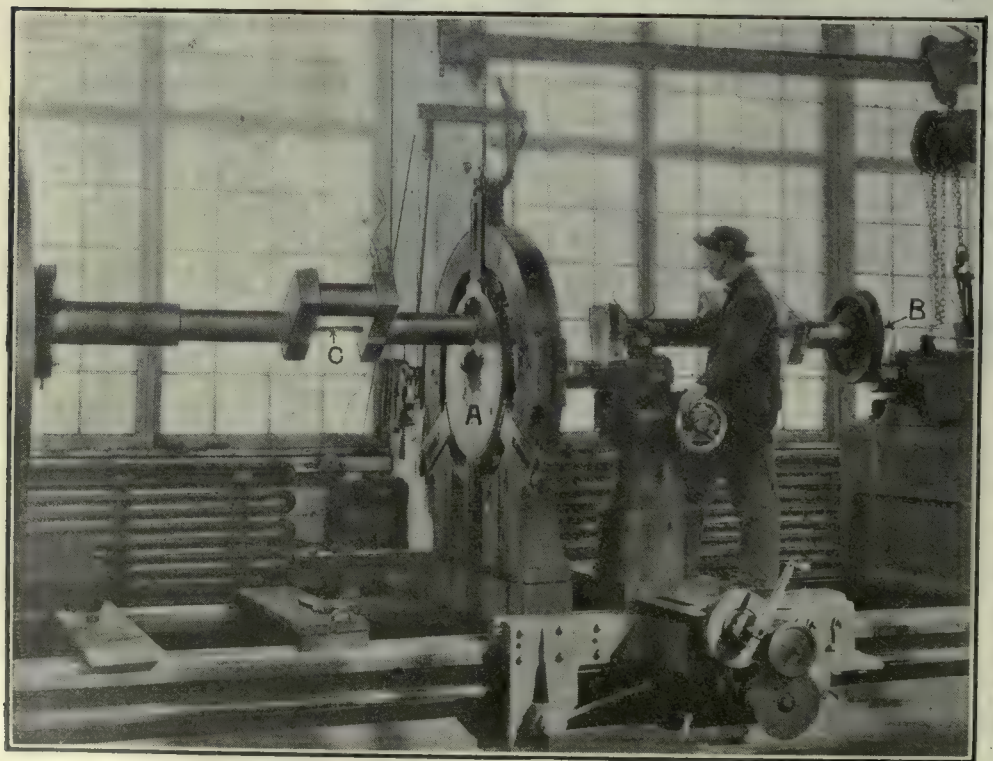


FIG. 3—TURNING A LIGHT CRANKSHAFT

Mounted at the extreme left is an angle plate carrying a worm gear mechanism at *A*. This worm is actuated by the handwheel *B* and below is the drum *C*. This drum carries a small steel cable shown at *D*, the ends being fastened to opposite ends of the frame of the planing machine. Turning the handwheel moves the worm, and with it the drum and the cable, which swings the frame of the machine, feeding the tool around the hub as desired. It is a most convenient arrangement for such a job.

The rudder frame itself is an awkward piece to support for any kind of machining. The hub rests on four round blocks, while the long right-hand end of the frame is supported by screw jacks, and a block at the extreme right holds the outer edge. Long hairpin clamps tie the frame to the large floor plate.

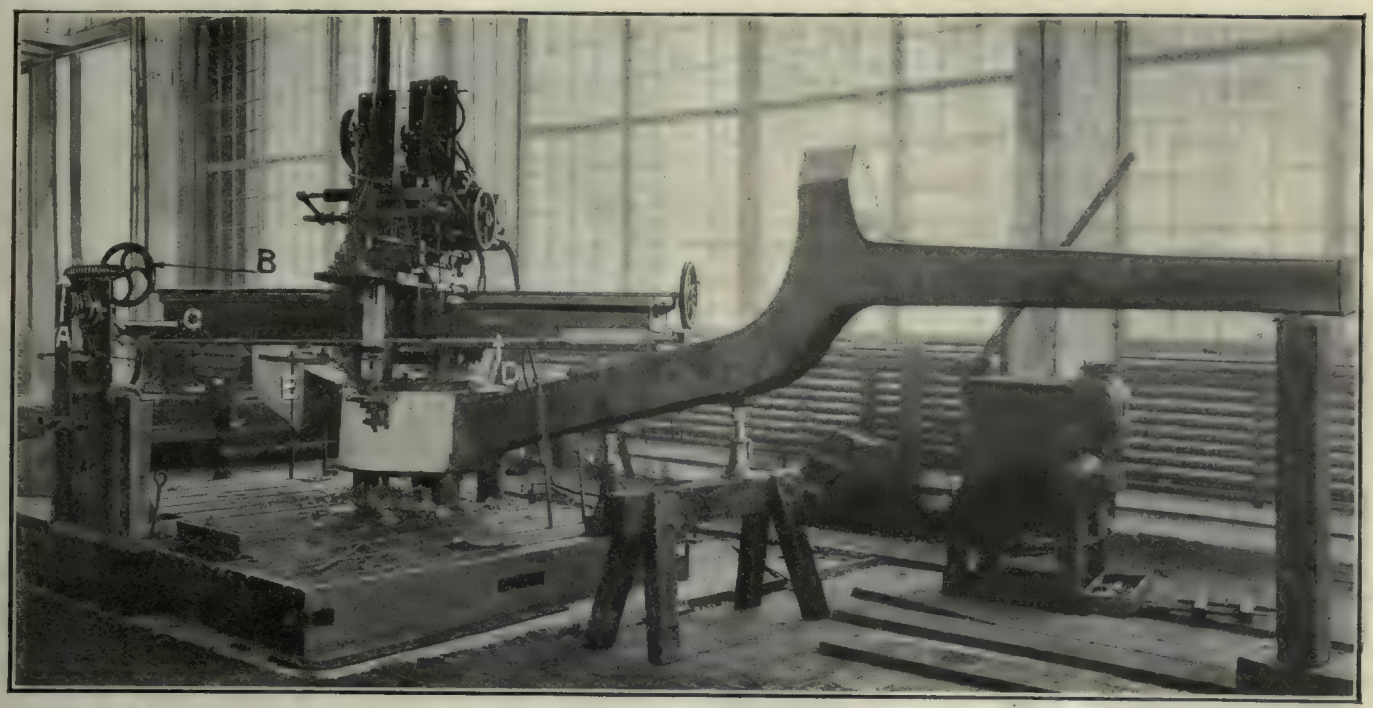


FIG. 5—PLANING OUTSIDE OF RUDDER FRAME HUB

The versatility of this machine is shown by the planing of the lower end of the rudder frame at *E*. Such a job as machining this frame would tax the ingenuity and resources of almost any shop, unless a portable machine similar to the one described was available for use when wanted.

More About the Drawing Room

BY H. H. ARMSTRONG

In Vol. 58, page 840 of the *American Machinist*, J. C. P. Bode is right when he says that the drawing room should be the "clearing house" of information, for it is there that the actual development of a machine or piece of apparatus is performed. When the prints finally leave for the factory, they should represent a practical piece of apparatus free from defects.

In order to clearly set forth the duties of a drawing room, the writer would like to relate what was expected of him while foreman of a drawing room for seven years.

When an inquiry was received from a customer for the cost of a number of units along the same general line, it was immediately turned over to the drawing room for the preparation of a cost estimate drawing. On this drawing the layout man would clearly set forth the construction, material and other points needed, for the cost estimating engineer only, so that if the price was not to the customer's liking, there would not be a large amount of money tied up in useless drawings. If in due time, the estimate was satisfactory to the customer, a requisition would be placed for these units.

The drawing room was then requested to go ahead with the detail design for production. When the drawings were completed and checked, a meeting was called consisting of the engineer, production man, tool superintendent, factory foreman, and the foreman of the drawing room. This committee reviewed each drawing, and comments were made as to the best method of manufacture. If the production on that apparatus was to be large, the tool equipment was decided on. If the production was limited, only sufficient tools were made to do the work to best advantage, and sheet metal templates were substituted in place of jigs and fixtures. Minutes were always kept of these meetings, and when the meeting was over, the drawing room foreman would order the tool equipment drawn up and submitted to the engineer for approval.

After the drawings were sent out it was the duty of the drawing room to prepare a material list, covering the amount of material needed for the entire requisition or manufacturing order. Upon completion of the material list, the production clerk promptly placed orders for the raw material, with outside manufacturers generally. These orders would state the date when the material would be required, so that while the tool department was working on the jigs, fixtures, or templates, the material for the work would be coming along.

Samples from the dies, jigs and molds were always delivered to the drawing room for inspection, and if these were acceptable the factory was notified to go ahead with production. It seemed to be an unwritten law in the factory to refer everything questionable to the drawing room for advice and adjustment.

Lastly the drawing room was a "clearing house" for information to the factory by issuing a daily bulletin for new and changed drawings. This bulletin listed all drawings sent out. If they were new it stated whether tools and patterns were required, and if changed, the bulletin would also state what tools and patterns were affected. By this means all departments were kept in touch with what was going out into production, and all delays were automatically explained.

The bulletin found its way into every department and the factory, by keeping in touch with it, was never handicapped by working to drawings that were out of date. When the new drawing came along, the old one was automatically called in and destroyed.

Determining the Friction and Carrying Capacity of Ball and Roller Bearings

By Allen P. Child

IN CONJUNCTION with the United States Navy, the Federal Bureau of Standards conducted a series of experiments to obtain data on the frictional resistance of ball and roller bearings at low speeds, and also the loads which the bearings will safely sustain. In training large guns it is desirable to reduce the friction at the trunnion bearings, which parts are moved at

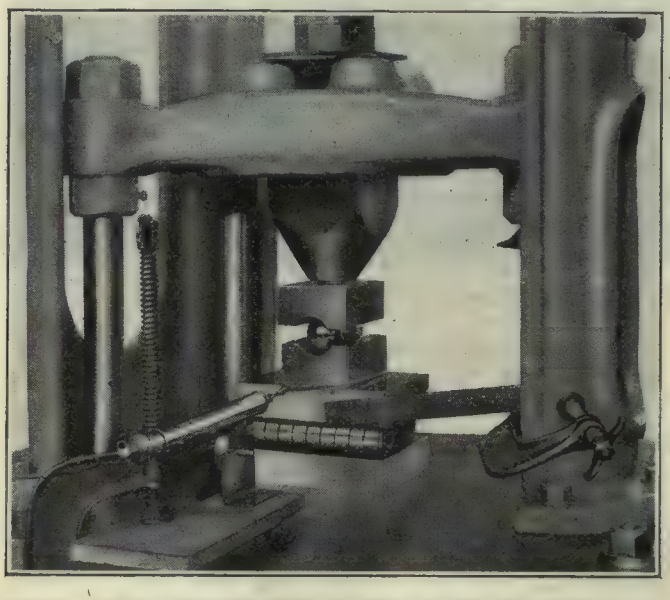


FIG. 1—MEASURING THE STATIC FRICTION OF BALL BEARINGS

very low speeds and infrequently. Regardless of these facts the bearings are subjected to great loads when the gun is fired. The conditions usual for bearings in engineering work are much different than these conditions, as bearings are seldom subject to great loads or impact.

Measuring the Static Friction

In making a static friction test on a ball bearing two balls were used with each pair of races, in order to secure stability in the loaded condition. A plate mounted on two rollers carried the lower ball race, as shown in Fig. 1, while the upper ball race was loaded by a three-screw testing machine having a capacity of 50,000 lb. Between the movable head of the testing machine and the upper ball race a spherical bearing was used. When the desired load had been applied the lower ball race was drawn forward by a force exerted through the spring balance, which rested on a low-friction roller. The smallest division on the spring balance represented 1 ounce.

In finding the friction of the rollers certain conditions were secured. All bearing surfaces were parallel to each other and also perpendicular to the action line of the load. The balls and rollers were also placed symmetrically with relation to the action line of the load. The load was applied equally to the balls and rollers by a spherical bearing block.

Through these tests it was found that the starting friction is nearly the same for both sizes of groove employed. The groove having the larger radius gave the lower value for the friction. The ratio of starting friction to the load increases slowly as the load increases, then much more rapidly. The rapid rise in the friction at greater loads seems to indicate that internal work was being performed on the material of either the balls or races, which work might cause heating and their destruction if the bearings were operated continuously under loads greater than the critical loads. Or reducing the static frictional resistance it is claimed that oil is of little, if any, use upon ball bearings.

Static friction of rollers loaded between two steel plates was measured in the same manner as the balls. A bearing having a radius of 10 in. showed that the static friction is nearly constant up to a load of 25,000 lb., and that for greater loads the friction increases rapidly. This action is similar to the behavior of the balls, and it is claimed that this critical load should be considered the allowable load on the roller.

Compression Tests for Maximum Load

The allowable load on a bearing may be determined by noting the greatest load which the bearing will sustain without permanent deformation. The same apparatus that was used for the friction tests was used for the compression tests, and a single ball was placed between the races and the load applied by the testing machine. A special apparatus was designed to measure the relative motion of the two races; that is, the deformation of balls and races combined.

At each corner of the races is a steel rod secured to one race, as is shown in Fig. 2. Opposite it is a short steel lever carried by a horizontal shaft which is held in any position in which it may be placed, by means of caps for the bearings that are loaded by long helical springs. Experience with the apparatus showed that the best results were obtained when the shaft rested in a triangular groove in the supports. The caps for the bearings were also grooved, but were later turned over to present a plane surface to

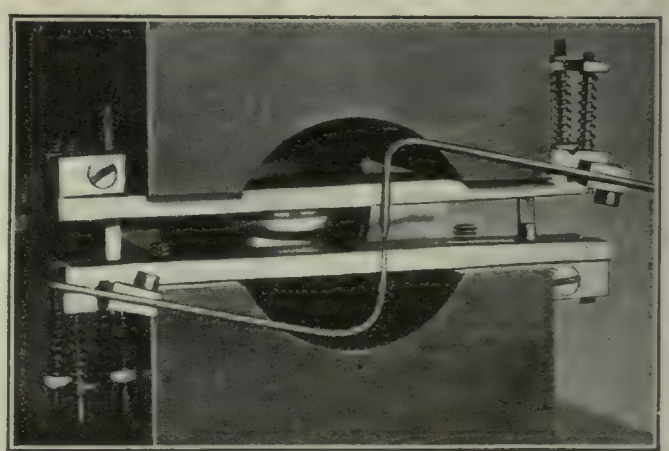


FIG. 2—MECHANISM FOR INDICATING THE DEFORMATION OF BALLS AND RACES

the shaft, which was then held in a three-line bearing.

The end of the shaft which projects from the bearing carries a curved pointer, the end of which opposes the end of the pointer on the other side of the races. In use the pointers are turned away from each other, the desired load is applied to the bearing, and then the pointers are turned toward each other by hand so that each lever previously referred to comes in con-

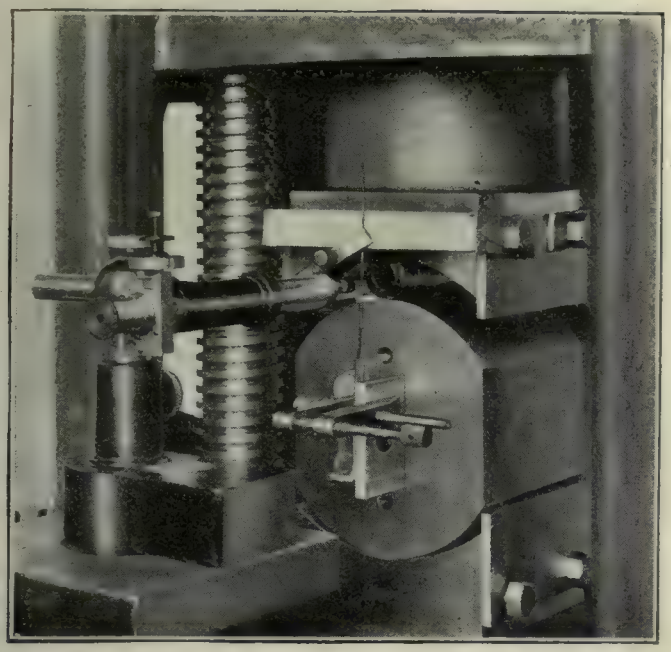


FIG. 3—APPARATUS FOR MEASURING THE DEFORMATION OF A ROLLER BETWEEN RACES

tact with its corresponding rod. The distance between the two pointers is measured by means of a micrometer microscope. It is claimed that the arrangement of this apparatus is such as to give correct values, even if the races are slightly tilted during the tests. The total deformation under load of the ball and race combined may be obtained, as well as the permanent deformation, after removing the load.

Measuring the Deformation

The pointers multiplied the movements of the levers ten times. The arrangement of the pointers, in pairs, made the change in distance between pointers twenty times the change in the distance between the races. Two microscopes, one at each end of the races, were used, by which instruments a difference of 0.00004 in. in the distance between the pointers could be observed and estimated. The displacement of either end of the ball race could be measured within 0.000004 in. A thin film of lubricating oil on the surface of the race was used for making visible the area of contact between the ball and race.

When determining the maximum allowable load for roller bearings, the arrangement shown in Fig. 3 was employed. The bearing was held in a race having an inner diameter of 7 in., was loaded by means of the testing machine, and the relative movement between the two pointers secured to the races was observed through the microscope. There is no need for going through the detail of the work, as its principle can readily be grasped. The results obtained are of great value in understanding the action of the bearing parts.

The New Screw Thread Standard—IV

By RALPH E. FLANDERS
General Manager, Jones & Lamson Machine Co.

Discussion of the Screw Thread Report of the A.E.S.C.—Condensed tables of dimensions for different classes of fits—Fine and coarse threads—Numbered and fractional sizes

THE TABLES given with this installment of the discussion on the Screw Thread Standard Report recently given out by the American Engineering Standards Committee show in one column for each size all the useful dimensions, both in the form of measurements and of tolerances, for both screws and nuts. The lead and angle tolerances permitted by the pitch diameter tolerances are also given. In fact, everything that workman, toolmaker or designer can desire is given in one place.

This useful condensation of the report has been made possible by a simplification of the standard recently approved of by the Sectional Committee and the Commission. The simplification omits the maximum major diameter for all nuts and tapped holes, as described below; and it makes the sizes and tolerances for the major and minor diameters of screws for all classes of fit here listed, the same as for those of Class 2.

The condensation has required a rearrangement and renumbering of the tables in the Report. The original plan will be preferred for some uses, but the writer believes that the tables as published here will in general be found more convenient.

IV—CLASSIFICATION OF FITS

1—DESCRIPTION

There are established herein for general use four distinct classes of screw-thread fits as specified in the following brief outline. The examples given under each class of fit are for the purpose of illustration only.

Loose Fit *(Class 1)* — Recommended as a commercial standard for tapped holes in the numbered sizes only. May be used with screws of other classes to obtain quality of fit desired. (See Appendix C).

Free Fit *(Class 2)*—Includes the great bulk of screw-thread work of ordinary quality of finished and semi-finished bolts and nuts, etc. (Called "Medium Fit Regular" in the N.S.T.C. "Progress Report".)

Medium Fit *(Class 3)*—Includes the better grade of interchangeable screw-thread work, such as automobile bolts and nuts. (Called "Medium Fit Special" in N.S.T.C. "Progress Report".)

Table II—Coarse-Thread Series—American

Figures taken from the Screw Thread Standard Report

				1/4-20	5/16-18	3/8-16	7/16-14	1/2-13	9/16-12	5/8-11
(1)	Size and threads, per inch									
	SCREWS AND BOLTS									
(2)	All fits	Major diam.	Max. (Basic)	0.2500	0.3125	0.3750	0.4375	0.5000	0.5625	0.6250
(3)	All fits	Major diam.	Min.	0.2428	0.3043	0.3660	0.4277	0.4896	0.5513	0.6132
(4)	All fits	Major diam.	Tol.	0.0072	0.0082	0.0090	0.0098	0.0104	0.0112	0.0118
(5)	All fits	Minor diam.	Max. (Note a)	0.1887	0.2443	0.2983	0.3499	0.4056	0.4603	0.5135
(6)	Class 2—Free fit	Pitch diam.	Max. (Basic)	0.2175	0.2764	0.3344	0.3911	0.4500	0.5084	0.5660
(7)	Class 2—Free fit	Pitch diam.	Min.	0.2139	0.2723	0.3299	0.3862	0.4448	0.5028	0.5601
(8)	Class 2—Free fit	Pitch diam.	Tol. (Note b)	0.0036	0.0041	0.0045	0.0049	0.0052	0.0056	0.0059
(9)	Class 3—Medium fit	Pitch diam.	Max. (Basic)	0.2175	0.2764	0.3344	0.3911	0.4500	0.5084	0.5660
(10)	Class 3—Medium fit	Pitch diam.	Min.	0.2149	0.2734	0.3312	0.3875	0.4463	0.5044	0.5618
(11)	Class 3—Medium fit	Pitch diam.	Tol. (Note b)	0.0026	0.0030	0.0032	0.0036	0.0037	0.0040	0.0042
(12)	Class 4—Close fit	Pitch diam.	Max.	0.2178	0.2767	0.3348	0.3915	0.4504	0.5089	0.5665
(13)	Class 4—Close fit	Pitch diam.	Min.	0.2165	0.2752	0.3332	0.3897	0.4485	0.5069	0.5644
(14)	Class 4—Close fit	Pitch diam.	Tol. (Note b)	0.0013	0.0015	0.0016	0.0018	0.0019	0.0020	0.0021
	NUTS AND TAPPED HOLES									
(15)	All fits	Major diam.	Min. (Basic) (Note c)	0.2500	0.3125	0.3750	0.4375	0.5000	0.5625	0.6250
(16)	All fits	Minor diam.	Max.	0.2013	0.2584	0.3141	0.3679	0.4251	0.4813	0.5364
(17)	All fits	Minor diam.	Min.	0.1959	0.2524	0.3073	0.3602	0.4167	0.4723	0.5266
(18)	All fits	Minor diam.	Tol.	0.0054	0.0060	0.0068	0.0077	0.0084	0.0090	0.0098
(19)	All fits	Pitch diam.	Min. (Basic)	0.2175	0.2764	0.3344	0.3911	0.4500	0.5084	0.5660
(22)	Class 2—Free fit	Pitch diam.	Max.	0.2211	0.2805	0.3389	0.3960	0.4552	0.5140	0.5719
(23)	Class 2—Free fit	Pitch diam.	Tol. (Note b)	0.0036	0.0041	0.0045	0.0049	0.0052	0.0056	0.0059
(24)	Class 3—Medium fit	Pitch diam.	Max.	0.2201	0.2794	0.3376	0.3947	0.4537	0.5124	0.5702
(25)	Class 3—Medium fit	Pitch diam.	Tol. (Note b)	0.0026	0.0030	0.0032	0.0036	0.0037	0.0040	0.0042
(26)	Class 4—Close fit	Pitch diam.	Max.	0.2188	0.2779	0.3360	0.3929	0.4519	0.5104	0.5681
(27)	Class 4—Close fit	Pitch diam.	Tol. (Note b)	0.0013	0.0015	0.0016	0.0018	0.0019	0.0020	0.0021
	THREAD FORM									
(28)	Depth of thread			0.03248	0.03608	0.04059	0.04639	0.04996	0.05413	0.05905
(29)	Pitch			0.05000	0.05556	0.06250	0.07143	0.07692	0.08333	0.09091
(30)	Basic width of flat = 1/8 x pitch (Note a)			0.00625	0.00694	0.00781	0.00893	0.00962	0.01042	0.01136
(31)	Min. width of fit = 1/24 x pitch (Note c)			0.00208	0.00231	0.00260	0.00298	0.00321	0.00347	0.00379
(32)	Helix angle at basic pitch diam.			4° 11′	3° 40′	3° 24′	3° 19′	3° 6′	2° 59′	2° 55′
	LEAD AND FORM TOLERANCES									
(35)	Class 2—Free fit	Lead tolerance (Note b)		0.0010	0.0012	0.0013	0.0014	0.0015	0.0016	0.0017
(36)	Class 2—Free fit	Tol. in 1/2′ angle (Note b)		1° 24′	1° 26′	1° 24′	1° 20′	1° 19′	1° 18′	1° 15′
(37)	Class 3—Medium fit	Lead tolerance (Note b)		0.0008	0.0009	0.0009	0.0010	0.0011	0.0012	0.0012
(38)	Class 3—Medium fit	Tol. in 1/2′ angle (Note b)		1° 2′	1° 4′	1° 1′	1° 0′	57′	57′	55′
(39)	Class 4—Close fit	Lead tolerance (Note b)		0.0004	0.0004	0.0005	0.0005	0.0005	0.0006	0.0006
(40)	Class 4—Close fit	Tol. in 1/2′ angle (Note b)		30′	30′	30′	29′	28′	28′	27′

EXPLANATORY NOTES FOR TABLES

(Note a)—Dimensions given are figured to the intersection of the worn tool arc with a center line through crest and root. Minimum flat at root equals $\frac{1}{8} \times p$.

(Note b)—The tolerances specified for pitch diameter are cumulative, and include all errors of lead and angle. The full tolerance on the pitch diameter is therefore not available unless the lead and angle of the thread are perfect. Lines 35 to 40 inclusive give, for information, the error in lead (per length of thread engaged) and in angle, which can each be compensated for by half the tolerance on the pitch diameter shown in lines 8, 11, 14, 21, 23, 25 and 27. If lead and angle error both exist to the amount tabulated, the pitch diameter of a bolt, for example, must be reduced by the full tolerance or it will not enter a basic nut or gage. If no lead error existed on such a bolt, the angle error could be twice that given, and conversely; but these extreme conditions are not contemplated as being desirable. See Appendix (B).

(Note c)—Dimensions given are allowable only with a tap having theoretically sharp corners. The threaded hole must not reject a correct basic "Go" gage by interference with the rounded roots due to a worn tap. Minimum flat at the root equals $\frac{1}{24} \times p$.

Close Fit *(Class 4)*—Includes screw-thread work requiring a fine snug fit, somewhat closer than the medium fit, such as high-grade aircraft parts, etc. In this class of fit selective assembly of parts may be required. It is not considered practicable as a commercial standard for tapped holes of the numbered sizes.

Section 2 on the "Recommended method of obtaining medium fit," and Section 3 covering "Special conditions" are left for consideration in a later installment.

4—GENERAL SECIFICATIONS

The following general specifications will apply to all classes of fits specified in the body of the report. (See Appendix (C) for special specifications applying to loose fits).

(a) *Uniform Minimum Nut*—The pitch diameter of the minimum threaded hole or nut corresponds to the basic size, variations being permitted above the basic size. The major and minor diameters of the minimum nut are also uniform for all class of fit.

(b) *Uniform Tap Drill Sizes*—The maximum and minimum minor diameters and the consequent minor diameter tolerances are the same for all nuts of a given size for all classes of fit. This permits uniform tap drill sizes for all classes of fit.

(c) *Uniform Major Diameter of Screws*—The maximum and minimum major diameters are the same for all screws of a given size for all classes of fit herein tabulated.

(National) Standard Screw Threads—$\frac{1}{4}$ to 3 Inches

of the American Engineering Standards Committee

(1)	¾-10	⅞-9	1-8	1⅛-7	1¼-7	1½-6	1¾-5	2-4½	2¼-4½	2½-4	2¾-4	3-4	(1)
(2)	0.7500	0.8750	1.0000	1.1250	1.2500	1.5000	1.7500	2.0000	2.2500	2.5000	2.7500	3.0000	(2)
(3)	0.7372	0.8610	0.9848	1.1080	1.2330	1.4798	1.7268	1.9746	2.2246	2.4720	2.7220	2.9720	(3)
(4)	0.0128	0.0140	0.0152	0.0170	0.0170	0.0202	0.0232	0.0254	0.0254	0.0280	0.0280	0.0280	(4)
(5)	0.6273	0.7387	0.8466	0.9497	1.0747	1.2955	1.5046	1.7274	1.9774	2.1933	2.4433	2.6933	(5)
(6)	0.6850	0.8028	0.9188	1.0322	1.1572	1.3917	1.6201	1.8557	2.1057	2.3376	2.5876	2.8376	(6)
(7)	0.6786	0.7958	0.9112	1.0237	1.1487	1.3816	1.6085	1.8430	2.0930	2.3236	2.5736	2.8236	(7)
(8)	0.0064	0.0070	0.0076	0.0085	0.0085	0.0101	0.0116	0.0127	0.0127	0.0140	0.0140	0.0140	(8)
(9)	0.6850	0.8028	0.9188	1.0322	1.1572	1.3917	1.6201	1.8557	2.1057	2.3376	2.5876	2.8376	(9)
(10)	0.6805	0.7979	0.9134	1.0263	1.1513	1.3846	1.6119	1.8468	2.0968	2.3279	2.5779	2.8279	(10)
(11)	0.0045	0.0049	0.0054	0.0059	0.0059	0.0071	0.0082	0.0089	0.0089	0.0097	0.0097	0.0097	(11)
(12)	0.6856	0.8034	0.9195	1.0330	1.1580	1.3926	1.6211	1.8568	2.1068	2.3389	2.5889	2.8389	(12)
(13)	0.6833	0.8010	0.9168	1.0300	1.1550	1.3890	1.6170	1.8524	2.1024	2.3341	2.5841	2.8341	(13)
(14)	0.0023	0.0024	0.0027	0.0030	0.0030	0.0036	0.0041	0.0044	0.0044	0.0048	0.0048	0.0048	(14)
(15)	0.7500	0.8750	1.0000	1.1250	1.2500	1.5000	1.7500	2.0000	2.2500	2.5000	2.7500	3.0000	(15)
(16)	0.6526	0.7667	0.8782	0.9858	1.1108	1.3376	1.5551	1.7835	2.0335	2.2564	2.5064	2.7564	(16)
(17)	0.6417	0.7547	0.8647	0.9704	1.0954	1.3196	1.5335	1.7594	2.0094	2.2294	2.4794	2.7294	(17)
(18)	0.0109	0.0120	0.0135	0.0154	0.0154	0.0180	0.0216	0.0241	0.0241	0.0270	0.0270	0.0270	(18)
(19)	0.6850	0.8028	0.9188	1.0322	1.1572	1.3917	1.6201	1.8557	2.1057	2.3376	2.5876	2.8376	(19)
(22)	0.6914	0.8098	0.9264	1.0407	1.1657	1.4018	1.6317	1.8684	2.1184	2.3516	2.6016	2.8516	(22)
(23)	0.0064	0.0070	0.0076	0.0085	0.0085	0.0101	0.0116	0.0127	0.0127	0.0140	0.0140	0.0140	(23)
(24)	0.6895	0.8077	0.9242	1.0381	1.1631	1.3988	1.6283	1.8646	2.1146	2.3473	2.5973	2.8473	(24)
(25)	0.0045	0.0049	0.0054	0.0059	0.0059	0.0071	0.0082	0.0089	0.0089	0.0097	0.0097	0.0097	(25)
(26)	0.6873	0.8052	0.9215	1.0352	1.1602	1.3953	1.6242	1.8601	2.1101	2.3424	2.5924	2.8424	(26)
(27)	0.0023	0.0024	0.0027	0.0030	0.0030	0.0036	0.0041	0.0044	0.0044	0.0048	0.0048	0.0048	(27)
(28)	0.06495	0.07217	0.08119	0.09279	0.09279	0.10825	0.12990	0.14434	0.14434	0.16238	0.16238	0.16238	(28)
(29)	0.10000	0.11111	0.12500	0.14286	0.14286	0.16667	0.20000	0.22222	0.22222	0.25000	0.25000	0.25000	(29)
(30)	0.01250	0.01389	0.01562	0.01786	0.01786	0.02083	0.02500	0.02778	0.02778	0.03125	0.03125	0.03125	(30)
(31)	0.00417	0.00463	0.00521	0.00595	0.00595	0.00694	0.00833	0.00926	0.00926	0.01042	0.01042	0.01042	(31)
(32)	2° 39′	2° 31′	2° 29′	2° 32′	2° 15′	2° 12′	2° 15′	2° 11′	1° 55′	1° 57′	1° 46′	1° 36′	(32)
(35)	0.0018	0.0020	0.0022	0.0024	0.0024	0.0029	0.0033	0.0037	0.0037	0.0040	0.0040	0.0040	(35)
(36)	1° 14′	1° 13′	1° 11′	1° 9′	1° 9′	1° 10′	1° 7′	1° 6′	1° 6′	1° 5′	1° 5′	1° 5′	(36)
(37)	0.0013	0.0014	0.0016	0.0017	0.0017	0.0020	0.0024	0.0026	0.0026	0.0028	0.0028	0.0028	(37)
(38)	54′	52′	51′	49′	49′	50′	48′	47′	47′	46′	46′	46′	(38)
(39)	0.0007	0.0007	0.0008	0.0009	0.0009	0.0010	0.0012	0.0013	0.0013	0.0014	0.0014	0.0014	(39)
(40)	27′	25′	25′	24′	24′	24′	24′	23′	23′	23′	23′	23′	(40)

There are good reasons for giving no values for the maximum major diameter of the nut, or for the resulting tolerance. These reasons are:

First, it is never measured, as intimated above, by any gage in practical use. Second, no harm from lack of strength or other defect can come in a nut or tapped hole in ordinary applications even if the major diameter is increased to the theoretical maximum or sharp "V." Third, the only harm that can arise from an enlarged major diameter is an undue sharpening of the crests of the cutting teeth in the tap, with a consequent tendency to rapid wear. But this is a matter which relates to tool standardization rather than to product standardization. Note (c) in the tables limits the sharpness of the tooth to a minimum flat of $\frac{1}{8} \times p$.

The third consideration is important. The whole subject has three natural divisions—those relating respectively to the product, to production tools, and to gaging. Of these the product is primary, and is the only one considered in this report. Its limits should be set as generously as possible, as in this case, thus leaving room for tool standardization, as for tap drills and taps, to be made independently within the product limits without disturbing the primary standard. The outside diameter and form of crest of the tap tooth may thus be varied within limits to give the best possible conditions, without changing the tables given above. See (e) below.

Practically the same observations apply to the minimum minor diameter of the screw, which is limited by setting the minimum width of flat at $\frac{1}{8} \times p$. See Note (a) in the accompanying tables.

(d) *Length of Engagement*—The tolerances herein determined are based on a length of engagement not to exceed the nominal diameter of the thread. Where greater lengths of engagement are required a corresponding increase in the accuracy of lead and thread form is necessary, which may be obtained by the provision or selection of more accurate threading tools, and the use of longer "Go" gages.

(e) *Rounded Root Forms*—The crest clearances allowed are such as to permit rounded root forms in both nut and screw. These may be formed either by tools purposely rounded or rounded as a result of wear in use. For the limits of this permissible rounding see Section IV, paragraphs 6 and 7.

The subject of the length of engagement, and its relations to pitch diameter, lead and angle tolerances, will be described later.

Table III—Coarse-Thread Series—American (National) Standard Screw Threads—Nos. 1 to 12

Figures taken from the Screw Thread Standard Report of the American Engineering Standards Committee

				No. 1-64	No. 2-56	No. 3-48	No. 4-40	No. 5-40	No. 6-32	No. 8-32	No. 10-24	No. 12-24	
(1)	Size and threads, per inch												(1)
	SCREWS AND BOLTS												
(2)	All fits	Major diam.	Max. (Basic)	0.0730	0.0860	0.0990	0.1120	0.1250	0.1380	0.1640	0.1900	0.2160	(2)
(3)	All fits	Major diam.	Min.	0.0692	0.0820	0.0946	0.1072	0.1202	0.1326	0.1586	0.1834	0.2094	(3)
(4)	All fits	Major diam.	Tol.	0.0038	0.0040	0.0044	0.0048	0.0048	0.0054	0.0054	0.0066	0.0066	(4)
(5)	All fits	Minor diam.	Max. (Note a)	0.0538	0.0641	0.0734	0.0813	0.0943	0.0997	0.1257	0.1389	0.1649	(5)
(6)	Class 2—Free fit	Pitch diam.	Max. (Basic)	0.0629	0.0744	0.0855	0.0958	0.1088	0.1177	0.1437	0.1629	0.1889	(6)
(7)	Class 2—Free fit	Pitch diam.	Min.	0.0610	0.0724	0.0833	0.0934	0.1064	0.1150	0.1410	0.1596	0.1856	(7)
(8)	Class 2—Free fit	Pitch diam.	Tol. (Note b)	0.0019	0.0020	0.0022	0.0024	0.0024	0.0027	0.0027	0.0033	0.0033	(8)
(9)	Class 3—Medium fit	Pitch diam.	Max. (Basic)	0.0629	0.0744	0.0855	0.0958	0.1088	0.1177	0.1437	0.1629	0.1889	(9)
(10)	Class 3—Medium fit	Pitch diam.	Min.	0.0615	0.0729	0.0839	0.0941	0.1071	0.1158	0.1418	0.1605	0.1865	(10)
(11)	Class 3—Medium fit	Pitch diam.	Tol. (Note b)	0.0014	0.0015	0.0016	0.0017	0.0017	0.0019	0.0019	0.0024	0.0024	(11)
(12)	Class 4—Close fit	Pitch diam.	Max.	0.0630	0.0746	0.0857	0.0960	0.1090	0.1179	0.1439	0.1632	0.1892	(12)
(13)	Class 4—Close fit	Pitch diam.	Min.	0.0623	0.0739	0.0849	0.0951	0.1081	0.1169	0.1429	0.1620	0.1880	(13)
(14)	Class 4—Close fit	Pitch diam.	Tol. (Note b)	0.0007	0.0007	0.0008	0.0009	0.0009	0.0010	0.0010	0.0012	0.0012	(14)
	NUTS AND TAPPED HOLES												
(15)	All fits	Major diam.	Min. (Basic) (Note c)	0.0730	0.0860	0.0990	0.1120	0.1250	0.1380	0.1640	0.1900	0.2160	(15)
(16)	All fits	Minor diam.	Max.	0.0578	0.0686	0.0787	0.0876	0.1006	0.1076	0.1336	0.1494	0.1754	(16)
(17)	All fits	Minor diam.	Min.	0.0561	0.0667	0.0764	0.0849	0.0979	0.1042	0.1302	0.1449	0.1709	(17)
(18)	All fits	Minor diam.	Tol.	0.0017	0.0019	0.0023	0.0027	0.0027	0.0034	0.0034	0.0045	0.0045	(18)
(19)	All fits	Pitch diam.	Min. (Basic)	0.0629	0.0744	0.0855	0.0958	0.1088	0.1177	0.1437	0.1629	0.1889	(19)
(20)	Class 1—Loose fit	Pitch diam.	Max.	0.0655	0.0772	0.0886	0.0992	0.1122	0.1215	0.1475	0.1675	0.1935	(20)
(21)	Class 1—Loose fit	Pitch diam.	Tol. (Note b)	0.0026	0.0028	0.0031	0.0034	0.0034	0.0038	0.0038	0.0046	0.0046	(21)
(22)	Class 2—Free fit	Pitch diam.	Max.	0.0648	0.0764	0.0877	0.0982	0.1112	0.1204	0.1464	0.1662	0.1922	(22)
(23)	Class 2—Free fit	Pitch diam.	Tol. (Note b)	0.0019	0.0020	0.0022	0.0024	0.0024	0.0027	0.0027	0.0033	0.0033	(23)
(24)	Class 3—Medium fit	Pitch diam.	Max.	0.0643	0.0759	0.0871	0.0975	0.1105	0.1196	0.1456	0.1653	0.1913	(24)
(25)	Class 3—Medium fit	Pitch diam.	Tol. (Note b)	0.0014	0.0015	0.0016	0.0017	0.0017	0.0019	0.0019	0.0024	0.0024	(25)
	THREAD FORM												
(28)	Depth of thread			0.01015	0.01160	0.01353	0.01624	0.01624	0.02030	0.02030	0.02706	0.02706	(28)
(29)	Pitch			0.01562	0.01786	0.02083	0.02500	0.02500	0.03125	0.03125	0.04167	0.04167	(29)
(30)	Width of flat = $\frac{1}{8}$ x pitch (Basic) (Note a)			0.00195	0.00223	0.00260	0.00312	0.00312	0.00391	0.00391	0.00521	0.00521	(30)
(31)	Width of flat = $\frac{1}{64}$ x pitch (Note c)			0.00065	0.00074	0.00087	0.00104	0.00104	0.00130	0.00130	0.00174	0.00174	(31)
(32)	Helix angle at basic pitch diam.			4° 31′	4° 22′	4° 26′	4° 45′	4° 11′	4° 50′	3° 58′	4° 40′	4° 1′	(32)
	LEAD AND FORM TOLERANCES												
(33)	Class 1—Loose fit	Lead tolerance	(Note b)	0.0008	0.0008	0.0009	0.0010	0.0010	0.0011	0.0011	0.0013	0.0013	(33)
(34)	Class 1—Loose fit	Tol. in ½ angle	(Note b)	3° 32′	3° 18′	3° 7′	2° 50′	2° 50′	2° 30′	2° 30′	2° 15′	2° 15′	(34)
(35)	Class 2—Free fit	Lead tolerance	(Note b)	0.0005	0.0006	0.0006	0.0007	0.0007	0.0008	0.0008	0.0009	0.0009	(35)
(36)	Class 2—Free fit	Tol. in ½ angle	(Note b)	2° 23′	2° 11′	2° 4′	1° 52′	1° 52′	1° 41′	1° 41′	1° 32′	1° 32′	(36)
(37)	Class 3—Medium fit	Lead tolerance	(Note b)	0.0004	0.0004	0.0005	0.0005	0.0005	0.0005	0.0005	0.0007	0.0007	(37)
(38)	Class 3—Medium fit	Tol. in ½ angle	(Note b)	1° 49′	1° 41′	1° 32′	1° 21′	1° 21′	1° 12′	1° 12′	1° 8′	1° 8′	(38)
(39)	Class 4—Close fit	Lead tolerance	(Note b)	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	(39)
(40)	Class 4—Close fit	Tol. in ½ angle	(Note b)	52′	46′	45′	42′	42′	37′	37′	33′	33′	(40)

(Note a)—Dimensions given are figured to the intersection of the worn tool arc with a center line through crest and root. Minimum flat at root equals $\frac{1}{8} \times p$.

(Note b)—The tolerances specified for pitch diameter are cumulative, and include all errors of lead and angle. The full tolerance on the pitch diameter is therefore not available unless the lead and angle of the thread are perfect. Lines 35 to 40 inclusive give, for information, the error in lead (per length of thread engaged) and in angle, which can each be compensated for by half the tolerance on the pitch diameter shown in lines 8, 11, 14, 21, 23, 25 and 27. If lead and angle error both exist to the amount tabulated, the pitch diameter of a bolt, for example, must be reduced by the full tolerance or it will not enter a basic nut or gage. If no lead error existed on such a bolt, the angle error could be twice that given, and conversely; but these extremes are not desirable. See Appendix (B).

(Note c)—Dimensions given are allowable only with a tap having theoretically sharp corners. The threaded hole must not reject a correct basic "Go" gage by interference with the rounded roots due to a worn tap. Mininmum flat at the root equals $\frac{1}{4} \times p$.

Table IV—Fine-Thread Series—American (National) Standard Screw Threads—¼ to 1½ Inches

Figures taken from the Screw Thread Standard Report of the American Engineering Standards Committee

				¼-28	5/16-24	⅜-24	7/16-20	½-20	9/16-18	⅝-18	¾-16	⅞-14	1-14	1⅛-12	1¼-12	1⅜-12	
(1)	Size and threads, per inch																(1)
	SCREWS AND BOLTS																
(2)	All fits	Major diam.	Max. (Basic)	0.2500	0.3125	0.3750	0.4375	0.5000	0.5625	0.6250	0.7500	0.8750	1.0000	1.1250	1.2500	1.5000	(2)
(3)	All fits	Major diam.	Min.	0.2438	0.3059	0.3684	0.4303	0.4928	0.5543	0.6168	0.7410	0.8652	0.9902	1.1138	1.2388	1.4888	(3)
(4)	All fits	Major diam.	Tol.	0.0062	0.0066	0.0066	0.0072	0.0072	0.0082	0.0082	0.0090	0.0098	0.0098	0.0112	0.0112	0.0112	(4)
(5)	All fits	Minor diam.	Max. (Note a)	0.2062	0.2614	0.3239	0.3762	0.4387	0.4943	0.5568	0.6733	0.7874	0.9124	1.0228	1.1478	1.3978	(5)
(6)	Class 2—Free fit	Pitch diam.	Max. (Basic)	0.2268	0.2854	0.3479	0.4050	0.4675	0.5264	0.5889	0.7094	0.8286	0.9536	1.0709	1.1959	1.4459	(6)
(7)	Class 2—Free fit	Pitch diam.	Min.	0.2237	0.2821	0.3446	0.4014	0.4639	0.5223	0.5848	0.7049	0.8237	0.9487	1.0653	1.1903	1.4403	(7)
(8)	Class 2—Free fit	Pitch diam.	Tol. (Note b)	0.0031	0.0033	0.0033	0.0036	0.0036	0.0041	0.0041	0.0045	0.0049	0.0049	0.0056	0.0056	0.0056	(8)
(9)	Class 3—Medium fit	Pitch diam.	Max. (Basic)	0.2268	0.2854	0.3479	0.4050	0.4675	0.5264	0.5889	0.7094	0.8286	0.9536	1.0709	1.1959	1.4459	(9)
(10)	Class 3—Medium fit	Pitch diam.	Min.	0.2246	0.2830	0.3455	0.4024	0.4649	0.5234	0.5859	0.7062	0.8250	0.9500	1.0669	1.1919	1.4419	(10)
(11)	Class 3—Medium fit	Pitch diam.	Tol. (Note b)	0.0022	0.0024	0.0024	0.0026	0.0026	0.0030	0.0030	0.0032	0.0036	0.0036	0.0040	0.0040	0.0040	(11)
(12)	Class 4—Close fit	Pitch diam.	Max.	0.2270	0.2857	0.3482	0.4053	0.4678	0.5267	0.5892	0.7098	0.8290	0.9540	1.0714	1.1964	1.4464	(12)
(13)	Class 4—Close fit	Pitch diam.	Min.	0.2259	0.2845	0.3470	0.4040	0.4665	0.5252	0.5877	0.7082	0.8272	0.9522	1.0694	1.1944	1.4444	(13)
(14)	Class 4—Close fit	Pitch diam.	Tol. (Note b)	0.0011	0.0012	0.0012	0.0013	0.0013	0.0015	0.0015	0.0016	0.0018	0.0018	0.0020	0.0020	0.0020	(14)
	NUTS AND TAPPED HOLES																
(15)	All fits	Major diam.	Min. (Basic) (Note c)	0.2500	0.3125	0.3750	0.4375	0.5000	0.5625	0.6250	0.7500	0.8750	1.0000	1.1250	1.2500	1.5000	(15)
(16)	All fits	Minor diam.	Max.	0.2152	0.2719	0.3344	0.3888	0.4513	0.5084	0.5709	0.6891	0.8054	0.9304	1.0438	1.1688	1.4188	(16)
(17)	All fits	Minor diam.	Min.	0.2113	0.2674	0.3299	0.3834	0.4459	0.5024	0.5649	0.6823	0.7977	0.9227	1.0348	1.1598	1.4098	(17)
(18)	All fits	Minor diam.	Tol.	0.0039	0.0045	0.0045	0.0054	0.0054	0.0060	0.0060	0.0068	0.0077	0.0077	0.0090	0.0090	0.0090	(18)
(19)	All fits	Pitch diam.	Min. (Basic)	0.2268	0.2854	0.3479	0.4050	0.4675	0.5264	0.5889	0.7094	0.8286	0.9536	1.0709	1.1959	1.4459	(19)
(22)	Class 2—Free fit	Pitch diam.	Max.	0.2299	0.2887	0.3512	0.4086	0.4711	0.5305	0.5930	0.7139	0.8335	0.9585	1.0765	1.2015	1.4515	(22)
(23)	Class 2—Free fit	Pitch diam.	Tol. (Note b)	0.0031	0.0033	0.0033	0.0036	0.0036	0.0041	0.0041	0.0045	0.0049	0.0049	0.0056	0.0056	0.0056	(23)
(24)	Class 3—Medium fit	Pitch diam.	Max.	0.2290	0.2878	0.3503	0.4076	0.4701	0.5294	0.5919	0.7126	0.8322	0.9572	1.0749	1.1999	1.4499	(24)
(25)	Class 3—Medium fit	Pitch diam.	Tol. (Note b)	0.0022	0.0024	0.0024	0.0026	0.0026	0.0030	0.0030	0.0032	0.0036	0.0036	0.0040	0.0040	0.0040	(25)
(26)	Class 4—Close fit	Pitch diam.	Max.	0.2279	0.2866	0.3491	0.4063	0.4688	0.5279	0.5904	0.7110	0.8304	0.9554	1.0729	1.1979	1.4479	(26)
(27)	Class 4—Close fit	Pitch diam.	Tol. (Note b)	0.0011	0.0012	0.0012	0.0013	0.0013	0.0015	0.0015	0.0016	0.0018	0.0018	0.0020	0.0020	0.0020	(27)
	THREAD FORM																
(28)	Depth of thread			0.02319	0.02706	0.02706	0.03248	0.03248	0.03608	0.03608	0.04060	0.04640	0.04640	0.05413	0.05413	0.05413	(28)
(29)	Pitch			0.03571	0.04167	0.04167	0.05000	0.05000	0.05556	0.05556	0.06250	0.07143	0.07143	0.08333	0.08333	0.08333	(29)
(30)	Basic width of flat = 1/8 x pitch (Note a)			0.00446	0.00521	0.00521	0.00625	0.00625	0.00694	0.00694	0.00781	0.00893	0.00893	0.01042	0.01042	0.01042	(30)
(31)	Min. width of flat = 1/24 x pitch (Note c)			0.00149	0.00174	0.00174	0.00208	0.00208	0.00231	0.00231	0.00260	0.00298	0.00298	0.00347	0.00347	0.00347	(31)
(32)	Helix angle at basic pitch diam.			2° 52′	2° 40′	2° 11′	2° 15′	1° 57′	1° 55′	1° 43′	1° 36′	1° 34′	1° 22′	1° 25′	1° 16′	1° 3′	(32)
	LEAD AND FORM TOLERANCES																
(35)	Class 2—Free fit	Lead tolerance	(Note b)	0.0009	0.0009	0.0009	0.0010	0.0010	0.0012	0.0012	0.0013	0.0014	0.0014	0.0016	0.0016	0.0016	(35)
(36)	Class 2—Free fit	Tol. in ½ angle	(Note b)	1° 45′	1° 32′	1° 32′	1° 24′	1° 24′	1° 26′	1° 26′	1° 24′	1° 20′	1° 20′	1° 18′	1° 18′	1° 18′	(36)
(37)	Class 3—Medium fit	Lead tolerance	(Note b)	0.0006	0.0007	0.0007	0.0008	0.0008	0.0009	0.0009	0.0009	0.0010	0.0010	0.0012	0.0012	0.0012	(37)
(38)	Class 3—Medium fit	Tol. in ½ angle	(Note b)	1° 13′	1° 8′	1° 8′	1° 2′	1° 2′	1° 4′	1° 4′	1° 1′	1° 0′	1° 0′	57′	57′	57′	(38)
(39)	Class 4—Close fit	Lead tolerance	(Note b)	0.0003	0.0003	0.0003	0.0004	0.0004	0.0004	0.0004	0.0005	0.0005	0.0005	0.0006	0.0006	0.0006	(39)
(40)	Class 4—Close fit	Tol. in ½ angle	(Note b)	36′	33′	33′	30′	30′	30′	30′	30′	29′	29′	28′	28′	28′	(40)

(Note a)—Dimensions given are figured to the intersection of the worn tool arc with a center line through crest and root. Minimum flat at root equals $\frac{1}{8} \times p$.

(Note b)—The tolerances specified for pitch diameter are cumulative, and include all errors of lead and angle. The full tolerance on the pitch diameter is therefore not available unless the lead and angle of the thread are perfect. Lines 35 to 40 inclusive give, for information, the error in lead (per length of thread engaged) and in angle, which can each be compensated for by half the tolerance on the pitch diameter shown in lines 8, 11, 14, 21, 23, 25 and 27. If lead and angle error both exist to the amount tabulated, the pitch diameter of a bolt, for example, must be reduced by the full tolerance or it will not enter a basic nut or gage. If no lead error existed on such a bolt, the angle error could be twice that given, and conversely; but these extremes are not desirable. See Appendix (B).

(Note c)—Dimensions given are allowable only with a tap having theoretically sharp corners. The threaded hole must not reject a correct basic "Go" gage by interference with the rounded roots due to a worn tap. Minimum flat at the root equals $\frac{1}{24} \times p$.

Table V—Fine-Thread Series—American (National) Standard Screw Threads—Nos. 0 to 12

Figures taken from the Screw Thread Standard Report of the American Engineering Standards Committee

				No. 0-80	No. 1-72	No. 2-64	No. 3-56	No. 4-48	No. 5-44	No. 6-40	No. 8-36	No. 10-32	No. 12-28	
(1)	Size and threads, per inch													(1)
	SCREWS AND BOLTS													
(2)	All fits	Major diam.	Max. (Basic)	0.0600	0.0730	0.0860	0.0990	0.1120	0.1250	0.1380	0.1640	0.1900	0.2160	(2)
(3)	All fits	Major diam.	Min.	0.0566	0.0694	0.0822	0.0950	0.1076	0.1204	0.1332	0.1590	0.1846	0.2098	(3)
(4)	All fits	Major diam.	Tol.	0.0034	0.0036	0.0038	0.0040	0.0044	0.0046	0.0048	0.0050	0.0054	0.0062	(4)
(5)	All fits	Minor diam.	Max. (Note a)	0.0447	0.0560	0.0668	0.0771	0.0864	0.0971	0.1073	0.1299	0.1517	0.1722	(5)
(6)	Class 2—Free fit	Pitch diam.	Max. (Basic)	0.0519	0.0640	0.0759	0.0874	0.0985	0.1102	0.1218	0.1460	0.1697	0.1928	(6)
(7)	Class 2—Free fit	Pitch diam.	Min.	0.0502	0.0622	0.0740	0.0854	0.0963	0.1079	0.1194	0.1435	0.1670	0.1897	(7)
(8)	Class 2—Free fit	Pitch diam.	Tol. (Note b)	0.0017	0.0018	0.0019	0.0020	0.0022	0.0023	0.0024	0.0025	0.0027	0.0031	(8)
(9)	Class 3—Medium fit	Pitch diam.	Max. (Basic)	0.0519	0.0640	0.0759	0.0874	0.0985	0.1102	0.1218	0.1460	0.1697	0.1928	(9)
(10)	Class 3—Medium fit	Pitch diam.	Min.	0.0506	0.0627	0.0745	0.0859	0.0969	0.1086	0.1201	0.1442	0.1678	0.1906	(10)
(11)	Class 3—Medium fit	Pitch diam.	Tol. (Note b)	0.0013	0.0013	0.0014	0.0015	0.0016	0.0016	0.0017	0.0018	0.0019	0.0022	(11)
(12)	Class 4—Close fit	Pitch diam.	Max.	0.0520	0.0641	0.0760	0.0876	0.0987	0.1104	0.1220	0.1462	0.1699	0.1930	(12)
(13)	Class 4—Close fit	Pitch diam.	Min.	0.0514	0.0634	0.0753	0.0869	0.0979	0.1096	0.1211	0.1453	0.1689	0.1919	(13)
(14)	Class 4—Close fit	Pitch diam.	Tol. (Note b)	0.0006	0.0007	0.0007	0.0007	0.0008	0.0008	0.0009	0.0009	0.0010	0.0011	(14)
	NUTS AND TAPPED HOLES													
(15)	All fits	Major diam.	Min. (Basic) (Note c)	0.0600	0.0730	0.0860	0.0990	0.1120	0.1250	0.1380	0.1640	0.1900	0.2160	(15)
(16)	All fits	Minor diam.	Max.	0.0478	0.0595	0.0708	0.0816	0.0917	0.1029	0.1136	0.1369	0.1596	0.1812	(16)
(17)	All fits	Minor diam.	Min.	0.0465	0.0580	0.0691	0.0797	0.0894	0.1004	0.1109	0.1339	0.1562	0.1773	(17)
(18)	All fits	Minor diam.	Tol.	0.0013	0.0015	0.0017	0.0019	0.0023	0.0025	0.0027	0.0030	0.0034	0.0039	(18)
(19)	All fits	Pitch diam.	Min. (Basic)	0.0519	0.0640	0.0759	0.0874	0.0985	0.1102	0.1218	0.1460	0.1697	0.1928	(19)
(20)	Class 1—Loose fit	Pitch diam.	Max.	0.0543	0.0665	0.0785	0.0902	0.1016	0.1134	0.1252	0.1496	0.1735	0.1971	(20)
(21)	Class 1—Loose fit	Pitch diam.	Tol. (Note b)	0.0024	0.0025	0.0026	0.0028	0.0031	0.0032	0.0034	0.0036	0.0038	0.0043	(21)
(22)	Class 2—Free fit	Pitch diam.	Max.	0.0536	0.0658	0.0778	0.0894	0.1007	0.1125	0.1242	0.1485	0.1724	0.1959	(22)
(23)	Class 2—Free fit	Pitch diam.	Tol. (Note b)	0.0017	0.0018	0.0019	0.0020	0.0022	0.0023	0.0024	0.0025	0.0027	0.0031	(23)
(24)	Class 3—Medium fit	Pitch diam.	Max.	0.0532	0.0653	0.0773	0.0889	0.1001	0.1118	0.1235	0.1478	0.1716	1.1950	(24)
(25)	Class 3—Medium fit	Pitch diam.	Tol. (Note b)	0.0013	0.0013	0.0014	0.0015	0.0016	0.0016	0.0017	0.0018	0.0019	0.0022	(25)
	THREAD FORM													
(28)	Depth of thread			0.00812	0.00902	0.01015	0.01160	0.01353	0.01476	0.01624	0.01804	0.02030	0.02320	(28)
(29)	Pitch			0.01250	0.01389	0.01562	0.01786	0.02083	0.02273	0.02500	0.02778	0.03125	0.03571	(29)
(30)	Width of flat = $\frac{1}{8}$ x pitch (Basic) (Note a)			0.00156	0.00174	0.00195	0.00223	0.00260	0.00284	0.00312	0.00347	0.00391	0.00446	(30)
(31)	Width of flat = 1-24 x pitch (Note c)			0.00052	0.00058	0.00065	0.00074	0.00087	0.00095	0.00104	0.00116	0.00130	0.00149	(31)
(32)	Helix angle at basic pitch diam.			4° 27′	3° 57′	3° 54′	3° 44′	3° 51′	3° 23′	3° 45′	3° 28′	3° 21′	3° 25′	(32)
	LEAD AND FORM TOLERANCES													
(33)	Class 1—Loose fit	Lead tolerance (Note b)		0.0007	0.0007	0.0008	0.0008	0.0009	0.0009	0.0010	0.0010	0.0011	0.0012	(33)
(34)	Class 1—Loose fit	Tol. in ½ angle (Note b)		4° 9′	3° 51′	3° 32′	3° 18′	3° 7′	2° 56′	2° 50′	2° 41′	2° 30′	2° 29′	(34)
(35)	Class 2—Free fit	Lead tolerance (Note b)		0.0005	0.0005	0.0005	0.0006	0.0006	0.0007	0.0007	0.0007	0.0008	0.0009	(35)
(36)	Class 2—Free fit	Tol. in ½ angle (Note b)		2° 50′	2° 41′	2° 23′	2° 11′	2° 4′	2° 3′	1° 52′	1° 49′	1° 41′	1° 45′	(36)
(37)	Class 3—Medium fit	Lead tolerance (Note b)		0.0004	0.0004	0.0004	0.0004	0.0005	0.0005	0.0005	0.0005	0.0005	0.0006	(37)
(38)	Class 3—Medium fit	Tol. in ½ angle (Note b)		2° 7′	1° 54′	1° 49′	1° 41′	1° 32′	1° 24′	1° 21′	1° 17′	1° 12′	1° 13′	(38)
(39)	Class 4—Close fit	Lead tolerance (Note b)		0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003	(39)
(40)	Class 4—Close fit	Tol. in ½ angle (Note b)		56′	54′	52′	46′	45′	41′	40′	38′	37′	36′	(40)

(Note a)—Dimensions given are figured to the intersection of the worn tool arc with a center line through crest and root. Minimum flat at root equals $\frac{1}{8} \times p$.

(Note b)—The tolerances specified for pitch diameter are cumulative, and include all errors of lead and angle. The full tolerance on the pitch diameter is therefore not available unless the lead and angle of the thread are perfect. Lines 35 to 40 inclusive give, for information, the error in lead (per length of thread engaged) and in angle, which can each be compensated for by half the tolerance on the pitch diameter shown in lines 8, 11, 14, 21, 23, 25 and 27. If lead and angle error both exist to the amount tabulated, the pitch diameter of a bolt, for example, must be reduced by the full tolerance or it will not enter a basic nut or gage. If no lead error existed on such a bolt, the angle error could be twice that given, and conversely; but these extremes are not desirable. See Appendix (B).

(Note c)—Dimensions given are allowable only with a tap having theoretically sharp corners. The threaded hole must not reject a correct basic "Go" gage by interference with the rounded roots due to a worn tap. Minimum flat at the root equals $\frac{1}{4} \times p$.

It Pays to Replace—

How a Shop Saved by Replacing Old Shop Equipment with New Equipment

These articles won honorable mention

By E. T. Spidy
Asst. Supt. Dominion Engineering Works, Ltd., Montreal, Canada

OUR machine shop is equipped with a regular complement of machine tools, together with some special machines and our line of manufacture is hydraulic turbines, paper mill machinery and special machines of various kinds.

In connection with paper making machinery there are large numbers of rolls made from iron, brass or copper piping and a large quantity of long shafts, on all of which there is an operation of straightening to be done before the pipe can be turned to make a roll, or before a forging or bar can be turned so that it will "clean up."

Straightening bars or pipes is an operation that is nearly always underestimated by estimators, unless they are experienced on that particular work. An experienced man, however, knows that while pipe is ordered "straight" by the purchasing agent, he gets what would be straight enough for a pipe line, but when he requires it to make a roll it has to be straightened before being turned. Likewise long forged shafts and long bar stock, while not to be compared with pipe, also have to be straightened. The usual method in the case of a bar is to set it between lathe centers, and rotate it, using a piece of chalk to mark the high spots. Next it is taken to the straightening press, the lower blocks adjusted the correct distance apart and the pressure applied at the chalk mark or where the mark indicates to be the correct point. The press in our case was of the hand-operated screw type having four posts and mounted on wheels that moved on two long I-beams set in concrete. Then the gang had to take the bar back to the lathe and go through the process again and again until it was straight.

Straightening Pipe

Pipe, which runs from eight to twenty-two feet in lengths and in diameters from 6 to 12 in., was set up in an old lathe close to the press and rotated. One end of the pipe was held in the chuck and the other on a large cone center. The procedure was the same as with the bars and two years' records showed us that each 8- or 10-in. pipe took an average of from 12 to 18 hr. to straighten. Over 500 pieces of pipe were done this way.

I should also mention that other methods are used in various endeavors to speed up this work. When we get short kinks, the oil torch is used to heat up the job to help the press. Again on long bends, that is, when the job was out in one plane from end to end, a jack would be placed on the bed of the lathe and the job strained. Then again the use of a jack, and then peening to stretch one side was often resorted to.

Who has not done what has just been described hundreds of times? It is an art and the skill of the operator means a lot. We learned long ago to hold on to "so and so" because he could straighten pipe quicker than anybody in these parts.

With all this we were not satisfied. We had so much of this work that the job set us hunting. We tried to get straighter pipe and so on, but found that no manufacturer would or could give it to us. Then we found out that Logeman Bros. Co., Milwaukee, Wis., made a specialty of hydraulic presses for just such requirements as ours.



LOGEMAN HYDRAULIC STRAIGHTENING PRESS

One of these presses was purchased and since its installation, our trouble is not only ended but the investment has proved an extraordinarily good one for our company, as 2 to 3 hr. is the present time for straightening a length of 8- or 10-in. pipe.

The new press is designed to handle straightening in one setting completely, and with a minimum of effort. It is now a one-man operation, whereas at least one helper and sometimes two, had to be employed with a machinist under the old way. Hydraulic power is substituted for handpower, and central electrical control of all operations is an outstanding feature. The illustration shows this press set up in our shop. We installed it on the same I-beams that the old machine was on. The operator travels the press carriage to one end while the pipe is lowered by the crane in between the cone centers. He then moves the tailstock into position by means of a handwheel. The pipe is rotated by a motor on the headstock of the machine, controlled by an electric switch on the press carriage within reach from the operator's seat. The hydraulic-press motor is situated on the press carriage, as is the pump, and is also controlled by a handy switch. One valve controls

the press motions. The cone centers have flexible connection to their respective centers which permits of movement up or down when pressure is applied to any part of the work. They automatically re-center themselves when the pressure is released.

The savings effected are in approximately the same ratio for all sizes of work. For one 12-in. pipe, 16 ft. long, that is ordered "commercially straight" and is what we would call "good average straight" the comparison shows as follows:

	Old Machine	New Machine
Time per pipe	12 to 18 hr.—say 12 hr.	2 to 3 hr.—say 3
No. men	2 (sometimes 3)—say 2	1
Rate per hour	1 mach. 1 helper—gang $1. per hr.	1 at 60c. per hr.
Labor cost per pipe, net	$12	$1.80

During the first six months the new press was in operation, we straightened 326 pieces of pipe, which represented a total saving of $3,325 in net labor and is much more than the price of the press. In this cost comparison is not included miscellaneous work on which saving has also been made, neither has power consumption, etc., been taken into consideration, because it would only add to the savings shown.

In the above statement it will be noticed that by employing averages, the saving shown could have been made larger. I am confident it is larger, but the result is satisfying enough to show the value of studying operations that are not always outstanding enough in themselves with respect to old machinery of accepted type, as compared with results made possible by machinery designed to meet modern needs.

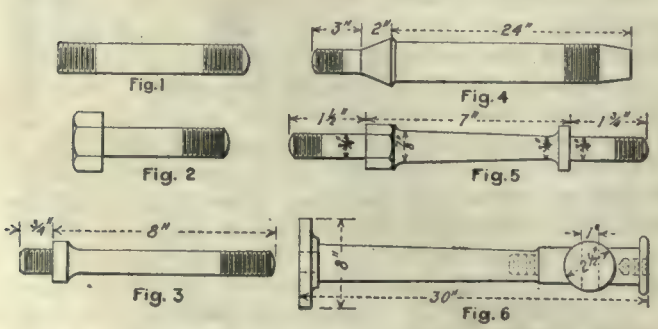
By H. Mapplethorpe

Foreman, Hedleys, Ltd., Engineers, West Bromwich, England

TO TELL the whole story of how a shop saved by replacing old machine tools with new, would take a long time, and I will therefore only give a birds's-eye view of my experience.

A few years ago, at the shops of Robey & Co., Lincoln, a department equipped with automatics was added and I was placed in charge. The equipment comprised, Cleveland, Hartford and Herbert automatics; Warner & Swasey, Bardons & Oliver and Potter & Johnson capstan lathes; a Landis grinding machine and some boring mills.

Studs, such as are shown in Fig. 1, were made on a



FIGS. 1 TO 6—PARTS MADE ON AUTOMATIC AND TURRET MACHINES AT A GREAT SAVING

1¼-in. Cleveland automatic in lots of 10,000 at a set-up. Previously, they had been made in three gross lots on a Smith & Coventry capstan lathe.

Bolts, as shown in Fig. 2, were used in large quantities and in various sizes and were made in a 1¾-in. Herbert automatic.

Studs for relief valves, as in Fig. 3, were made in a Hartford automatic, which often ran two or three weeks and made 10,000 to 15,000 pieces at a set-up. Previously these studs had been made from forgings and turned between centers in an engine lathe. When made in an automatic, the cost was less than that of the forgings, and the production was much greater than in the lathe.

Piston rods for a high-speed steam engine, Fig. 4, were used in large lots and had previously been made from forgings and machined between centers in an engine lathe. I undertook the making of them from bar steel on a 2½-in. Herbert hexagon turret lathe, with the result that there was less waste of material and the cost was less than that of the forgings. The piston rods, after they came from the turret lathe, were finished by grinding in a Landis machine, making a far superior finish than was possible by the method previously used.

Column studs for boiler stop-valves, as represented by Fig. 5, had previously been made from forgings and turned in an engine lathe. When this work was given to a 1¾-in. Herbert automatic and made from the bar, the time was 11½ min. each.

Standards for Handrails

The part, shown in Fig. 6, is standard for such hand rails as are usually placed around engines. These standards had formerly been made from forgings costing 17s. 6d. for the forging alone. Afterwards they were turned out by a Wollsey turret lathe, in the built-up fashion shown in the sketch, at an increase of 250 per cent in production.

Another job was the making of governor balls up to 2 in. in diameter, and formerly made of cast iron. Naturally, they varied considerably in density. Afterwards they were made from the bar in a Herbert automatic in 9½ min. each and, besides weighing alike, were better finished.

In the boiler shop, a hydraulic flanging press saved seven heats in flanging front plates of boilers of the locomotive type.

In the foundry, molding machines increased the output per man 600 per cent.

In the smithy, the drop hammer increased the output up to 1,000 per cent and produced far better finished articles.

During the world war, the output of bearing bushings for the Sunbeam aero engines was doubled at Hedleys by the introduction of Ryerson, Willard and Mullener turret lathes, and work within 0.0005 in. limit was produced.

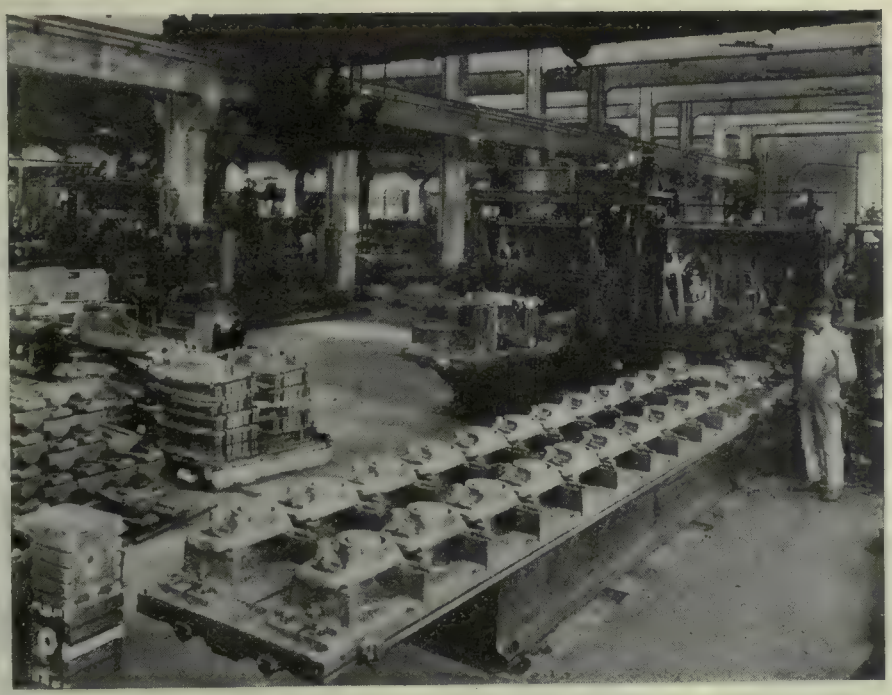
Performance of an English Tool Steel

The following data are reported from the Bullard Machine Tool Co. concerning the performance of Van Asten "Supra" steel made in England.

A ½-in. twist drill ran for one hour on 0.40 carbon steel at 640 r.p.m. with 0.043 in. feed. Penetration was 27 in. per minute. The drill was flooded with oil.

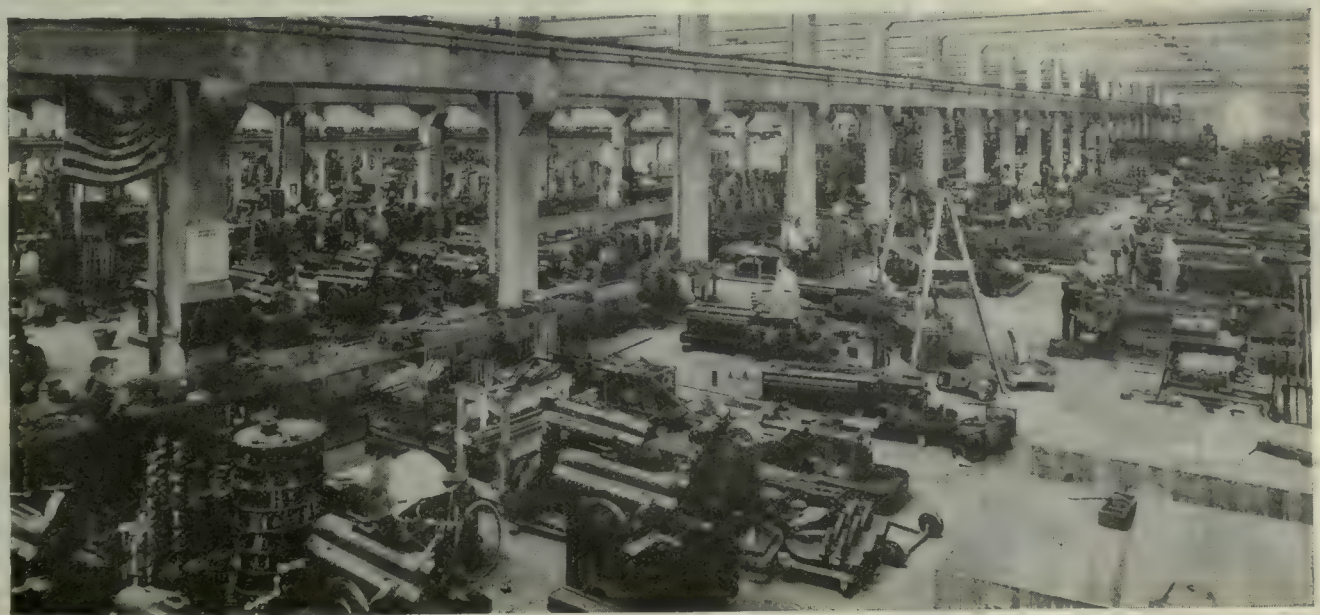
A 1x1¼-in. tool used in the side head of a Bullard 24-in. vertical turret lathe, machining Carpenter 5-317 chrome nickel steel, with length of cut 2¾ in., depth of cut ⅝ in., feed 0.014 in. per minute, work turning at 40 r.p.m., made a reduction from 4⅜ to 3½ in. in diameter with an average of thirty-one pieces per grind as against eight to ten pieces per grind with the steels formerly used.





Where
Machine Tools
Are Made

Gould & Eberhardt
Founded 1833





No. 1501, American Locomotive Co. Cylinders 28 x 30 in. Drivers 63 in. Steam 210 lb. Wheelbase: driving 17 ft. 3 in., engine 39 ft. 10 in., engine and tender 82 ft. 2¾ in. Weight: leading 57,500, drivers 257,500, trailing 62,000, total engine 377,000, tender 267,600 lb. Tractive power 66,600 lb. Adhesion factor 3.86. Tender capacity: water 14,000 gal., fuel 20 tons. Superheater.

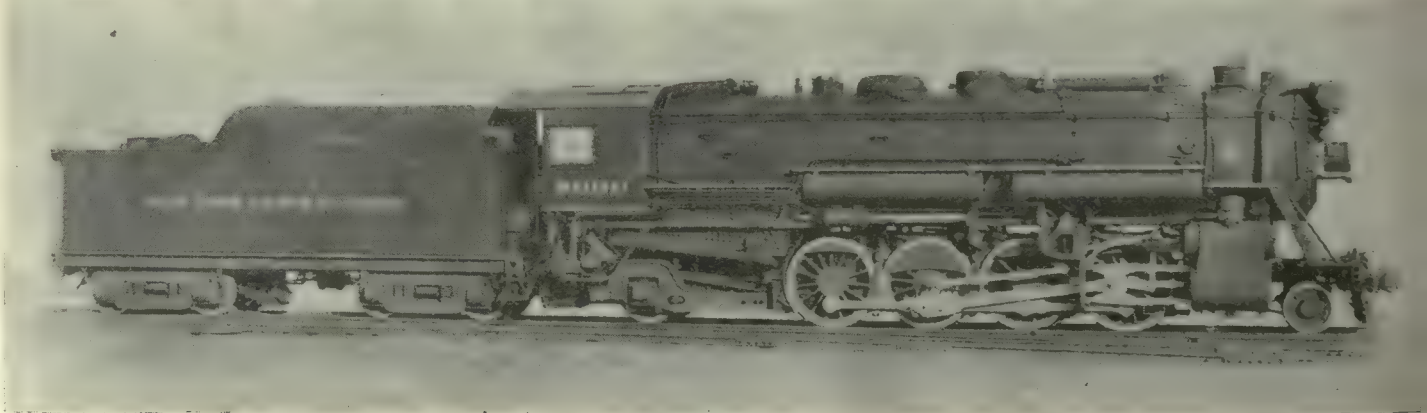
Six Recent Locomotives

Some Typical Motive Power in Different Parts

No. 1022, Lima Locomotive Works, Inc. Cylinders 27 x 28 in. Drivers 79 in. Steam 200 lb. Wheelbase: driving 14 ft. 0 in., engine 37 ft., engine and tender 72 ft. 10¾ in. Weight: Leading 61,000, drives 189,000, trailing 56,000, total engine 306,000, tender 236,000 lb. Tractive power 43,900 lb. Adhesion factor 4.3. Tender capacity: water 12,000 gal., fuel 14 tons. Superheater included.



No. 8,000, Lima Locomotive Works, Inc. Cylinders 28 x 30 in. Drivers 63 in. Steam 200 lb. Wheelbase: driving 16 ft. 6 in., engine 37 ft., engine and tender 71 ft. 6½ in. Weight: leading 30,000, drivers 245,500, trailing 58,500, total engine 334,000, tender 199,700 lb. Tractive power: main cylinders 63,500, with booster 74,500 lb. Adhesion factor 3.87. Tender capacity: water 10,000 gal., fuel 16 tons. Superheater.





No. 2936, Baldwin Locomotive Works. Cylinders 27 x 28 in. Drivers 79 in. Steam 200 lb. Wheelbase: driving 14 ft., engine 37 ft. 1 in., engine and tender 72 ft. 6½ in. Weight: leading 49,190, drivers 198,960, trailing 59,710, total engine 307,860, tender 188,140 lb. Tractive power 43,800 lb. Tender capacity: water 10,000 gal., fuel 16 tons. Superheater, power reverse and stoker.

For American Railways

for a Wide Variety of Service of the U. S. A.

No. 4300, Baldwin Locomotive Works. Cylinders 30½ x 32 in. Drivers 62 in. Steam 250 lb. Wheelbase: driving 22 ft. 8 in., engine 32 ft. 2 in., engine and tender 73 ft. ½ in. Weight: leading 33,600, drivers 352,500, total engine 386,000, tender 196,000 lb. Tractive power 87,000 lb. Tender capacity: water 9,000 gal., fuel 35,000 lb. Superheater, feed-water, stoker and power reverse.



No. 2063, American Locomotive Company. Cylinders: high pres. 25, low pres. 39, stroke 32 in. Drivers 57 in. Steam 240 lb. Wheelbase: driving 15 ft. 9 in., engine 58 ft., engine and tender 98 ft. 2¾ in. Weight: leading 29,500, drivers 483,500, trailing 25,000, total engine 538,000, tender 265,200 lb. Tractive power: simple 121,600, compound 101,300 lb. Adhesion factor 4.77. Tender: water 15,000 gal., fuel 17 tons. Superheater.



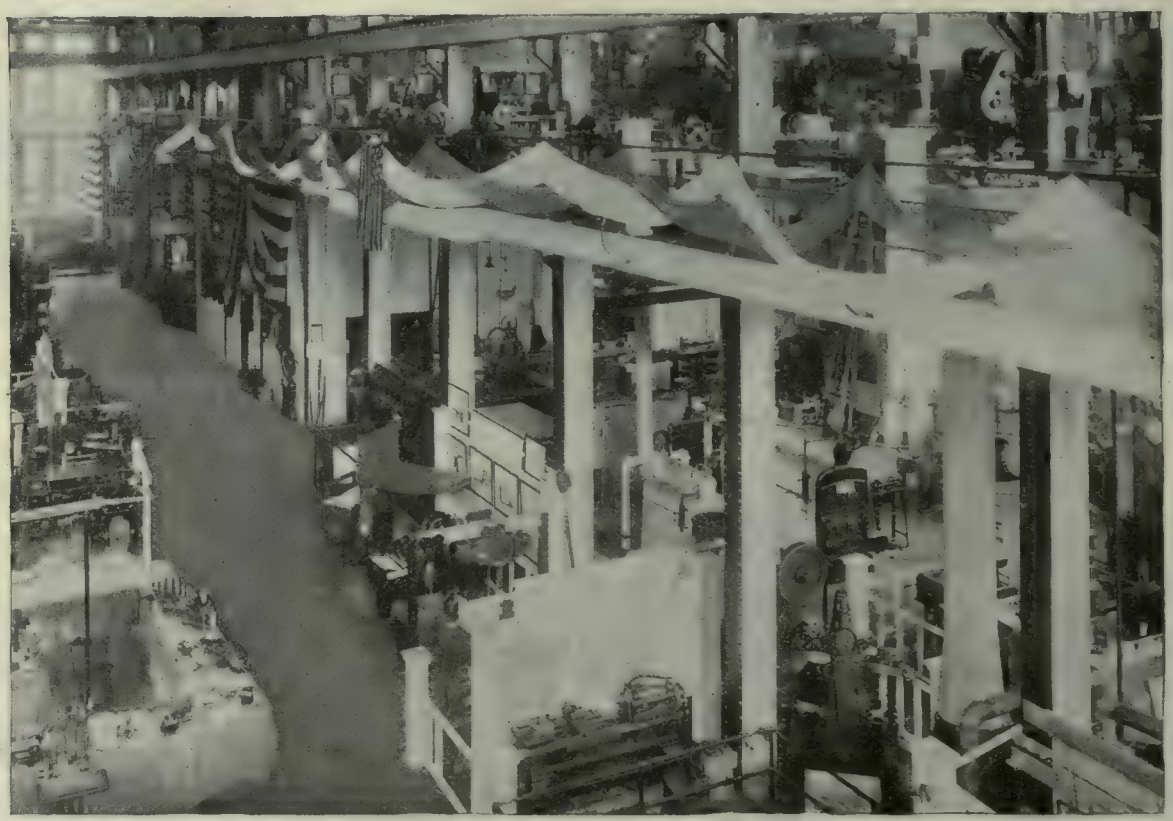


THIRD ANNUAL MACHINE TOOL EXHIBITION

Held at

Mason Laboratory, New Haven, Conn., Sept. 18 to 21, 1923

More than 100 makers of machine and small tools exhibited their products



Industrial Cost Accounting for Executives

By PAUL M. ATKINS

Article twenty-three takes up the problem of recording the product and improvement costs — Checking the distribution and summaries of the items of cost

ALL THE various elements which serve to make up the cost of the product have now been discussed together with the means of recording them. It is now time to turn our attention to the problem which is involved in their summary in such a way as to show the cost of the product. This article will be, to a certain extent, a review of what has gone before in the hope that it may serve to bind some of the various details together which, perhaps, have seemed to have little relation.

The physical basis for the assembly of order or process costs are the material issues, time tickets and bookkeeper's or journal vouchers. These should be filed according to order number after they have been entered in

QUANT. ORDERED	QUANT. COMPL'T'D	ARTICLE				ORDER NO.
ITEM		MONTH	MONTH	MONTH	MONTH	TOTALS
STORES						
WORKED MATERIAL						
LABOR						
VOUCHER REGISTER						
BURDEN						
MISC.						
TOTAL						
WORKED MATERIAL IN						

Courtesy of the Square D Co.

FIG. 53A—ORDER COST CARD

their respective journals, and at the close of each month or when an order is completed they should be totaled and entered on the order cost cards like those shown in Fig. 53 A and B. In some cases where it is desirable to analyze the order costs in great detail it is well to enter each voucher on the cost card as it comes to the file. Forms arranged for this purpose are shown in Fig. 54 A, B and C. The first method, summarizing only once a month or when the order is finished, requires much less labor than the second method, but it does not provide the possibility of quite so much information about the cost of the order, especially some time after its completion.

It is necessary to check the distribution of each of the items of cost against the controlling account entries for each month and that means that the labor, material, and burden for each month must be kept separate from the same items for other months until the verification has been made, and, at the same time, it is essential to check the total of all the orders which are still in process with the balance of the proper controlling "in process" account, and this means that the totals of all items for a month on the unfinished orders must be obtained. Care must be exercised to see that the various steps in the recording of order costs are taken in such a way as to permit both these requirements being met.

The first step to take to add up the material issues in most cases is keeping the stores and worked material separate. It is for this purpose that many group issues

ACC'T NO	QUANTITY	PART AND ORDER NO.
COST CARD		
DESCRIPTION		

DATE COMP	MONTH	MONTH	MONTH	MONTH	TOTAL
STORES DR.					
SALVAGE DR.					
STORES CR.					
SALVAGE CR.					
NET MAT					
LABOR					
BURDEN F.					
BURDEN G.					
TOTAL THIS MO.					
BAL. FORWARD					
TOTAL					
AMT. CH'D OUT					
BAL. END MO.					
QTY. GOOD					
FIRED SCRAP					SF 2 AC

Courtesy of the Union Special Machine Co.

FIG. 53B—ANOTHER TYPE OF COST CARD

are provided with two value columns so that the extensions for stores and worked material may not be mixed. This segregation is also necessary for the successful operation of the material journal, it will be remembered. If a Burroughs duplex adding machine is employed it will be found to simplify the procedure very much for it will permit not only the addition of all the stores issues for a single order, but also the accumulation of the total value for all the orders.

It is, perhaps, anticipating a following article dealing with mechanical aids to cost-accounting to discuss this machine here, but it is such an important help in the task of verification that it merits a few words at this

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Form F 84-A

ORDER COST CARD ORDER NO.

DATE COSTED ARTICLE NO.

DESCRIPTION

COST SUMMARY

				ORDER TOTALS	REDUCTION FOR EXCESS SPOILAGE	COST TOTALS	COST PER HUNDRED	%
1	QUANTITY STARTED	9	RAW MATERIAL					
2	QUANTITY FINISHED	10	PARTS					
3	QUANTITY SPOILED (1-2)	11	LABOR					
4	% SPOILED (3÷1)	12	FACTORY O.H.					
5	% SPOILAGE CHARGED TO COST	13	TOTAL					
6	% CHGD. TO SPOILAGE (4-5)							
7	AMOUNT ACTUAL SPOILAGE (4 x 13)	DR. ACCT. No.		DR. ACCT. No.		DR. ACCT. No.		
8	AMOUNT CHGD. TO SPOILAGE (6 x 13)	$		$		$		

RECORD OF OPERATIONS

DEPT.	OPN.	HOURS	AMOUNT BONUS	TOTAL	DEPT.	OPN.	HOURS	AMOUNT BONUS	TOTAL
	1					7			
	2					8			
	3					9			
	4					10			
	5					11			
	6					TOTALS			

Courtesy of the Acme Wire Co.

FIG. 54A—DETAILED ORDER COST CARD

place. The mechanism is so arranged that two different additions may be made at the same time. The stores issued for a single order should be added in the upper set of adding wheels and when all the figures for an order have been put in the machine a "transfer total" may be taken which gives the sum of the entries in the upper adding mechanism and at the same time transfers the total to the lower set of adding wheels, leaving the upper set clear. The issues for another order may now be added in the upper set and the total transferred as before to the lower set where it is automatically added to the sum previously transferred there. When all the issues have been added, the total for each order is shown on the adding machine tape and by depressing the "total" lever for the lower set of adding wheels the grand total for all the orders is also printed.

The order totals should then be entered on the order cost cards, and the same series of operations performed for the stores credit slips. The difference between the two grand totals should agree with the monthly total of the stores journal. If it does not, the issues and credit totals should be obtained separately from the journal, an easy matter if the credits have been entered separately in red ink in the stores journal as was advised in the article dealing with that subject. It is then not difficult to see whether the error has been made in the distribution of the issues or the credits and hence the location and correction of the error is facilitated.

The same procedure should next be followed for the worked material issues and credit slips. The result assures the agreement of the material distribution with the controlling accounts. The labor distribution should also be checked in a similar fashion. In this case the figure to check against is the sum of the direct labor charges to be found in the payroll summaries. If the earned burden is allocated by means of a machine rate or process rate, the same verification must be performed,

S. F. 262 P

SYMBOL BATCH NO. MACH. CHGE. LABOR DM NF

	HOURS	MACH CHGE.	LABOR	MATERIALS	PIECES	MACH. CLASS
0						
1						
2						
3						

DEPT	HOURS	MACH CHGE.	LABOR	DEPT.	MACH. CHGE.	LABOR
Tls						

Summary

Total Charges other Depts.				
S.D. Receipts				
HOURS				
Machine Charge				
Labor				
CREDITS				
Material				
Total Cost of Batch				

Summarized	Audited	Checked	

Batch		HOURS	MACH. CHGE.	LABOR	MATERIALS	PIECES	W. M. in Stores
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						
	11						
	12						
	13						
	14						
	15						
	16						
	17						
	18						
	19						
	20						
	21						
TTs							

Courtesy of the Acme Wire Co.

FIG. 54B—ANOTHER TYPE OF DETAILED COST CARD

this time checking against the total of the burden journal. If the percentage on direct labor-hours method is employed, the total of the hours distributed to the several orders is the element which requires attention for checking purposes.

When either the percentage on direct labor-hours or charges method is used the earned burden for each order cannot be calculated till after the hour and labor charge totals have been distributed and aggregated against the various orders. It is essential, of course, to keep the labor charges or the hours in the different departments separated from each other for the burden rates differ among the departments. After the burden has been applied it is then necessary to total it for all the orders and check the results against the entries in the controlling accounts.

When all the aforementioned distributions have been checked against the balance of the merchandise in process account.

In the case of worked orders for worked materials, however, certain other steps are necessary. It will be remembered that the worked material when completed is turned into the store-room on the authority of worked material in slips and that the slips were priced at an estimated cost price, usually the last actual cost price. The credit to the worked material in process account and debit to the worked material account is obtained by means of a worked material in journal in which the "in" slips are entered day by day. It is quite evident that if the debits to the worked material in process account are the actual costs of labor, material, and burden, and credit is made on an estimated basis, the balance of the account will not show the time condition of the worked material in process unless some adjustment is made. In

SE-66 A P 5m 5 14

COST RECORD CARD

FOR

CHARGE SYMBOL				
TOTAL LABOR				
" STORES			COMPUTED	JOURNALIZED
" W. M. STORES				
" MISC.				
TOTAL FLAT COST				

LABOR				STORES			WORK. MAT'L STORES			MISCELLANEOUS	
DATE	AMOUNT	DATE	AMOUNT	DATE	ISSUE NO.	AMOUNT	DATE	ISSUE NO.	AMOUNT	DATE	AMOUNT
		BR'T FOR'D									

FIG. 54C—DETAILED COST RECORD CARD

checked together with the bookkeeper's vouchers for direct charges, it is then time to assemble the order costs. It may seem like a rather useless waste of time to do all this verification, but it must be remembered, first that a large number of vouchers enter into these distributions and it is not surprising if mistakes occur from time to time in spite of all the care which may be exercised to prevent them, and, secondly, that if gross errors are allowed to pass uncorrected, the final results will not be sufficiently accurate to aid the executive greatly in the control of his business. On the other hand it must not be thought that agreement can readily be obtained between the summation of the details and the totals. If the differences are small—fractions of a per cent, or sometimes even as much as 2 per cent of the total involved—it is not worth while making a meticulous search for them. In part they may be accounted for by split cents and in part by slight errors which it would cost more to find than it would be worth in additional accuracy once it was found.

The next step is to sum up all the elements of cost for each order for the month and check against the totals debited to the controlling "in process" accounts, leaving out of consideration, of course, the balance of the account remaining from the preceding month. This is done to assure the correctness of the entry of all the details which have previously been discussed.

It is now time to separate the completed from the uncompleted orders. In the case of the orders for merchandise, the unit price may be figured and any other analyses made which may be of benefit to the executive. The unfinished orders should then be totaled and some cases this adjustment is a credit to the account and sometimes a debit depending on whether the estimated price at which the worked material is credited is too low or too high.

The time to correct this account is at the end of the month. The necessary amount is found by ascertaining the difference between the actual cost of the order as shown by the order cost card when the order is completed, and the estimated value as shown by the worked material in slips which should be filed with the other vouchers which belong to the order. The net total of these differences should be obtained and a general journal entry made of it for posting to the worked material variation account in which the variations should be allowed to accumulate till the end of the year when it can be closed into the profit and loss or surplus account. If the estimating is done carefully and slight modifications made of the last actual cost price to meet changing conditions, the net variation for any one month is likely to be very small since the variations of the several orders tend to cancel each other. It will also be found that the entries in the variation account will also tend to offset each other and hence the final adjusting entry will not be found to be very large.

The cost cards of the unfinished orders should then be totaled and checked against the balance of the worked material in process account. The value of the worked material in slips must be deducted from the total for the orders if there are any. If the orders have been divided into lots or batches, this problem will not exist for each batch can be handled as a separate unit. In

figuring unit costs for the month it is essential to include all batches or lots of an order finished within the month in order to smooth out irregularities. If there are conspicious differences in unit costs among the various lots it is well to analyze them carefully to discover the cause, if this is possible, but the unit cost—when it is spoken of without further qualification—should be the average for all units completed during the period in question.

It is now possible to dispose of the vouchers. Usually they are filed all together according to order and lot number in a dead file. They are seldom wanted again unless a very detailed analysis of the order cost is required. Such an analysis is needed from time to time when anything peculiar is noted about the order or its cost, and hence this filing should not be treated in a perfunctory way. Though rarely wanted, if the operation of the factory is under reasonably satisfactory control, when they are needed, the need is immediate. In some cases, too, the auditors like to look over a few sample orders to satisfy themselves in regard to the accuracy of the record keeping.

When the cost records are to be kept in the form of process costs, it will usually be found that they are much simpler than in the case of order costs with one exception. So long as the product is not so changed in going through a process that the individual units lose their identity or rather the capacity of being measured in the same fashion, both before and after the process, it is quite simple. The quantity going in can be measured in the same terms as that coming out and the difference must be in process. When this is not possible it often becomes necessary to measure what remains in process and then a practical engineering problem of considerable difficulty is met. Usually it is safe to treat all material in a certain process at the end of a period as half done, and so give its quantity half the importance of the units of finished product which have been turned out during the period. Knowing the quantity of material involved and the cost of the labor, material and burden charged to the process it is a simple problem to ascertain the unit cost for the process.

Improvement Costs

The recording of the details of the improvement costs is substantially the same as for the product. Orders, of course, should be issued for all work of this kind and these orders should be made the basis of all cost records. The distribution of labor and materials should be verified in the same way as for the product.

Whether or not burden shall be applied to such orders is a very much debated question. Usually it is decided on the basis of expediency. If only a few improvements are made by the factory itself, they are usually produced by the maintenance department and under such conditions it is almost impossible to work out any satisfactory burden rate. On the other hand where large quantities of tools and even entire machines are made within the factory, often in the tool department, it would seem desirable for several reasons to charge burden to such work and under these circumstances it becomes much easier. The addition of burden will give a better basis for comparison of the costs with the price it would be necessary to pay to obtain the same articles from outside suppliers. With the present tax laws, also, it is more satisfactory to allocate this cost to the permanent assets.

Unless there is a large amount of any one class of improvements such as tools, it is often convenient to have only one improvement in process account. It must not be forgotten that there are almost invariably several fixed asset accounts to which the completed improvements are to be charged when completed. This does not need to cause any difficulty. A single general journal entry crediting improvements in process account and debiting the appropriate fixed asset accounts for the improvements which have been finished during the period is quite sufficient. It must not be forgotten also that a plant register card must be made out for each new improvement, except for such as are additions to already existing assets, in which case the value should be added to the plant register card for the asset in question.

Controlling Account Entries

Before closing this article it may be well to show the entries to the controlling accounts affected. Some of these overlap with accounts already shown but this will only serve to knit together more closely the fabric of the accounts.

Worked Material in Process Account

Stores journal (value of stores issued for the production of worked material. Credit therefore to the stores account.)

Worked material journal (value of worked material issued for the production of other worked material. Credit therefore to the worked material account.)

Payroll book (value of labor expended directly on the production of worked material. Credit therefore to the payroll account.)

Burden journal (value of earned burden apportioned to work material in process. Credit therefore to the manufacturing burden account.)

Voucher register (value of direct charges incurred for the benefit of worked material. Credit therefore to accounts payable account.)

Worked material in journal (value at estimated cost price of the completed worked material. Debit therefore to worked material account.)

General journal (account of variation between actual and estimated cost of worked material when the actual is greater than the estimate. Debit therefore to worked material variation account.)*

The debit balance of this account represents the value of the worked material in process at the end of the period.

* If the actual cost is less than the estimated then this account will be debited and the variation account credited.

Merchandise in Process Account

Stores journal (value of the stores issued for the production of merchandise. Credit therefore to the stores account.)

Worked material journal (value of worked material issued for the production of merchandise. Credit therefore to the worked material account.)

Payroll book (value of labor expended directly on the production of merchandise. Credit therefore to payroll account.)

Burden journal (value of earned burden apportioned to merchandise in process. Credit therefore to manufacturing burden account.)

Voucher register (value of direct charges incurred for the benefit of merchandise. Credit therefore to accounts payable account.)

General journal (amount of the merchandise completed during the period. Debit therefore to the merchandise account.)

The debit balance of this account represents the value of the merchandise in process at the end of the period.

The entries in the merchandise account are quite simple. The debit comes, as is indicated above from the "in process" account, and credit represents the value of the goods shipped during the same period.

MERCHANDISE ACCOUNT

General journal (value of the completed merchandise for the period. Credit therefore to the merchandise in process account.)

General journal (value of merchandise sold during the period. Debit therefore to the trading account.)

The debit balance of this account represents the value of the completed merchandise on hand at the end of the period.

The improvements in process account is so like the worked material in process and the merchandise in process accounts as not to need repetition here. To indicate the manner in which the completed improvements may be credited to one account and debited to several others, the general journal entry follows:

Machinery account
Buildings account
Furniture and fixture account
Tool account

Improvements in process account

To transfer the value of completed improvements from the "in process" account to the proper fixed asset accounts.

We now have before us the complete cycle of the operations involved in recording the cost of product and improvements. The information so developed is of benefit to the executive in the control of his business, but to a very considerable extent the value of the cost records are due to what may be called the "by-product" of the work involved in securing unit costs. Some of the uses of industrial costs have already been pointed out in an earlier article, but before going on to a further discussion of them a few articles must be devoted to the details of the work of the cost department.

Benefits of Vocational Training

BY W. ROLAND NEEDHAM

THAT which stimulates and fosters legitimate interest in one's vocation is worthy of all encouragement. They do the best work, and on the whole the work that pays best, who are keenly interested in what they do. The boy who is to turn out really good work will do far less than his best unless he knows something of the wherefore, the why, and the whence, as well as the how of it all.

The temptation peculiar to those who deal with machine tools and processes is that the machinist be content to be merely a machine attendant or operator. Almost unconsciously he may become well nigh as automatic and mechanical as the tool he uses—in fact he may be just part and parcel of the machinery itself. Where this is so the quality of his work undoubtedly suffers, and he becomes a lesser man than he might be. Even if his hand almost identify itself with the tool he employs, his mind should at all times be the directing agency.

Where a lad is deliberately, and of set purpose, urged to inquire what it is he does and why he does it, how his bit dovetails into other bits, how all the bits work together, and what the whole of it is for, that boy has one of the biggest assets life can give him. Sooner or later he will himself discover things of value, and always there will be the reward and the lure of the paths which open to right and left of such a course. What the open road is to the lover of nature so will his career be to him.

Much depends upon the nature of the instruction offered. The machine shop foreman, however sympathetic he may be and however able an instructor, has neither time nor opportunity to tutor effectively the apprentices entrusted to his charge. These lads must do the work assigned to them, and must for the most part pick things up each as seems to him best and according as his peculiar bent dictates.

THE COMPETENT INSTRUCTOR

In the vocational school, however, everything is different. There the teacher is usually a practical man. He knows the inwardness of things from his own first-hand experience, and he also accumulates that knowledge of the needs of the boys themselves which stands them in such good stead. The personal touch and the intimate grip of matters, which he has the time and opportunity to give, mean very much indeed to those in his charge. The right teacher can make the right pupil.

The curriculum should aim at legitimate wedlock between practice and theory, and the issue will be strong, virile, and full of promise. The aim too should be not only to present detailed instruction in the departmental sense, there should also be some attempt to provide that larger outlook which shall enable a boy to envisage parts in their intimate inter-relations and as related to the whole. Those who can be led to realize how processes dovetail into each other, and how all minister to the completed product, will be well equipped as they enter upon their engineering career.

So long as those responsible do not swing to the opposite extreme, and starve theory in order to develop adequately the practical side, nothing but good should result from the labors of the vocational school. There, as elsewhere, scope should be found for the lad whose bent induces him to probe deeply into the foundations of things. He will find out in any case. So much the better, however, for everybody, if such as he be given a sympathetic lead and offered a helping hand. These lads become the men who discover things and make things move.

In conclusion, all whose training is academic and theoretical, rather than practical, also stand greatly in need of just such instruction in craftsmanship as the vocational school offers. Many strange perversions would never see the light of day if those concerned were in possession of the merest rudiments of practical knowledge. It is only they who have this elementary grasp of material things who can hope to steer clear of certain pitfalls in design, as distinguished from execution.

NEED FOR PRACTICAL TRAINING

Often it is the workshop end which has to save the face of the technical issuing staff by suitable modifications here and there. This should not be, and need not be. It will not be, if the vendors in ideas will take the trouble to come to earth and material requirements. They need not seek to emulate the craftsman in skill of manipulation, but they most certainly should know enough of processes to appreciate inherent difficulties and meet certain requirements, none the less real because in a way subsidiary or incidental. They need something which the vocational school provides in practicable form.

Belt Drive Betterments

By L. M. Francis

IN OPERATING belt-driven machinery of any kind, it is important that the belts used deliver sufficient power to get the maximum result possible with the equipment in use. If this is not the case, a continual waste of time is occasioned, which may grow to large proportions and represent a considerable amount of money, as time goes on.

With what may be termed the more ordinary types of machines such as lathes, planers, drills, etc., it is quite often the case that the matter of how much power is being delivered to the cutting point is given too little attention. If a machine will not pull the desired cut a lower speed or feed is used, and while, to all appearances, good results are being obtained, the production is not as high as might be.

In the maintenance of belting it is of primary importance that, in each location, the proper kind and quality be used. The operating force usually knows what belts will give the best results. In many cases, over a period of years, they have been supplied with many brands which have been run on various machines, thus giving good opportunity for observation on this point. Once the proper belt is determined, that kind should be used. I do not mean by this that new kinds should not be tried out to find a better kind if possible, but this trying-out process should be localized, and a new type should not be generally applied till it has proved itself better.

Purchase Price Considerations

In this connection it is probable that the purchasing department is often at fault in assuming that a belt is a belt in any case, and in buying on consideration of price, or otherwise, without regard to specifications furnished by the shop. Then again, such specifications may not be furnished, leaving the matter open.

It is usually poor economy to buy belting on price considerations alone, for any saving effected may be lost many times over in lessened production and rapid depreciation. If, however, low price goes with necessary quality, it is a desirable combination. I do not maintain that the highest priced belt is always the best. The important thing is to get the one that gives results, and the primary result is the delivery of satisfactory power.

Another bad condition, for which the responsibility may lie either with the shop for doing it, or with the management for not buying in sufficient quantity, is the use of belts after they have outlived their usefulness. Old belts do not necessarily have to be thrown away. They can often be cleaned, split, trimmed, re-glued, or otherwise worked over, so as to be satisfactory in locations, other than where applied when new. It is certain, however, that belts full of oil, ragged at the edge, loose in the joints and, in fact, worked till their life is gone, will not deliver the power they did when in good condition.

As an example of this, I recall a modern, heavy duty lathe used on fairly large work, which should have had an abundance of power, but was found to be incapable of beginning to pull the kind of a cut it should. On investigation, it was found that this was due mostly to the fact that the line shaft belt was slipping. This was an old belt which should not have been in use and the substitution of a new one remedied the difficulty.

Belt power depends not only on size and condition, but also on running speed. On one large lathe I have in mind, even a reasonably heavy cut caused the line shaft belt to slip. A larger pulley was placed on the line shaft to increase belt speed at that point, and the difficulty was reduced, with consequent increase in production rate. With lathes, if it is desirable to keep the countershaft turning at the same speed, both line and countershaft pulleys can be increased in diameter to get greater belt speed between them.

Sometimes additional cutting speed, as well as power, is desirable, and higher cutting speed will generally be used if the power is available. We had in one plant a large planer and while it was in good condition, the operating speed was very slow. For this machine we made new pulleys and necessary alterations to replace the 3-in. single with 4½-in. double belts, and increased the operating speed about 50 per cent. It worked exceptionally well after these changes, and sometimes on work running into tons in weight.

In speeding up planers it is perhaps more necessary to consider, than with other types, what the result will be. This is due to the fact that the heavy weight of table and work combined must be reversed in direction at the end of each stroke and, if this weight is traveling too fast when reversed, the belts will slip, or the driving gear may be broken. Due to this fact, it may be found feasible to speed up the cutting stroke only, as was the case with a fairly large machine, where the cutting speed was raised from approximately 16 to 22 ft. per min., with no change in reverse. Even with a change of this kind, the net gain in production is considerable, especially if the machine is working on long cuts.

Another means of obtaining increased driving power is, of course, by the use of double belts in place of single, with no changes in widths or size of pulleys.

The above remarks are from the writer's experience of what can be done in the way of increasing productive ability by means of more efficient power application. What can be accomplished in specific cases can only be determined by giving the matter some consideration and trial. With the possible improvements and saving in time in mind, it would seem worth while to deem such procedure of some importance, and worthy of study and attention. On top of direct gains, it is certain that a feeling of more satisfaction will be aroused with the operators, if their belts are pulling when they want them to.

This is not in any way an argument for the use of old machine tools in place of modern ones, but is offered in the way of suggesting improvements that may be possible in cases where the machinery is there and must be used.

The Passing of Cast Gearing

A little evidence of the great change in gearing practice is noticeable in the recent announcement of a new book on patternmaking. The striking part is that no mention is made of patterns for gearing. A few years ago no book would have been complete without a substantial section devoted to the making of gear wheel patterns, both spur and bevel. In fact many of the older books on patternmaking would have been slim affairs without it. But cast gearing is fast becoming ancient history and patternmakers now have other problems which demand equal attention.

Skoda and the Revolution of Pilsen

BY HENRY OBERMEYER AND ARTHUR L. GREENE

The cause for the change in products produced—Activity in railroad and locomotive equipment—Skoda's resources —Conditions regarding labor, coal and raw material

THE TWO contrasting pictures herewith show more clearly than any words the revolutionary transformation undergone by the biggest machine and ammunition factory in old Austria, the Skoda works, now in the new nation of Czecho-Slovakia. Where, before and during the war, the greatest shops of the company were bristling with long range guns, dreadnought turrets and other implements of war as shown in Fig. 1, today one sees only the construction and assembling of locomotives, such as illustrated in Fig. 2, newspaper presses, milk separators and similarly peaceful and productive work in hand. It has been a change more radical and more extensive, in all probability, than that of any other factory of comparable size in Europe, not even excepting those of France, northern Italy and Belgium which were destroyed physically by the forces of war.



FIG. 1—TYPE OF WORK IN THE SKODA WORKS DURING THE WAR

The change has been not merely one of form but one of kind. Barring the production of steel forgings on which the foreign reputation of the works is largely based, and excepting a certain amount of war materials still manufactured as a matter of routine for the not inconsiderable standing army of the country and, as a matter of politics, for the Kingdom of the Serbs, Croates and Slovenes, the Skoda Works have, since the war, diversified their output and extended their range of activity to such a degree that it can be truthfully said, the old factory has disappeared to make room for a new. The result is that while other factories of Czecho-Slovakia are almost daily adding to the growing problem of unemployment with which the nation is contending, Skoda has found it possible to employ nearly twice as many workers as it had before the war.

From the standpoint of economics this fact in itself is a remarkable feat. Before the Treaty of Versailles ripped its most productive territory from the side of Austria to make a buffer state between the two great German speaking nations of Central Europe, the Skoda Werke of Pilsen occupied a position in the dual monarchy not dissimilar to that of Krupp's in Germany. When the war came the Skoda plants were rapidly enlarged and together bore the burden of supplying the Austrian armies with the bulk of their artillery. When the war ended it seemed as if the world demand for war materials would cease for good and all, and that factories like Skoda would be forced to close up shop in part at least or cast about for ways and means of adapting themselves to the changed conditions of the market.

This was not the worst, however. Austria-Hungary was a great territory sheltering a large population of variegated peoples with variegated needs and admirably placed in the valley of the Danube River for direct and easy transport to almost every part of the domain. The great mass of the people were farmers or tradesmen catering to farmers. This state of affairs meant a great consuming capacity for all products, not the least of them machinery. It also meant, unfortunately, that the industrial resources and manufacturing centers of the country were bunched together almost entirely in what has since become Czecho-Slovakia; that is, in Bohemia, Moravia and Silesia.

Before the disintegration of the empire took place, the comparatively small section produced for a population of approximately 50,000,000 persons distributed over an area of 600,000 sq.km. The territory was a small world market in itself and under the impetus the

industries grew and flourished rapidly. The land in the industrial region was rich in coal and iron and other natural resources which made it almost self-sustaining from the manufacturer's point of view. Then, suddenly, just as the factories had reached the peak of their productiveness, their markets were cut down by the incision of a boundary line to approximately a quarter of their former size; in short to a population of about 14,000,000 in an area of 142,000 square kilometers.

Therefore, only 25 per cent of what was formerly Austria-Hungary is expected to sustain nearly 80 per cent of that nation's former industry. Czecho-Slovakia thus presents the spectacle of a country acutely suffering from ar embarrassment of riches. Supporting a population given over chiefly to manufacturing, she finds that, where she had free intercourse before, the barriers of trade rivalry are raised against her. Like an inefficient workshop she has installed an engine generating four times as much power as she can ever use.



FIG. 2—LOCOMOTIVE ASSEMBLING AT SKODA WORKS

Only two lines of procedure are practicable. Either she must reduce her productive power radically, which means untold suffering and the complete disappearance of many of her largest factories, or she must find within a reasonable time new fields in which to export her products where prohibitive customs duties and low priced competition will not militate against her.

One of the engineers of the Skoda Works estimates that Czecho-Slovakia to exist industrially must export at least 60 per cent of all her manufactures. If this condition is so, then anyone who is in the least acquainted with the export market of today can realize the situation which Czecho-Slovakia is facing.

The Skoda Works, as has been intimated, are an exception, temporarily at least, to the general rule; and, although the abnormal activity of a part, with depression in the other branches, does not augur well for the condition of the whole, yet the particular methods and policies by which Skoda has escaped the economic consequences of the peace make an interesting and significant study in themselves.

Four tendencies are to be particularly noted in the growth of European machine industries since the war. They may be classified as: standardization, specialization, conservation and variation. The last is the solution which the Skoda Works have applied to their problem and which, in the long run, must be adopted by all the large machine manufacturers of Czecho-Slovakia. It is a solution which of necessity applies to any industry working for a restricted market.

In following out this policy the Skoda Works have deliberately scorned the entire field of machine manufacturing in the country. They have bought patents from machine factories both in and out of Czecho-Slovakia, have experimented along new lines of manufacture, and have gone afield to study the demands of other countries. Just how the extension has taken place may best be illustrated by the following figures:

The total yearly productive capacity of the Skoda Works, according to the last estimate made a year ago, is 316,000 tons. This tonnage is distributed roughly as: cast steel, 20,000; electro-steel, 4,000; ingots and blooms, 100,000; cast iron, 10,000; brass, 1,000; aluminum, 500; large forgings, 25,000; small forgings, 15,000; pairs of wheels and axles, 22,000; gearings, 5,000; locomotive works, 25,200; motor car works, 1,600; heavy ordnance and ammunition works, 15,000; general machinery and boiler shops, 71,700. To this, however, must be added many new items under the head of miscellaneous which, at the time the estimate was made, were still under consideration or experiment. Thus, the production of dynamos and electric motors was begun but recently after long deliberation, and the first of them have not yet been finished at this writing.

The company began the manufacture of agrieultural machinery, for which it was thought there would be a big market following the unproductive and destructive years of the late war, by buying from the Prager Works of Prague their patent on an 80-hp. heavy motor plow. Tractors and smaller plows, it was believed, would be demanded to fill the places of thousands of horses which had been sacrificed to battle, wherefore they, together with cream separators, were added to the agricultural program. The war led to unusual depression in most of the factories of the warring countries, so that an increased demand for steam and gas engines and stationary boilers of all kinds was a foregone conclusion. The Prague Iron Works and the Alpina Montan Geselschaft have been among the best customers in this field. Much the same conditions existed in the mines, which had been not only worked too hard in the haste to turn out sufficient war materials for the army, but the machinery of which had also been allowed to deteriorate. At the same time, mining on a wider scale became a matter of vital necessity for such countries as Austria and Germany from whom large slices of their richest territory had been taken by the peace, and conveyors and ore



FIG. 3—FORGE SHOP AT THE SKODA WORKS

separators were therefore added to the list. Finally, although shipbuilding throughout the world had received a set-back during the past two years, there was a pronounced boom in shipping for at least that length of time immediately following the war, and the Skoda Works still send steam turbines and marine engines to Italy.

Locomotive and Railroad Equipment

Interesting as they are, none of these new branches have been quite as important as the extension made in the direction of locomotives and railroad equipment. Although this represents an old department in the Skoda Works, it is also one which has experienced a new growth since the war.

To meet the new demand the Skoda Works transformed their entire factory in less than a year and a half after the war. The conditions of construction work were comparatively simple. No new types of locomotives were demanded, since the Czecho-Slovak Government, pending the development of electrically run railroads, preferred locomotives of a type which would afford easy interchangeability of parts with old engines which had been left to them under the treaty. Prac-



FIG. 4—SECTION OF STEEL FOUNDRY AT SKODA

tically the only new type, in fact, which has been built by the Skoda Works since the war is an 83-ton locomotive with a 2-10-0 wheelbase. The standard type of passenger locomotive in use by the Czecho-Slovakian State Railways is a twin cylinder tank locomotive with a 4-6-0 wheelbase.

Most of the work undertaken for the Balkan railways is repair. Recently, however, Skoda secured an order from the Roumanian Government for 100 freight locomotives with a 2-8-0 wheelbase. In most respects these locomotives are similar to the type of standard freight locomotive in use on the Czecho-Slovak railways, the principle points of difference being that; the latter has a diamond stack designed for firing by brown coal and equipped with a star shaped spark arrester, while the former has a taper chimney; in the latter the netting inside the smoke box is flat and semi-cylindrical, while in the Roumanian the smoke box is provided with a bucket netting; the Czecho-Slovak type has a Hardy brake with 1-in. tubes acting only on the locomotive and the tender, with brake valves, while the other is equipped with an automatic continuous Westinghouse brake; and, finally, while the latter is fired only by coal, the former may be fired both by coal and naphtha according to the Cosmovici system. There are other minor differences not connected with the actual operation of the train.

Naphtha for Locomotive Firing

An important feature of the Roumanian type, as noted above, is that the locomotive is built for firing by naphtha as well as coal. For naphtha firing a special opening is provided underneath the fire door, to which a naphtha dispenser (Cosmovici system) is fixed. A Cosmovici heating system is placed on the left side of the boiler. The locomotive is coupled with a tender rolling on three axles and capable of carrying 15.8 cu.m. (4174 gal.) of water, 6.3 cu.m. (9½ tons) of coal, and 4.5 cu.m. (1190 gal.) of naphtha.

But to return to the subject. There is the danger that the rapid extension of the Skoda Works in all its branches may be taken a bit too easily for granted. As a matter of fact, it should be obvious that no machine factory can suddenly divert its productive energy into widely varied channels unless there is at the bottom of that effort not merely an elaborate and well defined program, but the necessary resources of labor, experience, machines and raw materials to make it possible. This is all the more true in the case of a concern the size of Skoda.

For the most part Skoda was possessed of those resources, and those it did not have it went about acquiring in the shortest possible order. The foundation of Skoda's strength was and is today in its forge, a section of which is shown in Fig. 3, and in its foundry. It was one of the first plants in Europe to begin the making of crucible steel, which it took from Krupp's and developed to a point above the majority of its continental rivals. It was the largest forge and factory of Austria before the war, and has the largest foundry, partly shown in Fig. 4, in Czecho-Slovakia today. Its three electric furnaces of a 4 to 6-ton capacity apiece, one of which is shown in the illustration, Fig. 5, are able to turn out steel surpassing in strength that of any other factory in the country if not in the entire eastern part of Europe with the possible exception of the highly specialized Böhler works in Austria. By a secret process it has developed the manufacture of a manganese steel, especially for rails, cement mills and crushing



FIG. 6—PIPE BENDS FOR TURBINES AT NIAGARA FALLS

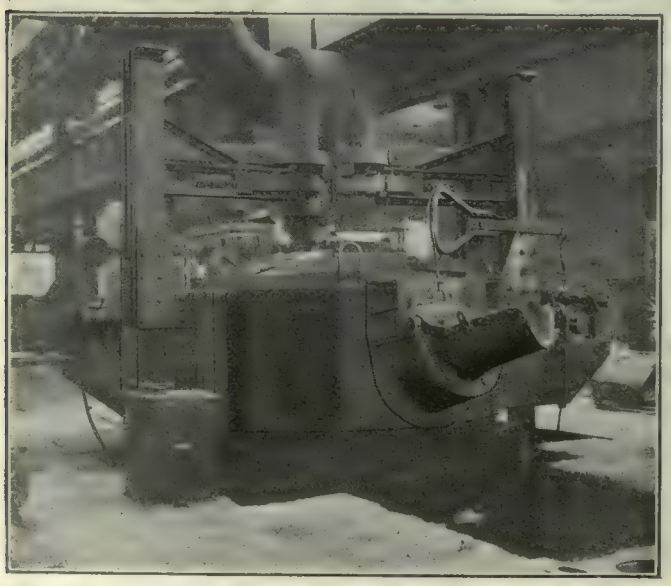


FIG. 5—ONE OF SKODA'S ELECTRIC FURNACES

machines, which possesses resistant qualities making it impossible to handle the steel by any other method than that of grinding. A Harmet press with the enormous pressure of 10,000,000 kg. is used for pressing liquid steel. Then and now the greatest part of the Skoda castings is sent to other countries and to other factories. It is not generally known, but the pipe bends installed in the giant turbines at Niagara Falls were turned out in the Skoda factory just before the war. The size of the pipe bends can be judged by glancing at Fig. 6. The foundry, in fact, is capable of making castings to almost any size and intricacy. Probably the largest ever made there was the flywheel of a gas engine illustrated in Fig. 7, the single casting of which weighed fully 100,000 kilograms.

With this equipment it is no miracle, therefore, that Skoda has been able to combine a large and variegated section of the machine industry of Czecho-Slovakia within its scope of operation. Scarcely less important than the forge and foundry, however, both of which together virtually comprise the factory as it stood be-



FIG. 7—A 100,000 KG. GAS-ENGINE FLYWHEEL

fore the war, is the recent acquisition of the Skoda Works of what was formerly known as the United Engineering Works, Ltd., consisting of the factories of Ruston, Bromovsky and Ringhoffer. The factories, which are engaged in the manufacture of finished machinery, always worked in close conjunction with the Skoda Works under a kind of mutual agreement whereby Skoda received much of its machinery practically at cost in return for supplying the United Engineering Works with forgings, castings and semi-finished parts at basic prices. The combination, therefore, is merely to consolidate under one head the two essential parts of what had long ago become in fact a single industry. Its importance for the Skoda Works lies in the fact that to this extent it has now become a self-sustaining entity. It is fair to assume that without these essential facilities such as Fig. 8 shows to be at hand in the machine shops, the Skoda Works could never have branched out alone to include the various undertakings in which it finds itself today, and thus would have been compelled to reduce its working force instead of adding to it as it has.

Size of Working Force

The increase in the working force of the Skoda Works, it should be added, is only as compared with pre-war times. Compared with the war, when every available man and machine was working at the maximum, or even compared with two or three years ago before the post-war boom had entirely lost its impetus, the number of workmen employed in all the shops is found to have been materially reduced. On the other hand, the year immediately following the war, during which the greater part of demobilization and repatriation took place, saw only a reduction of from 40,000 to 22,000, while the further reduction since that time, affecting only Czecho-Slovak working men, brought the total number down to 17,000. Even this, however, represents an increase of approximately 7,000 over 1914, and to that extent indicates the spread of Skoda's enterprise.

Wages, which reached their highest point in May, 1922, have been reduced about 30 per cent within the past twelve months, the average workman now receiving 5 crowns an hour for his labor. In contrast with the day scale still in vogue in many German factories, it is interesting to see that 70 per cent of the workers in the Skoda plants receive their pay by piecework, the remainder being only helpers and apprentices. This condition exists too in spite of the fact that Czecho-Slovakia is supposed to be a socialistic republic and that the trade unions are more strongly organized here than in almost any other part of Europe.

Industrial and Labor Associations

For the most part the organization of the workers is welcomed by the employers, who also have their own association, the Czecho-Slovak Federation of Industries. It has become easier to deal with the demands of labor in the mass and it is said to be possible in this way to compel the unions to acknowledge some sort of responsibility to the State and to the public. In the event of industrial disputes the Minister for Social Welfare is frequently called in as a conciliator, but he has no powers to enforce his rulings and neither has the Board of Arbitration set up by the Government. However, when factories are reducing their production, labor is not so apt to cause trouble as in times of general prosperity. Consequently the system is still to come to trial. Skoda, fortunately, has been singularly free from such disturbances.

Even more fortunately, it has been free from the shortage of coal and other raw materials from which Germany, Austria and Hungary especially are suffering. Only coke coal has been somewhat hard to get; but, since this is the only product of which Germany has no lack, the latter country has been glad to exchange her surplus for the bituminous coal of Czecho-Slovakia of which, especially since the occupation of the Ruhr, she has been in such desperate need. Iron ore is plentiful in Czecho-Slovakia, but its general quality, because of the high per cent of silica it contains, makes it difficult to convert into the durable, high grade steel which is the Skoda standard. The maximum amount of silica which can be permitted in iron ore for steel manufacture is 6 per cent, whereas the average in that mined in Czecho-Slovakia often reaches as high as 15 per cent. As a result, Styrian or Swedish ore is generally mixed with the native iron to obtain the proper quality.

At the same time, the presence of natural resources on a large scale has not kept the Skoda Works from developing a more efficient use of fuel, and in the matter of electrification especially it is far ahead of most of the industrial centers of the country. Fully half the current of the Pilsen plant is obtained directly from a mine owned by the company not more than 7 miles outside of town in Nyrany, where there is also a small plant. Other mines in less accessible territory are also owned by Skoda, and it is the declared intention of the engineers to link these up as well in time so that all the shops of the company will be run by power transported over wires instead of by railroad freight.

Future Development

What will probably happen if conditions are ever restored to anything like normal in Europe is that Skoda will be discovered to have grown from the most important machine factory of Austria and Czecho-Slovakia into one of the four or five most important in the world. Not merely the nucleus but the foundation and the framework are already there. This is a fact of which business circles do not yet seem quite aware, as may be seen by the following translation of a comment by the

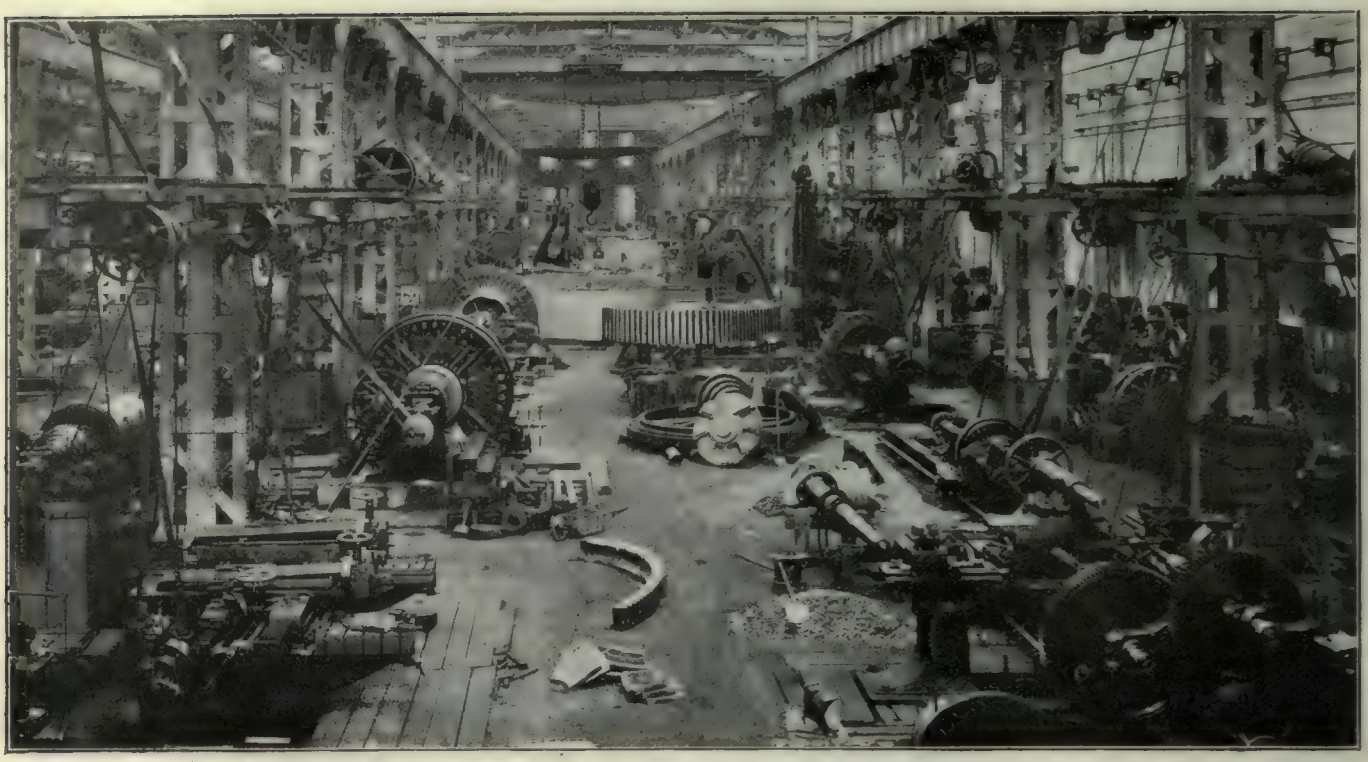


FIG. 8—MACHINE SHOP AT SKODA WORKS

financial expert of the *Wiener Journal* of Vienna—certainly not apt to exaggerate the prosperity of its lost province—which appeared in the issue for Feb. 13 last.

"For some time past the stock of the Skoda Works and Poldihütte has been widely advertised and boosted in financial circles, with due regard for the present money shortage, but without success. For a better understanding of the matter, it should be pointed out that both companies are undoubtedly bound to profit as a result of the existing tension in Europe and in Asia, chiefly because of the fact that, regardless of whether a general European conflagration occurs again or not, they are receiving sufficient important orders now to tide them over the period of industrial depression. According to a recent dispatch of the *Russpress*, which is characteristic of similar reports: 'The Skoda Works in Pilsen today are receiving orders continuously in such great numbers that it will be entirely unnecessary for them to reduce in any degree the present number of their workers.'"

There are not many factories outside of Germany of which the same thing could be written.

The Use of Machinery Export Statistics

By W. H. Rastall

Chief of the Industrial Machinery Division, Department of Commerce

If a machinery manufacturer could be provided with accurate statistics showing the destinations to which American machinery of the types he produces has been shipped, this information would undoubtedly be a very great help in making plans for foreign sales. For many years the Government has been conscientiously striving to so collect and distribute this information that it would be dependable, explicit, and timely, but the published figures have often been severely criticized.

In an effort to remedy defects in the returns, a change was made in the method of handling these statistics on Jan. 1, 1922, and for the first time figures were collected showing not only the value of the exports to each destination, but also the quantity. Instead of merely reporting that so many dollars' worth of lathes were shipped, say, to Japan during a given interval, an effort was made to show also the number of lathes included in this value.

This new practice soon developed the fact that these export returns were in some cases palpably inaccurate. For example, a centering lathe chuck was reported by its shipper at a value of $3,800, and Diesel engines at a value of $60, both of which are hard to picture to the imagination. Such engines are not usually so cheap nor are lathe chucks so expensive. Hundreds of similar examples could be cited.

Special investigations made to ascertain how figures such as these creep into the official statistics have shown that, in this particular, the Government is absolutely in the hands of the exporters, since these statistics are compiled from the export declaration accompanying each outbound shipment. At any important custom house these declarations are received in such large numbers as to make it impracticable for the customs authorities to verify the accuracy of each item. If the export declaration is inaccurate the Government figures based thereon will necessarily be inaccurate also.

One way in which inaccuracies can creep into these export declarations is through the practice of certain manufacturers of delegating the preparation of the declaration to freight forwarders, export merchants, or others, who turn the task over to a subordinate clerk having no accurate information regarding the commodity involved.

Excerpts from Trade Information Bulletin No. 139.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Overhanging Gear Drives

By J. T. Towlson
London, England

The overhanging gear drive shown in Fig. 1 is a regular part of a machine well known upon the English market.

I do not like this drive for the reason that both

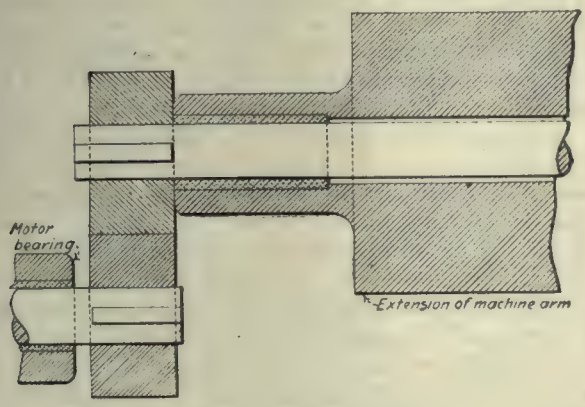


FIG. 1—THE ORIGINAL DRIVE

driving and driven shafts are unsupported at the outer end, thus imposing greater pressure upon the bearings and increased bending strains upon the respective shafts. This condition tends to wear out the bearings

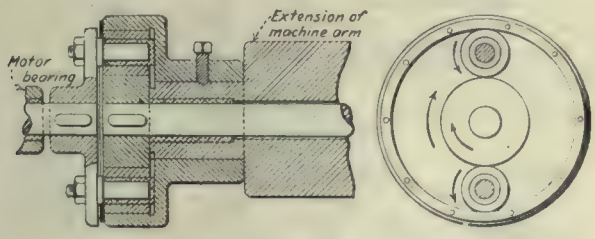


FIG. 2—THE PLANETARY ARRANGEMENT

quickly and is also likely to cause distortion of the shafts, with consequent gear noise and loss of power.

In Fig. 2 I have shown, diagrammatically, a planetary gear arrangement that I have substituted for the first mentioned drive. In this form the driving and driven shafts are brought into the same line and the bending strains are balanced by introducing intermediate pinions on opposite sides of the driving and driven gears. Though the drawing shows but two pinions, three would be better; spacing them 120 deg. apart.

Two objections may be raised to this form of drive; one being that it is expensive to make and the other that it interferes with the speed ratio between driving and driven shafts. I believe that the extra cost of this construction is more than offset by the saving in maintenance, while the second objection can easily be overcome by a proper calculation of the relative gear sizes.

Another method shown in Fig. 3 is, perhaps, less expensive than the planetary arrangement and is a very satisfactory solution. It does not balance the

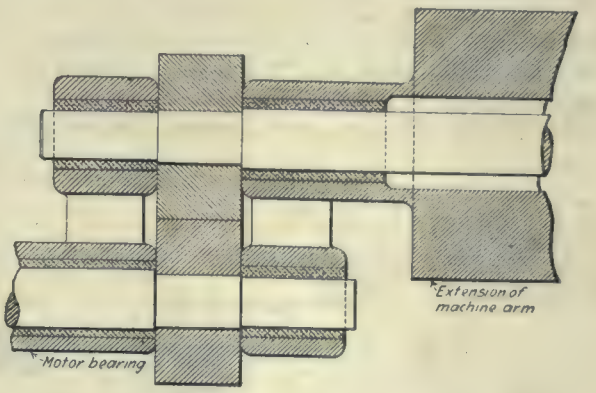


FIG. 3—ANOTHER METHOD

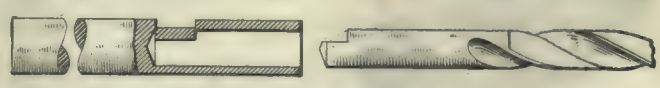
stresses but it provides ample and proper means of sustaining them, thus reducing the wear upon the bearings and the likelihood of bending the shafts.

I would like the opinion of other engineers as to the relative merits of the various constructions.

Extension Shanks for Small Drills

By J. F. Cavanagh

Small drills with extra long shanks are often very convenient but are not always available. It is an easy matter, however, to provide an extension for a small drill in the following manner. Take, for example, a $\frac{1}{8}$-in. drill. Cut a piece of $\frac{3}{16}$-in. drill rod of the required length for a shank extension and drill a $\frac{1}{4}$-in. hole about $\frac{1}{2}$ in. deep, centrally in one end. Make a fine saw-cut not quite half way through the rod at the bottom of the hole and another $\frac{1}{8}$ in. nearer the end. Grind a flat portion about $\frac{3}{32}$ in. long on the end of the drill shank. Insert the drill in the extension and with a drift or center punch, force in the portion of the shank extension between the saw-cuts so it will engage the flat portion



EXTENSION SHANK FOR SMALL DRILL

of the drill. The sketch shows the extension with drill removed. Such extensions are quickly made and are serviceable. Flatting the drill shank, as shown, does not impair the usefulness of the drill. It will be seen that modifications of the above dimensions should be made for other sizes.

Milling Hexagon Shapes

By Francis M. Weston, Jr.

When a large number of pieces require to be side-milled as in the milling of the hex on the gas-engine valve guides shown herewith, the cost of production can be more than cut in half by milling seven pieces at once by the use of the simple fixture illustrated in the accompanying drawings. This method is particularly applicable in small shops where special machinery for quantity production of such work is not available.

This fixture consists of a cylindrical block threaded to suit the dividing head of a milling machine and bored to take the seven pieces—one in the center and the other six grouped around it on the points of a regular hexagon—see Fig. 1. Four side-milling cutters are set up on the arbor of the machine and travel in the paths *A*, *B*, *C* and *D*. Three runs of these cutters clear across the work, which is indexed 60 deg. for each cut, completes all seven pieces.

For laying out the large hexagon for locating the

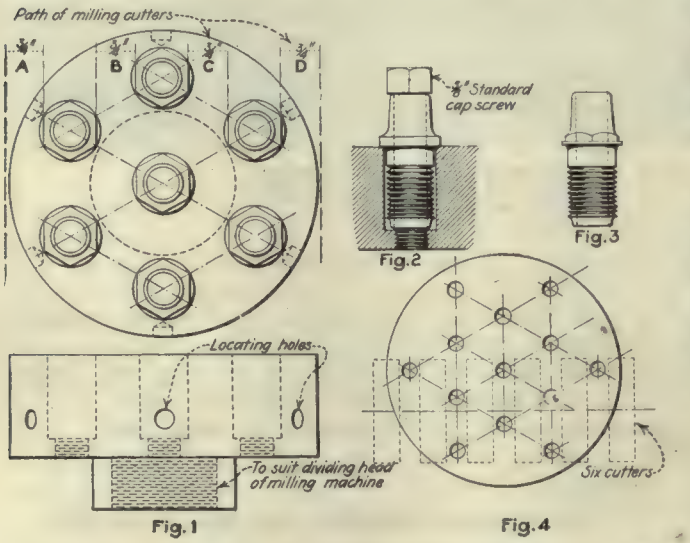


FIG. 1—FIXTURE FOR MILLING HEXAGONS ON SIX PIECES. FIG. 2—METHOD OF HOLDING PIECE TO BE MILLED. FIG. 3—PIECE WITH HEXAGON MILLED FIG. 4—FIXTURE FOR MILLING HEXAGONS ON THIRTEEN PIECES.

seven pieces it will be noted that the radius of the inscribed circle of the hexagon formed by lines passing through the center of the outer row of pieces, is the sum of the width of one of the cutters selected plus the width across flats of the hexagon of one of the pieces to be milled.

When the pieces to be milled have a central hole, as in the case of the valve guides, they can be secured to the fixture as is shown in Fig. 2, where a guide ready to be milled is shown secured by an ordinary capscrew. Fig. 3 shows the finished guide. For other kinds of work, suitable methods of securing must be devised.

The saving in cost of operation by this device over milling one piece at a time is more than 50 per cent. The cost of milling the hexagon on valve guides was reduced from about five cents to a little more than two cents each, in lots of one hundred or more. This latter figure covers time consumed in setting up the cutters and the setting up and taking down of the pieces to be milled. The saving on the first two hundred pieces paid for the making of the fixture, and all later work resulted in a real economy in the shop expense. A slight further saving could have been affected by selecting thinner cutters for the work, as the pieces could then have been grouped closer together and the proportion of waste travel to working travel of the cutters would have been reduced.

Shapes other than hex can also be milled in groups with an appreciable saving of time by arranging them in some similar suitable form.

When the number of milling cutters of the same size on hand is sufficient, and the arbor of the milling machine is long enough to accommodate six of them, a further saving of time can be effected by arranging the fixture and cutters as indicated in Fig. 4 for milling thirteen pieces at once.

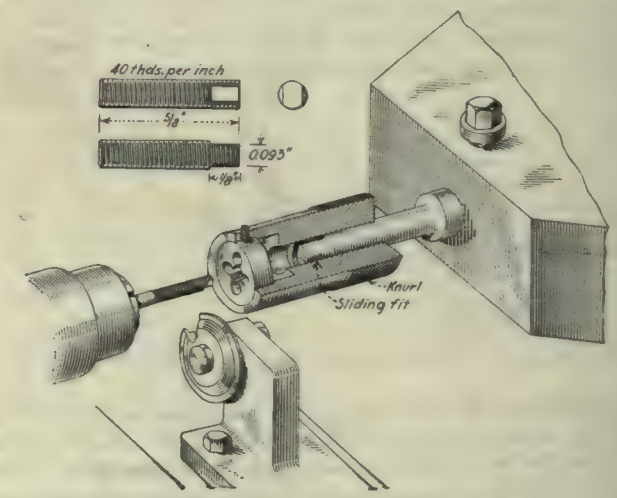
Combined Threading and Broaching Tool

By J. P. Housley

A small setscrew, threaded over the whole length and flatted on two sides for a short distance at one end to take a special socket wrench, was costing altogether too much to manufacture, for the reason that the flats were milled after the threading was done and the threading die had again to be run over the screw to remove the burrs thrown up by the milling cutters. We eliminated these two operations by means of the combined tool shown in the sketch.

A broach, to cut the metal away at the end of the screw to form the flats, was made with a shank to fit the hole in the turret of the screw machine upon which the screws were made. A holder to take the round adjustable threading die was made to fit freely over the body of the broaching tool, and the outside knurled to enable the operator to get a good grip upon it with his hand.

In operation, the turret would be moved forward



A BROACHING AND THREADING TOOL

until the die was nearly in contact with the wire as the latter was held in the collet. The operator would then move the die-holder forward (over the body of the broach) and run up the thread on the wire to the required distance. Stopping the machine, he would then move the turret up against a fixed stop, thus broaching the flats on the end of the threaded wire.

Now moving the turret back to clear the broach from the wire, the machine would be reversed and the die run off the thread, removing the burrs left by the broach in its passage. The cut-off tool then severed the piece from the wire and completed the screw, ready for inspection, in one operation.

Reading the *American Machinist*

By E. V. Allen

There are numerous schemes in use in order to make it possible for several shop men to read a single copy of the *American Machinist*. One of the best I ran across a few days ago, and the form slip that is pasted to each

NAME OF PUBLICATION, AMERICAN MACHINIST

Date of Publication, June 14, 1923

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The Hydraulic Press Mfg. Co., Mount Gilead, Ohio

CIRCULATING SLIP FOR THE "AMERICAN MACHINIST"

copy of the magazine as it arrives at the shop office, is reproduced herewith.

Special attention is called to the one-day limit for each man after which he passes the copy to the next man on the list. Also to the fact that the men are not to clip or tear out articles or advertisements, but instead they mark articles in which they are interested and after all on the list have read the paper, the articles are clipped and filed in the office, where they are easily accessible to anyone interested.

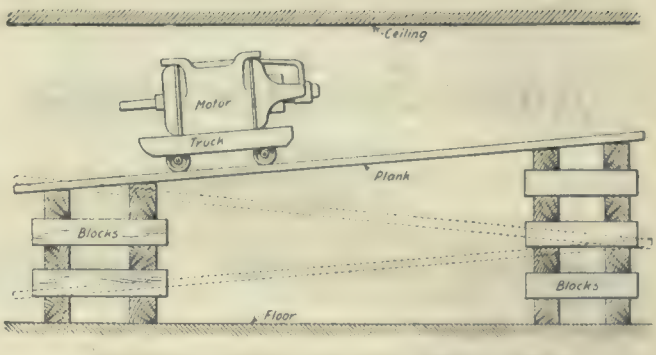
Putting a Motor on the Ceiling

By I. B. Rich

Putting a motor on the ceiling gets it out of the way, but it gives the millwright a bad job unless the shop has a portable elevator that can lift any reasonable weight and hold it while it is being fastened. A block and tackle doesn't help a bit, as it cannot get the motor up to the ceiling and hold it there unless you rig two hoists, one on each side, and lift between the two.

Here is a stunt I saw in the new shop of the Pioneer Instrument Co., in Brooklyn, N. Y. They had a small four wheel truck for moving heavy boxes and took that to carry the motor. They laid the motor on the truck with its feet up, as shown. Then they took two planks, one for each set of wheels on the truck and made them into an inclined plane by blocking up one end.

Running the truck to the high end they blocked up the other end to double the height, and ran the truck back again on the plank. Repeating this process of blocking



RAISING A MOTOR BY INCLINED PLANKS

up first one end and then the other, they rolled the motor up into place and bolted it to the ceiling without difficulty, or using hoisting apparatus of any kind.

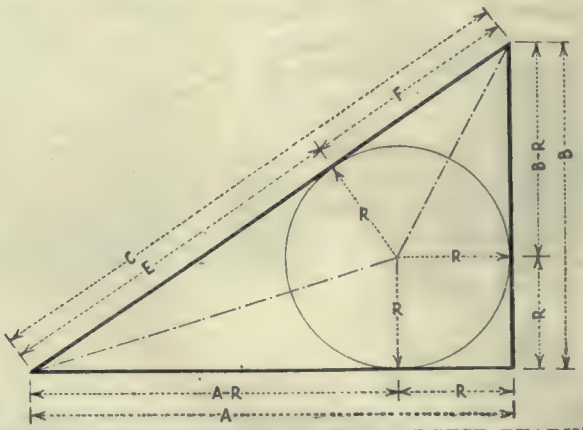
The motor was 5-hp. and too heavy to handle without special equipment or some make-shift of this kind. It was not hard to work and the only precaution necessary was to prevent the truck from rolling back down the planks or from getting out of control. But the work was done without a hitch and in good time.

Diameter of an Inscribed Circle

By Edward Heller

An interesting problem came up a short time ago in our shop. We had some triangular bars that had to be supported on round bearings, and it was desired to turn the ends so as to produce the maximum diameter. Now, while we could determine the diameter fairly closely by laying it out, it was found that no one around the engineering department could, off hand, give a theoretical formula for the diameter of the turned ends.

The writer looked through a number of geometry books in the hope of finding a proposition or problem



FINDING THE DIAMETER OF THE LARGEST BEARING THAT CAN BE TURNED ON THE BAR

that would suit this case, but it was all in vain. A solution was finally hit upon by starting from the finished job and working backwards.

Denoting the sides by the letters A, B and C and the radius of the required circle by R, we get

$E = A - R$ and $F = B - R$.

But $E + F = C$

$\therefore A - R + B - R = C$

$A + B - C = 2R =$ diameter of the bearing.

In our case the bars were such that $A = 2\frac{1}{2}$ in. and $B = 3\frac{3}{8}$ in. This gave about 4.2 in. for C, and

$$D = 2\tfrac{1}{2} + 3\tfrac{3}{8} - 4.2 = 1.675 \text{ inches.}$$

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors
October 4, 1923

Minority Rule in the Shop

THE MANAGER of a shop building twelve sizes of water pumps, six sizes of oil pumps and three sizes of some other pumps, all of them in nine different styles and with a variety of drives and attachments, looks with envy at his neighbor across the street who manufactures articles in quantities, *real* quantities. He feels, that if he could build his pumps in lots of 10,000 or more, most of his troubles would disappear and his costs would appear as if he were looking at them through the wrong end of a telescope.

The neighbor across the street looks at it in a somewhat different way. He will tell you that for every article of which he makes 10,000 there are a hundred of which he makes only one or two or a dozen.

If a method is suggested for cutting costs, he'll point to the thousand and one small quantities which are taking the joy out of his life. Such methods are all right, he says, for his neighbor across the street who makes only a few varieties of pumps, but not for a shop which makes literally thousands of articles. Therefore he continues to employ the old methods.

There are so many small orders, each with its own troubles, there are so many small quantities which require as much clerical labor and supervision as if they were large, that he loses perspective. If he only would gather some figures he might see that all the small quantities together, figured in dollars and cents, are not twenty per cent of his business. The other eighty per cent or more are of large quantities. If he does so he'll conclude that his interest lies in the eighty per cent, that these eighty per cent make the profits and deserve to be studied, that it may be wise to devise better methods for them, buy better equipment for them and that the twenty per cent should not be permitted to dominate his policy.

Assembling on Moving Belts or Chains

THE INTRODUCTION of methods whereby the machine being assembled is moving, either on a belt, a platform or a chain-drawn jack or carriage, has a psychological effect which many overlook. Originally brought into use in shops where large production was necessary, it has found its way into plants where the product is of the highest grade, and with good results.

There are many accustomed to the older methods who feel that every man on a quality job should be urged to take his time. They cannot understand how quantity and quality can go together. But we have many modern examples that this can be done. In fact many trade and vocational schools are teaching that the aim is quality first, and then faster production of that quality.

The effect of introducing the moving belt in assembling or in other operations is to unconsciously speed up the work. Even though no one says a word the constantly moving work is an incentive to more rapid motions. It is like a pacemaker in a race, or the keeping of a pile of work to be done beside the machine.

There is, however, a limit to the speed at which the moving of work will be efficient. It can frequently be increased far beyond what was originally believed possible. But let it be speeded even a little beyond the maximum speed for the average worker, at that time at least, and the output decreases noticeably. Possibly in another generation this may be the normal speed but at present there seems to be a very definite limit depending, of course, on the work and the workers.

The urge of moving assembly, however, can be applied successfully in many places, even where the quality of work desired is very high. It is being so used in some of the best plants today with good results. It is worth careful study by all production engineers.

One Reason Why Men Are Hard to Get

FROM ALL parts of the country comes the similar tale regarding the difficulty of getting good men in the shops. Employment managers who were thrown into the discard with other war time expenses as soon as labor became plentiful, are again being hired and we hear once more of the importance of personnel work.

But it will be more difficult to make this sort of talk effective than it was before. The wise employer who really believes that personnel work is important does not use his employment solely as a recruiting establishment when business is brisk.

Disturbing features of the situation are that boys no longer flock to the machine shop to learn the trade and that good mechanics are going into other lines of work. There is no use in laying this state of affairs to bolshevism or any other bogey. The answer is the same as though we asked why men who used to be law abiding citizens are now playing in the bootlegging game. There's more money in it—and the mechanic is perfectly within his legal rights.

There is no use in trying to fool ourselves as to the reason. Many other industries pay better wages and have shorter hours. When a good machinist who may get 70 cents an hour in some shops, can earn twice this as a carpenter or bricklayer, and with only a fraction of the skill formerly required, can he be blamed for changing jobs?

Of course it is easy enough to say that the carpenter or bricklayer gets too much. Perhaps he does—but as long as he gets it, what we may think about it makes no difference. Other industries compete with our own and frequently win. Unless a man or a boy has the love of the shop born in him, he can hardly be blamed for going where there is the most money. If we want to hold men we must study the problems of wages and particularly of interesting men in their work, more carefully than we have done in the past.

Now for the Machinery Bloc!

By FRED H. COLVIN
Editor, *American Machinist*

A friend of mine's a farmer,

who raises winter wheat, and though he has a bumper crop, his joy is not complete. The market's full, the price is low and all the soil he tills, don't raise enough in ready cash to pay his current bills. But he's most hopeful just the same, that things will be O.K. He is sending men to Congress who will do the things he'll say. He's got his eye fixed on a star, he's firm as any rock, on all the things he's going to do with this here farmers' *bloc*.

He says to me,

"You're foolish, Bill, that you don't do the same. You've got a lot of solid men to put into the game. Just send them down to Washington where *blocs* are growing fast and soon you'll have your troubles nailed, plumb tight against the mast.

"Now here's a tip,"

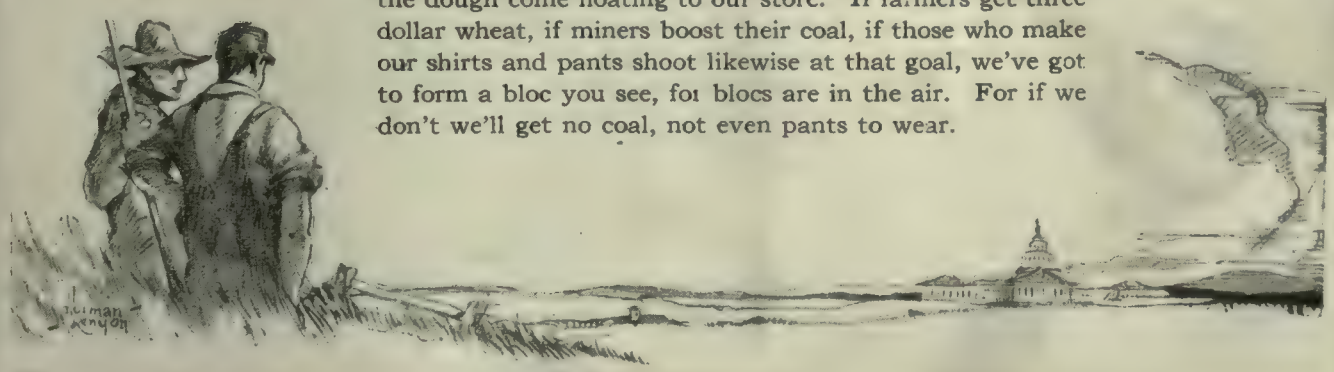
he says again, "and take it straight from me, our *bloc* will help you put it through, it's what we'd like to see. You build machines of every kind that make the things we need, like reapers, motor cars and such, that save a horse's feed. Without them, Bill, we'd work like hell, just please excuse the swear, and you can bank on our support to see you're treated square.

"So drop your anxious tone of voice,

likewise your worried mien, get busy with your special blocs to boost your own machine. Be sure you pick your fighting men, men whom no storm can rock, then you'll be safe, protected by, the *great machinery bloc*."

This farmer friend has got the dope,

why should we worry more, let's form a bloc and watch the dough come floating to our store. If farmers get three dollar wheat, if miners boost their coal, if those who make our shirts and pants shoot likewise at that goal, we've got to form a bloc you see, for blocs are in the air. For if we don't we'll get no coal, not even pants to wear.



Shop Equipment News

Henry & Wright "Viktor" Drilling Machine

The Henry & Wright Mfg. Co., Hartford, Conn., is marketing a new series of production drilling machines to be known as the "Viktor," that embodies several interesting features in design and construction.

The column of the machine shown in the accompanying illustration is in two sections. The lower part, or pedestal, contains a tank for the drilling compound and is fitted with a door through which the tank may be removed for cleaning. The suction pipe from the pump and the discharge pipe from the table to the tank are of armored flexible tubing, so that no pipe joints need be loosened or other connections disturbed in order to get the tank out.

At the upper end of the pedestal are closed pockets, cored in the casting, to hold lubricating oil. The transverse shaft, through which the power of the motor is transmitted, passes horizontally through these pockets so that the ball bearings on which it runs and the bevel gears that transmit the power to the central vertical shaft are at all times partially submerged in oil.

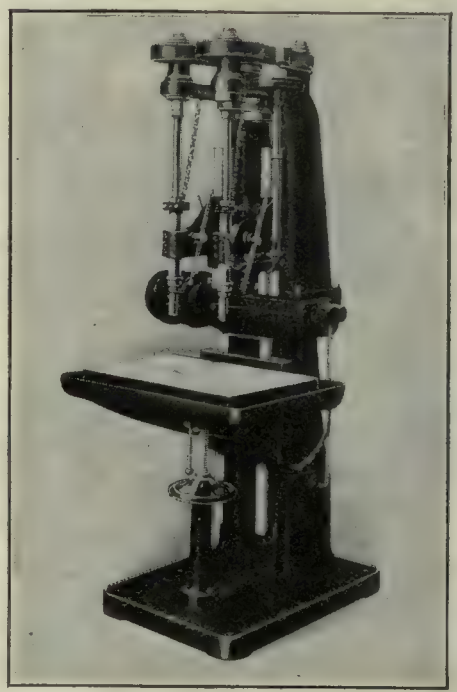
The vertical shaft passes through the upper part of the hollow column in which it is supported by ball bearings, and to its lower end is keyed the second member of the pair of driving bevel-gears. At the upper end, just above the column, a flanged pulley to receive the spindle driving belt is similarly fastened.

Upper Part of the Column

This part of the column also houses the counterweight that balances the drill spindle. To prevent the weight from coming in contact with the central shaft the latter is further enclosed for nearly its full length by a rigid tube.

When the upper part of the column is bolted to the pedestal, both the drive shaft and the vertical shaft with their attached gears and bearings are enclosed within a chamber that is practically dust proof, and that also protects them from injury.

The drill spindle is driven from the central shaft by a 2 in. belt passing over flanged pulleys. Four pairs of pulleys are provided for each spindle, and these pulleys may be interchanged in the same manner as the change gears of a lathe to provide different speeds for the spindle. A spring-suspended idler maintains a constant tension upon the driving belt without reference to the ratio of the pulleys employed, so that one endless belt serves for all pulley combinations.



"VIKTOR" DRILLING MACHINE

The table is in the form of a rugged knee, gibbed to slide vertically upon the face of the column. It is centrally supported by an elevating screw of substantial size, by means of which it may be adjusted for height. The distance from the chuck jaws to the surface of the table ranges from zero to a maximum of 27½ in., 6½ in. of which is covered by the vertical traverse of the sleeve and the remainder by the adjustment of the table.

The working surface of the table is 16 in. square in the single spindle machine, with proportionately increasing length as additional spindles are included. The center distance of the multi-spindle machines is uniformly 9 inches. The table is surrounded by a wide and deep channel to collect the used compound.

Mounting of the Motor

The 1 hp. motor is permanently bolted to the side of the column and the horizontal driving shaft is, in effect, an extension of the motor shaft. A geared pump, constructed entirely of bronze and capable of delivering 4 gal. per min. of compound, is keyed directly to the opposite end of the shaft so that no belt or gear reduction intervenes between motor and pump, and but one pair of bevel gears and the driving belt between motor and drill.

Hand or power feed may be applied independently to each spindle. Power for the latter is obtained through enclosed change gearing directly from the drill spindle. The power feed may be set to release at a predetermined point and return, or may be allowed to operate continuously.

The machine as a whole is rigid and compact, and is designed to withstand rough treatment. The floor space occupied is 22x32 in. and the machine stands 78¼ in. high. The net weight of a single spindle machine is 820 lb., and proportionately greater as the number of spindles increases. Drilling speeds available with the four pairs of pulleys ordinarily furnished range from 339 to 2,818 r.p.m. Feeds of 0.004, 0.008 and 0.012 in. per revolution may be obtained with the regular gearing, and coarser feeds up to ⅛ in. by means of special gears. The machine will drive a ¾ in. drill, and can be furnished with one, two, three, four, six or eight spindles.

The ability to maintain high-speed and continuous operation under heavy load makes the machine particularly suitable for production work. The simplicity of the machine and the attention paid to details that tend to give long life are features especially stressed.

Crescent Metal Cleaning Machines

The Crescent Washing Machine Co., New Rochelle, N. Y., has recently made some additions to the line of metal cleaning machines which it manufactures. These machines employ the same design of revolving wash units used on the other machines made by this company and pactness of the machine fits it for use in small metal cleaning departments, at the end of a line of automatic screw machines, or in other places where floor space is limited.

The washing compound tank has a capacity of 75 gallons and can be heated by steam, gas or electricity.

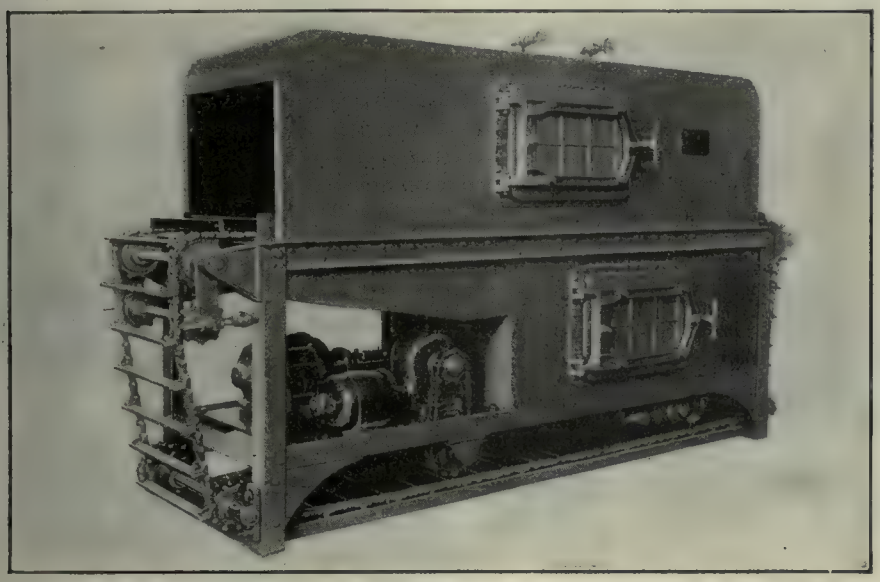


FIG. 1—CRESCENT MODEL 1A METAL CLEANING MACHINE

previously noted on page 314, Vol. 57, of the *American Machinist.*

The Model-1A machine is illustrated in Fig. 1. This is the smallest size automatic metal washing machine in this line, and it is claimed that it will do the work of four men using other methods. It will wash metal parts up to 18 in. wide by 14 in. high, such pieces being placed directly on the conveyor. Racks are used for smaller pieces. The com- A 1½-hp. motor drives the pump and a ½-hp. motor furnishes power for the conveyor, which can be run at various speeds. This machine weighs 2,250 lb. and a larger size, known as the Model-2A weighs 2,550 lb. The latter model will handle pieces up to 26 in. wide.

The rotary drum type shown in Fig. 2 employs a perforated cylinder to handle parts instead of a conveyor. The drum turns the parts over and over, exposing all surfaces to the wash which streams through the perforations from above and below. One man can handle this machine, the parts falling into a tote box or other receptacle as they come out of the drum after the cleaning operation.

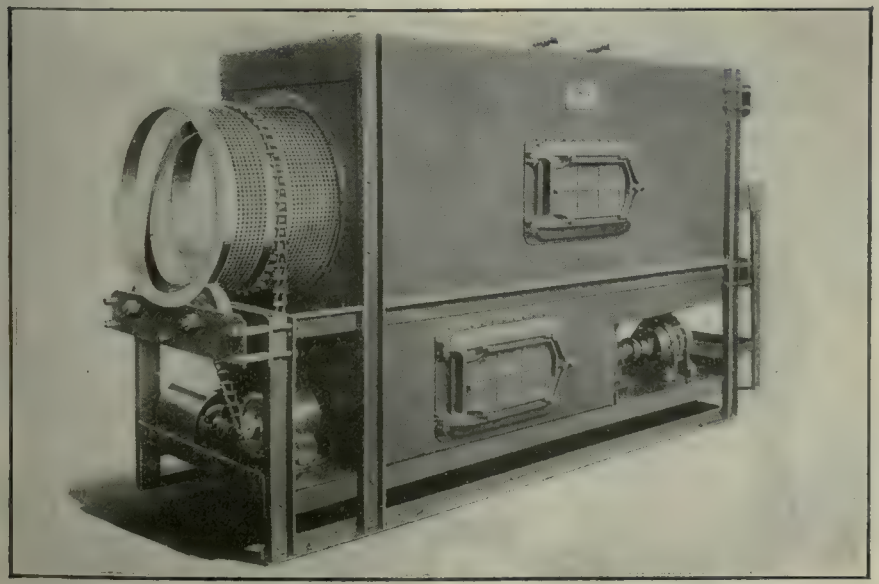


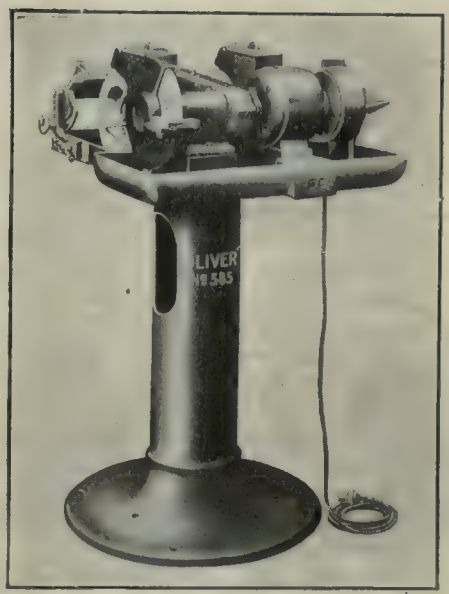
FIG. 2—CRESCENT DRUM TYPE METAL CLEANING MACHINE

Oliver Oilstone Grinder

A grinding machine for sharpening turner's chisels and tools, gouges, knives, and other woodworking tools, has recently been placed on the market by the Oliver Machinery Co., Grand Rapids, Mich.

The machine is equipped with two oilstone wheels which are kept constantly saturated with kerosene or other oil. The oil flows from the center of the wheels by centrifugal force and capillary action. The wheels are guarded and are arranged with a table which acts as a tool rest. and carries a sliding tool holder.

The tool holder has a micrometer



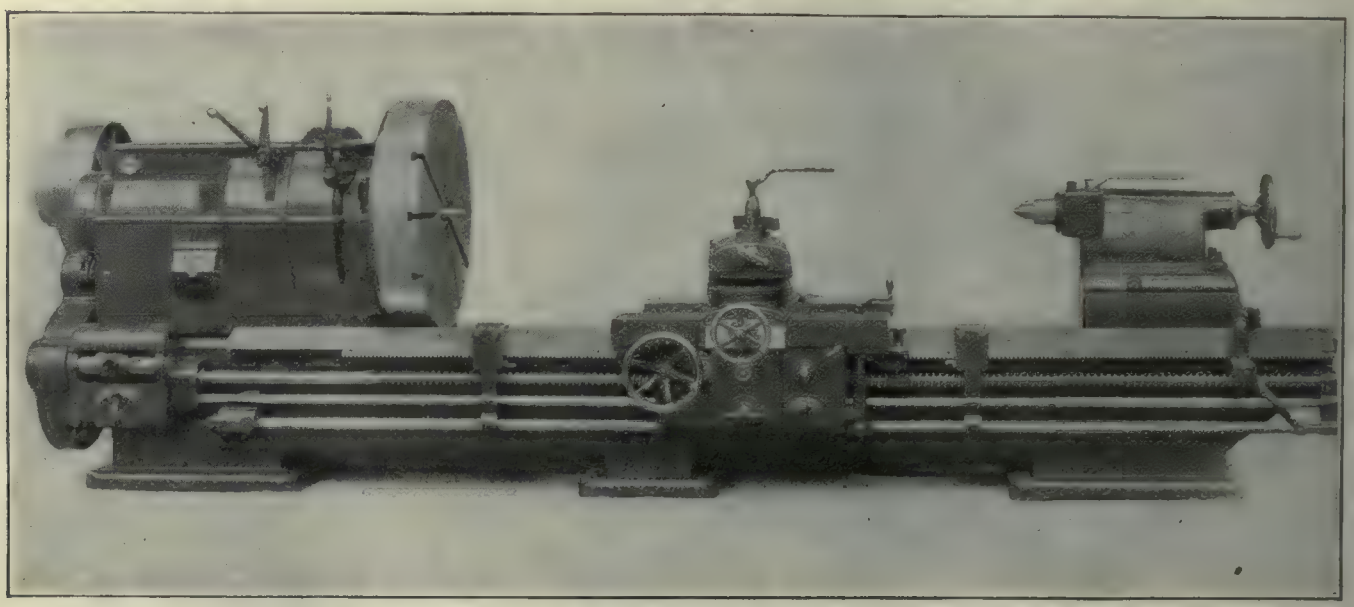
OLIVER OILSTONE GRINDER

feed so that irregular shaped tools can be accurately ground. An emery cone and a leather stropping wheel are mounted on one end of the motor shaft, and the shaft is flexibly connected at the other end to a general utility grinding wheel provided with a suitable tool rest. The oilstone wheel shaft is geared to the shaft of the general purpose wheel.

All shafts run in ball bearings. The motor and its direct-connected wheels run at 1,800 r.p.m., the oilstone wheels rotating at 300 r.p.m. The motor can be furnished for direct or alternating current and may be connected to a convenient lamp socket.

Le Blond 30- and 36-inch Heavy Duty Geared-Head Lathes

Two larger sizes, 30- and 36-in., have been added to the line of heavy duty, geared-head lathes manufactured by the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. The 36-in. machine is shown in the accompanying illustration.



LEBLOND 36-INCH HEAVY DUTY GEARED HEAD LATHE

The general design of these lathes is similar to that of the 25- and 27-in. sizes described on page 90, Vol. 58, of the *American Machinist*.

The headstock is of the selective speed type, 16 speeds ranging from 4 to 255 r.p.m., being available. The speed changes are produced by the manipulation of two levers. All gears are forged and heat-treated and have stub form teeth. Sliding gears are of chrome nickel steel.

The single driving pulley runs at 500 r.p.m., and is 24 in. in diam. A belt 6 in. wide is used. The forged crucible steel spindle has a 2¼-in. hole and No. 6 Morse taper centers are used. The headstock gearing and bearings are automatically oiled by a geared pump system.

The bed is deep and heavy and of length to suit the service required. The back carriage bearing is flat, the front shear being V-shaped to resist tool pressure in all directions. Both bed and carriage are of semi-steel. The tailstock is similar to those furnished with the smaller sizes and is equipped with a rack and pinion device for quick movement.

The carriage apron is cast in one piece, and is of the double-wall type in which all studs and shafts have a bearing at each end. Both feeds are operated by a single positive clutch.

The leadscrew has 1 thread per in., and the quick change gear mechanism gives a range of 48 feeds and speeds. The leadscrew is not splined, a separate feed rod being provided. Special coarse leads and metric threads can be cut by applying gears at the end of the box.

The 36-in. lathe swings 38½ in. over the shears and 29 in. over the carriage, the swing of the 30-in. machine being 32½ in. over the shears and 22¼ in. over the carriage. The usual standard equipment is provided.

Arrangements for motor drive can be made, the motor being mounted on a bracket and driving through a belt, or mounted on the head and geared to the drive shaft. For the larger lathe a 15- to 25-hp. motor is required, and for the 30-in. size a 15- to 20-hp. motor is sufficient.

The 36-in. machine weighs 16,200 lb. net with a 12-ft. bed, the smaller size weighing 13,200 lb. with a 10-ft. bed. Various bed lengths can be furnished as desired.

Foote-Burt Multiple Spindle Boring Machine

For use in boring and reaming automotive cylinders, and for miscellaneous boring operations on other work, the Foote-Burt Co., Cleveland, Ohio, is now marketing a multiple spindle boring machine.

The new design represents an improvement over the machine previously manufactured by this company for this purpose, one of which was described on page 38, Vol. 39, of the *American Machinist*. The present machine is intended for production work on parts that are to be machined in quantity and, for this reason, the spindles are set on fixed centers and the speeds and feeds are worked out to suit the particular job.

Either belt or motor drive may be provided, the machine shown in the illustration being motor-driven. The main driving shaft in the head is driven through reduction gears from the motor, and carries two worms which mesh with two worm wheels on vertical shafts in the head.

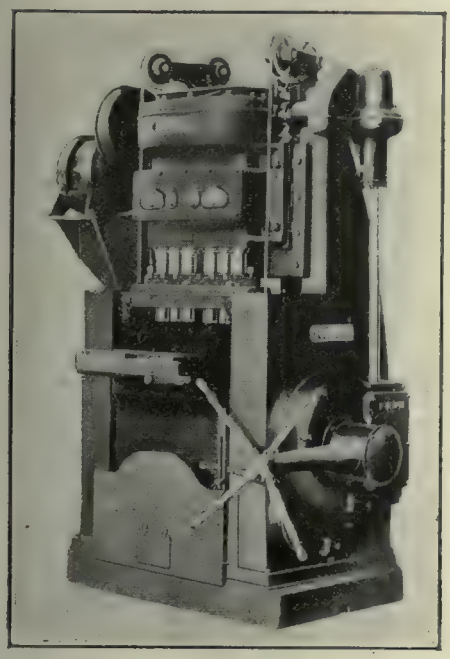
The boring spindles are divided into two groups, one worm wheel shaft driving each group through suitable spur gearing. The spur gears which drive the spindles have both coarse and fine pitch teeth, the intention of this arrangement being that the coarse teeth will carry the heavy load, the finer teeth producing smoother action. The head gearing and bearings are oiled by a force feed system, a geared pump for the purpose being mounted at the rear of the head crossrail.

The head occupies a fixed position and the feed is accomplished by raising the work table. By means of change gears, four feeds are available. The change gears transmit power from the drive shaft to a

vertical shaft which drives the feed pinion shaft through a worm and worm wheel. The feed pinions mesh with vertical racks located at either side of the table.

The worm is normally held out of engagement with the worm wheel by means of a spring. It is thrown into engagement by a hand lever and locked with a trigger. At the end of the operation the worm may be tripped out of engagement by hand, or an automatic arrangement on the machine may be used. The capstan wheel is used for hand feeding.

In this design all gears are enclosed and the machine is somewhat more compact than before. The spindle heads and jig plates may be changed for various jobs.

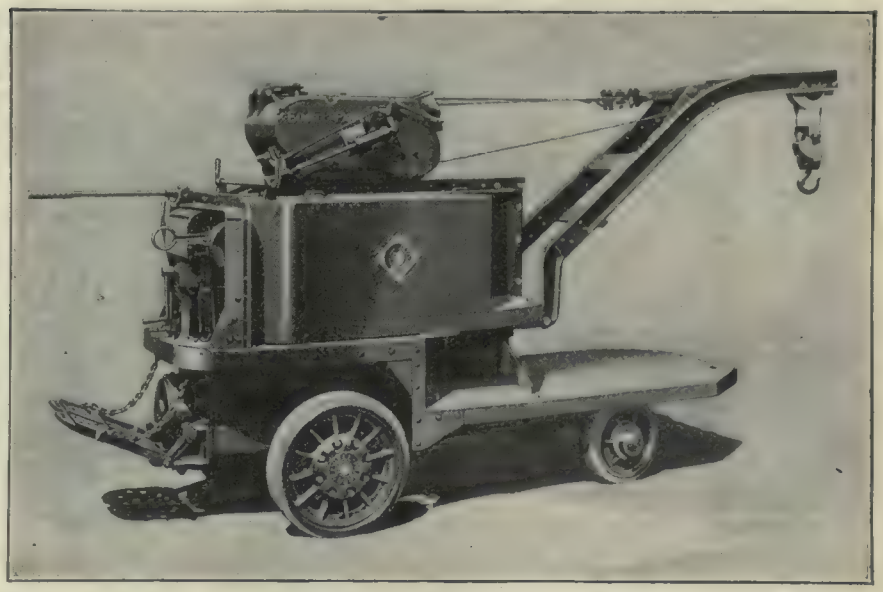


FOOTE-BURT MULTIPLE SPINDLE BORING MACHINE

Elwell-Parker Electric Crane Truck

The electric crane truck recently placed on the market by the Elwell-Parker Electric Co., Cleveland, Ohio, has been developed especially for use in the railroad general storeroom. Since it will tow, carry, lift, stack, lower, or push material or other movable equipment about, it should be a useful tool for the general storekeeper.

The crane consists of a lifting unit, power plant and battery, counterbalancing the boom. This apparatus is mounted on a steel column with a heavy base which is anchored to the steel frame of truck. Wide-gage axles are provided.



ELWELL-PARKER ELECTRIC CRANE TRUCK

There are two drums in the hoisting mechanism, one of which raises and lowers the boom, the other handling the hook. The drums are driven by a single motor through worm gearing, but each drum may be operated independently. Each drum is fitted with a plow steel cable ⅜ in. in diameter.

The unit is moved from point to point by means of an electric motor, located just back of the crane column, and connected through worm gearing to the driving axle. Both motors receive power from the battery which swings with the boom, the leads for the driving motor passing down through the column.

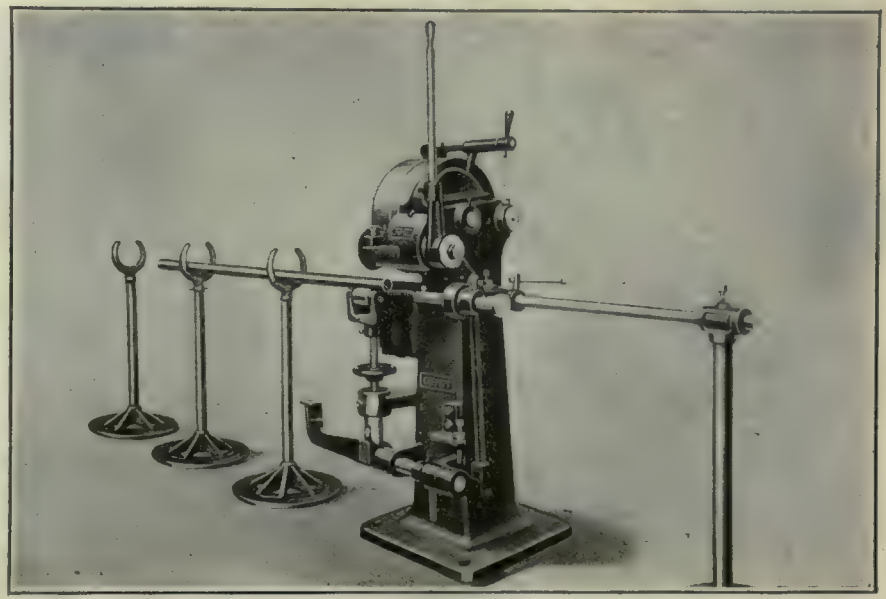
A separate controller is provided for each motor. The wheels on the forward axle have 15x3½-in. solid rubber tires, the driving wheels being provided with 22x4½-in. tires. All four wheels steer.

Geist Roller Pipe Cutter

The Landis Machine Co., Waynesboro, Pa., is now marketing a heavy duty roller pipe cutter manufactured by the Geist Manufacturing Co., also of Waynesboro. The machine is made in one size only, and has a range from ⅛-in. to 2-in. pipe, inclusive.

The cutter is made of tool steel, properly heat-treated, and can be reground when dull. The cutter shaft bearing is provided with an adjustable cap for taking up wear.

The guide rollers are also made



GEIST ROLLER PIPE CUTTER

of tool steel and are mounted in roller bearings in a cage or slide. The cage is elevated toward the cutter by a cam which is operated jointly by a pedal and a lever, as shown in the accompanying illustration.

The rollers are adjusted for various sizes of pipe by means of the handwheel located just below them, and the pedal and lever can be adjusted to suit the convenience of the operator. The movements of pedal and lever are limited by an adjustable stop. For pipe from ⅛-in. to ⅜-in., a small cage of rollers is attached to the regular cage without removing the regular rollers.

The machine is belt-driven and all spindles and shafts are ground and run in bronze bushed bearings. All gears are enclosed.

The length gage shown at the right of the machine is adjustable for different sizes, and for lengths of pipe up to 4 ft. The gage arm is a heavy casting and the parts which come in contact with the revolving pipe are hardened.

Cleveland Horizontal Boring, Drilling and Milling Machine

The horizontal boring, drilling and milling machine, previously made by the Cleveland Machine Tool Co., is now being built and marketed by the Sommer & Adams Co., 18511 Euclid Ave., Cleveland, Ohio. Several improvements in the design and construction of the machine have recently been made.

The column has been made wider where it attaches to the base and heavier throughout. No special base is now required as the bed is of the deep box type, heavily ribbed on the inside. The outer support may be clamped securely to the bed, or removed to accommodate other work when not in use.

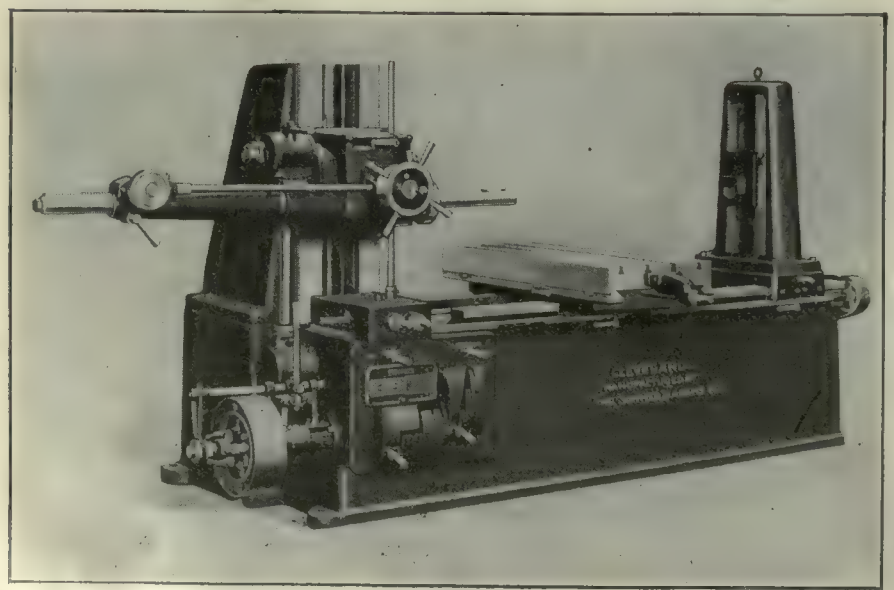
The machine is driven through a friction clutch by a single belt pulley, the recommended speed being 240 r.p.m. which will give from 10 to 150 r.p.m. at the spindle. A series of 12 spindle speeds are available through a gear box. A total of 16 feeds is provided, ranging from 0.005 in. to 0.333 in. per revolution of spindle.

The platen has a working surface 20x42 in. in size, and can be moved in either direction by a power traverse feed. Safety feed trips and a micrometer adjustment are provided for the platen.

The vertical adjustment of the spindle head is 18 in., the height from platen to spindle varying from ¾ to 19 in. The spindle is 2½ in. in diam., is fitted with a No. 5 Morse taper, and can be traversed a distance of 23 inches.

The saddle or carriage which carries the platen has a longitudinal adjustment on the bed of 36 in. All machines are equipped with a tapping attachment and vertical power feeds to head. All speeds and feeds are reversible.

For motor drive a 3- to 5-hp. motor is required, the motor being belted to the driving pulley and mounted at the rear. The weight of the machine crated for shipment is 6,000 pounds.



CLEVELAND HORIZONTAL BORING, DRILLING AND MILLING MACHINE

Britain Buys More U. S. Autos

The British imports of passenger car chassis from the United States increased to such an extent during June that the month's total of automobile imports from this country were about 60 per cent greater than in May. The total British imports of automobiles, however, declined by nearly 7 per cent during the same period.

The May total of complete passenger cars imported was 2,380; the decrease to 1,597 during June reflects the seasonal falling off in car sales which begins with early Summer, and continues usually until the Autumn buying starts. The 584 cars shipped from the United States mark the first occasion since August last year that United States shipments exceeded those from Canada. The 949 passenger car chassis imported from the United States in June is the largest number from any country during a single month, and nearly double the total of 484 from all countries during the month of May. While the number of complete trucks imported during June remained practically the same as May, the value showed a marked increase.

Automobile Trade in Costa Rica

There are about 300 cars in Costa Rica, practically all in the city of San Jose and the small cities within a radius of 15 miles, according to *Commerce Reports*, published by the Department of Commerce. Excepting possibly 10 cars of European manufacture, all passenger cars and trucks are American; importation of European cars has been discontinued. All automotive accessories imported likewise come from the United States or from Canadian plants that are branches of American manufacturers.

Only three dealers in Costa Rica carry a fairly complete line of accessories, and each of these has the agency for at least one car with exclusive sales rights throughout Costa Rica. One agent for a low-priced American car has installed a fully equipped modern vulcanizing plant. He also operates a battery charging station and carries in stock the necessary parts for the construction of new batteries; in addition, he maintains a service department for two other American cars. Two other agents have service stations, not only for the repair and maintenance of the cars for which they have the agency but for other makes as well.

Carry Full Stocks

All automobile distributors carry a complete stock of car parts and a full line of accessories, which they purchase from jobbers in the United States. The accessories and equipment carried in stock consist of: Two popular makes of American storage batteries, one of the most popular American bearings, practically all of the well-known brands of brake linings, several widely advertised American bumpers as well as the Skinner (Canadian), two American carburetors, three makes of electric horns, several jacks, lamps of all kinds, two different steering-wheel locks, five magnetos, two makes of shock absorbers, two well-known spark plugs in both inch and millimeter sizes, two types of garage jacks.

News Section

Committee to Foster Russian Trade

The formation of a Committee on Russian Trade with Henry T. Hunt, former member of the Railroad Labor Board as chairman, is announced. An effort will be made to enlist 2,000 representative American manufacturers and export houses in the resumption of trade with Russia.

"Russian conditions are rapidly approaching stability," Mr. Hunt, lawyer and a former mayor of Cincinnati, said at the Committee's headquarters, 120 Broadway, New York City. "The Soviet regime has realized that extreme and radical Bolshevism, if continued, would lead to even further economic ruin of the country. As a result, steps are being taken to protect honest business transactions and make possible trade with safety."

The committee, Mr. Hunt said, is preparing an industrial report which will exhaustively describe Russian conditions. The investigation on which the report is to be based was conducted by a group of experts, including Valerian E. Greaves, a former professor of law in the University of Petrograd, and Ellery A. Baker, formerly in charge of the Industrial Department of the National City Bank of New York.

Co-operating with the committee are representatives of export bodies and trade associations including the American Manufacturers' Foreign Credit Insurance Exchange and Lloyds of London. Monroe Curtis is aiding the work from Berlin. The committee, it is said, is studying the possibility of obtaining credit insurance on at least a portion of the shipments, and will make arrangements for financing.

Japanese Firm Wants Catalogs

A cable received by the Barnes Drill Co., Rockford, Ill., from S. Noda, president of Roku-Roku Shoten, Japan, states that the head office at Tokio was completely destroyed by the recent earthquake and that all of the catalogs of American concerns were lost. The company is anxious to have these catalogs replaced and is requesting that they be sent to the Tokio office whose street address is 30 Takanawa Minamicho, Shiba.

Drop Forgers Will Attend A.S.S.T. Convention

The executive committee of the Drop Forgers' Supply Association held a meeting recently in Philadelphia when it was decided to make a concerted effort to invite as many drop forgers as possible to attend the convention and exposition of the American Society for Steel Treating to be held at Pittsburgh, Oct. 8 to 12.

Inasmuch as the drop forge industry is so closely allied to the aims and purposes of the A.S.S.T., all of the members by attending will be able to obtain great benefit from the many papers that are to be presented on that subject and also by visiting the exhibitors from whom they secure their materials, supplies and machinery.

Work by Committee on Marine Standards

Preliminary steps have been taken by the American Marine Standards Committee to form subject committees to study and develop standards for certain hull and engineering details and certain phases of operation practice. These subject committees are formed by the technical committees appointed and their work is to be carried on independently, but the results thereof are subject to review by their respective technical committees. When the work on any subject has been carried to conclusion by a subject committee the results are to be reported to its technical committee and upon review thereof by the latter, report is made to the executive board to have the results passed upon and the appropriate status given thereto either as "Suggested American Marine Practice" or "Tentative American Marine Standard" or "American Marine Standard" as provided by the constitution and rules of the organization. Before, however, such action is taken all concerned in the marine field are to be given opportunity to criticize or approve the results or to make recommendations for their betterment.

Government Furnishes Auto Data

Investigation of motor vehicle preferences and requirements in various foreign markets has been made by the Automotive Division of the Department of Commerce upon the request of automotive manufacturers. Reports on this subject besides covering requirements such as right- and left-hand drive, the kind of electrical equipment used, usually contain detailed list of prices of the predominant makes of cars and trucks. Full details may be obtained from the automotive division or the district and co-operative offices of the Department of Commerce.

Far East Needs American Trade Catalogs

Machinery manufacturers will render a service to their Japanese representatives by sending immediately their catalogs and price lists of recent date. Tokio and Yokohama offices were either totally destroyed or thrown into such confusion that a replacement of trade literature is in many cases a necessity before normal business may be resumed.

Machinery Exports in August

Exports of metal-working machinery during August, 1922, with revised comparative figures for August, 1923, as compiled from the returns to the Department of Commerce, were as follows:

	AUGUST 1922 Value	AUGUST 1923 Value
Lathes	52,963	99,913
Boring and drilling machines	31,370	46,283
Planers, shapers and slotters	11,980	32,891
Bending and power presses	16,061	77,704
Gear cutters	15,290	22,131
Milling machines	27,631	48,481
Thread cutting and screw machines	13,530	114,557
Punching and shearing machines	6,735	23,443
Chucks, centering, lathe, drill and other	23,566	26,090
Reamers, cutters, drills and other parts for machine tools	100,295	196,214
Pneumatic portable tools	44,772	410,070
Foundry and molding mach'y.	70,228	34,062
Other metal-working machinery and parts of	527,438	481,850
Total metal-working mach'y.	1,032,483	1,730,739
Automobiles and chassis (total)	5,137,894	7,101,654
Motor trucks and buses (except electric)	844,139	1,120,005
Passenger cars, except electric	4,286,299	5,954,814

Metal Hull Airplanes Prove Successful

A new commercial flying boat with a metal hull is completing successful trial flights at the plant of the Aeromarine Plane & Motor Co., Keyport, N. J., where it was designed and built as the first practical over-water commercial aircraft in the United States. Paul G. Zimmermann, chief engineer of the company, under whose direct supervision the machine was designed and constructed, is authority for the statement that the all-metal hull marks the same progress in aeronautics as in the case of the railroads when steel cars supplanted those of wooden construction. He added that all flying craft of the future will be made of metal because it is not so vulnerable to weather conditions and furthermore, metal craft can be produced in quantities far more economically than the old style wood and wire designs.

Chicago Machinery Men Help Japan

In the recent drive to help Japan the machinery division of the trade organizations of Chicago exceeded its quota of $22,500 by nearly $8,000. Edward P. Welles, president of Charles H. Besly & Co., was chairman of the division and F. A. Wetmore was general chairman of the trade organization group, the world war organization being revived for the time being. Thirty-seven trade divisions participated. Although the total quota was placed at only a half million dollars, the trade divisions together totaled more than $600,000.

Detroit Business Increases as Auto Production Booms

One of the most sensational price wars and production races ever experienced in the automotive field is having more than passing effect upon the machine tool industry in Detroit and vicinity.

Automobiles are being turned out by the thousands, with every manufacturer attempting to get his new models in ahead. Production figures have leaped, having surpassed 40,000 for a week in the largest plant and having jumped to more than 1,000 daily in others.

Leaders in the machine tool field report a general pick-up in business due to the normal and expected speeding up of all industrial activities in Michigan.

Announcements of new models are tumbling over themselves, it appears. During the past week two companies announced new models. One of the largest companies in Detroit is about to announce a new six cylinder car to supercede its line of fours, it is understood. Another factory is changing models.

At present the lighter cars are finding an extremely good market, which has caused observers in the automotive field to predict overproduction of some types of cars within the near future. With the approach of colder weather manufacturers are turning out a larger proportion of closed cars.

That the city has reached a stability in its industrial life is indicated by the announcement of employment figures by the Employers' Association. This shows 215,973 employees as against 215,830 of the previous week, an increase of 143, which offsets a slight decrease of 57 of two weeks ago.

Public utilities and railroads throughout the state are going rapidly forward with extensions and improvements. The D. T. & I. has purchased a new right of way in Monroe county, while the Michigan Electric Railway has recently taken over the Michigan United Railway property and has been given authorization for about $17,000,000 in bonds.

The Michigan State Telephone Co., which has already made one of its large Detroit exchanges automatic, will spend $2,500,000 additional in the city.

Export balances, bank clearances and postal receipts give a most encouraging index to the city's prosperity along every line.

South Has Further Improvement

The volume of sales by the machine tool jobbers in the Atlanta territory during the last two weeks of September continued to maintain the increase noted the first half of the month as compared with August sales, with the result that the month as a whole is generally estimated by the trade approximately from 12 to 15 per cent better than the previous month, with the outlook for the remaining three months of the year giving every promise that sales volume will continue to hold up about on this average basis.

The trade dislikes to present any definite figures as to the September volume this year as compared with September, 1922, but virtually all of the distributors agree that sales were materially better this September than last, with the average increase probably running very close to 18 or 20 per cent.

As was the case during the first half of last month, the principal sales the last half of the month were to the woodworking industries and the smaller machine shops, with the larger plants doing but comparatively little buying. In the larger tools the principal activity has been in lathes, drill presses, etc., though there has also been a good demand for smaller tools and machinery. Inquiries received by the trade the latter half of September were not larger than the first part of the month, but a larger proportion of such inquiries continued to produce business than was the case a month or so ago.

At the various Southern markets, cotton has continued to climb in price until the spot quotations have now reached 30 cents per pound, which means that the total Southern crop has increased in value in the past month approximately $200,000,000. This has given rise to a much better feeling on all sides, and machine tool distributors believe that if the present crop is marketed at these prices the result will be an indefinite period of prosperity for all industry in the South. For that reason the jobbers are looking for tool sales the last three months of this year to hold up to a level of about 15 per cent greater than the volume during the Summer months, and probably from 18 to 20 per cent greater than the total volume the last three months of 1922.

Business Steady in Chicago

Industrial buying in Chicago continues slow. The Sinclair Oil Co. has made some purchases. Single tools are bought now and then by industrials.

The Chicago, Indianapolis & Louisville Ry. has entered the market for one double-cylinder planer to handle 12-in. material; one combination automatic car gainer; one vertical and horizontal chisel mortiser with vertical car borer attached, having carriage 40 ft. long; one cut-off saw to cut material 10 in. square; one rip-saw to handle material 8 in. thick by 16 in. wide, and one No. 3 hand saw. The Pennsylvania R.R. is said to have purchased a 90-in. wheel quartering machine. The Seaboard Air Line has purchased two 100-ton bushing machines. The Chicago, Milwaukee & St. Paul Ry. has made some purchases and the Pullman Co. is making inquiry for several tools.

The dealers in second-hand machinery continue to get a fair volume of business. Since industrials continue production in good volume, dealers believe that they will buy machine tools in the next few weeks.

While present buying of steel is small, indications are that tonnages of importance will be placed in the near future. Mills are not exactly in need of tonnage, but shipments have been going forward for some time in excess of new orders and backlogs are unquestionably being reduced.

Better news was heard on the Chicago market this week. It was learned that railroads are inquiring for more cars, and there has been a further improvement in the farm implement industry, some implement manufacturers operating at as high as 85 per cent of capacity. Forge companies are unusually active, and building is going ahead in Chicago at a high rate considering the season of the year. Tank companies which have been practically out of the market for some time are again inquiring for steel. About 14,000 tons are involved in tank projects awarded the last few days.

Consumption of steel continues about the same, shipments exceeding new orders. Pressure for deliveries is still almost as heavy as during the Summer months. All classes of consumers are reported willing to take steel if shipments could be obtained in from three to six months.

Good Reports from Connecticut

The sales and production pulse throughout the Connecticut district is normal and a healthful condition for ensuing months is anticipated. None of the manufacturers interviewed are manufacturing for stock, preferring to begin at this time to anticipate the Jan. 1 inventory. Although this is the condition everyone is planning production schedules based on trade inquiries.

A production superintendent in one of the principal chuck manufacturing concerns of this district made a study of his production records a day or two ago and has drawn conclusions and inferences which he anticipates will obtain and is going ahead on the indications revealed. Production figures for 1920, 1921, and 1922 were paralleled. The three lines show an upward trend from January to July, when they decline slightly and in August and September the curve swings upward with October and November holding quite a general high level but a slight fall in December is indicated. Based on the three years' indication he has worked out a schedule accordingly, at the same time anticipating the probability of the necessity of meeting a better trade condition. The salesmanager of that organization made a two weeks' trip among the automobile industries of Michigan and returned with the encouraging information that a higher peak in sales can be expected. The automobile salesmanagers and production superintendents in Michigan hold out bright prospects and this industry reflecting most noticeably in the chuck business the prospects are even better than "favorable." He found the automobile trade busy. Railroads are also buying and they are noticeably strong with the inquiries.

In the chuck manufacturing districts replies to queries revealed that in every instance the production organizations are larger now than in pre-war times and in two instances the working or-

ganizations were reported to be as large or larger than at the peak of production during the war. Immediately after the war, one manufacturer explained, his war working force was maintained and stock production was carried along and a very considerable inventory was piled up—the product being as staple as nails, and while his organization is not now so large the sales represent 100 per cent more than production.

A manufacturer of big machines reports production schedules for the next month, anticipates healthful trade and does not reckon any let up. The inquiries are of such volume that the manufacture must go along on the present satisfactory basis to meet even fifty per cent of the normal sales following inquiries.

New York Ready for Fall Trade

Makers of automobile accessories and parts for automobiles are the purchasers of machine tools at this time of the year in the New York City district, according to the dealers. September has proved to be a good month in some respects, while in actual sales made it has not been up to expectations. Machine tool dealers are by no means pessimistic, however, and are of the opinion that the Fall business which is just starting will be as good as has been anticipated.

Railroads are buying occasionally but not to the extent that they were during the first part of the month. Inquiries from these sources are larger than usual and continue to show every sign of a renewed activity in the buying within a short time. Heavy machinery has been asked for in several instances and orders that total large amounts are confidently looked for by Metropolitan dealers.

Automobile production was better during the month of September than it has been since June and inquiries from this field have been received in abundance. Buying has also resulted in some cases.

General industrials are not expanding and no plans are to be found of contemplated expansion within the next month. Woodworking machinery received some attention during the latter part of the month.

Used machinery is in better demand than usual. Some railroads are buying re-built and used machine tools, it is reported.

Exporting is a trifle better than it has been in several weeks. The conditions in Europe seem to be clearing and exporters hold out hopes for a greater renewal of activity as soon as the Ruhr complication is straightened out.

Will Discuss Wire Gage

There will be a public hearing on the subject of wire and sheet metal gages on Oct. 8 at 10 a.m. in Room 1101, Engineering Societies Building, 29 W. 39th St., New York City. The meeting is being arranged to give opportunity for discussing the wire gage series proposed by a subcommittee of the National Screw Thread Commission and discussed briefly in the *American Machinist*, Vol. 58, No. 7.

Good Business in Indiana Reflected in Machine Tool Trade

While there seems to be a good deal of uncertainty in Indianapolis concerning what will happen industrially this Winter, this doubt, apparently, has affected the machinery business very little. There is some hesitancy, it is true, on the part of some to make new installations, but for the most part the situation is good. Prices seem stabilized, brokers here say, and this is having much to do with buying. They point to the fact that most executives realize that now they will be able to get both machine tools and machinery about as cheaply as they will for some months, or even years.

With the construction program on the wane, the interior finish sash and door and flooring mills, which until this time have been crowded with work, are finding time not only to make repairs and replacements, but to make some installations as well. There has been some steady buying from these sources during most of the Summer, but many factories were entirely too busy to think of any plant additions at that time. The increase in business coming to the furniture factories of the state is causing some expansion in production and dealers and manufacturers here report several inquiries for special machinery for these plants.

The automobile business is beginning to cause some surprise. Especially is the tool business good. Most plants here, instead of getting out their Fall jobs under pressure and then cutting production, not only have got out their usual Fall work on time, but are finding the demand from dealers continuing. Auto accessory manufacturers here, of which there are many, including shock absorber factories, body factories, and specialty factories, are profiting by this increased business and also are buying both machinery and tools.

Money is easier and bankers here say there is no cause for any legitimate industry worrying because of the supply or rate.

Inquiries Plentiful in Cincinnati

The machine tool industry in Cincinnati is in the midst of a lull which has affected the sales of practically every one of the houses. Buyers who have been placing orders are showing more caution in making purchases while the automotive industries are buying only what is absolutely necessary. Railroads have been less active than at any time in the past few months in ordering equipment.

Several executives attribute the decrease in sales to the fact that there is a great deal of used machinery on the market and also to the fact that there has been considerable machinery bought up by concerns at forced bankruptcy sales.

Many Inquiries

Despite the fact that orders have fallen off to a great extent, inquiries are plentiful and it is hoped that many of these will materialize into orders within the course of the next few weeks. Lathes have been selling in fair numbers, but production at best can only be said to be fair. Planers also are having rather slow sales with inquiries numerous. Electric drills and grinders have decreased in demand and the market for them is somewhat dull. Conveying machinery is probably in better demand in the local market than any other machinery and sales are good with prospects favorable for a continuation of satisfactory business in the immediate future. Milling machines have been selling only fair and production in this line has fallen off to some extent.

The improvement in the employment situation in Cincinnati has been of assistance to machine tool plants. A survey shows that there is a slight surplus of skilled workmen, while there are also sufficient unskilled workers on hand to supply all current needs in the machine shops.

The iron market is rather featureless even though there has been a slight improvement. Little interest is being manifested in future requirements and orders placed are for comparatively small lots and prompt delivery.

Railroads Carrying Out Program

The railroads of the United States have made good their promise to provide adequate transportation for 1923, according to reports made to the Board of Directors of the American Railway Association at their first meeting since June held recently in New York. Twenty railroad executives from all parts of the country were present for the consideration of traffic conditions throughout the United States.

"The reports from the country, as a whole," said the statement issued by the Board of Directors following the meeting, "indicate that the program is being carried out to the entire satisfaction of the public.

"The program whereby the locomotives awaiting repairs was to be reduced to 15 per cent by Oct. 1, has been more than fully met. It is now below that figure, having reached 14.7 per cent on Sept. 1, thirty days ahead of the time set.

"One of the great problems every Fall has been the movement of coal via the lakes to the Northwest. The largest number of tons of coal has been dumped from Jan. 1 up to date of any year of record, insuring the full program for lake coal movement being met without any difficulty.

"The car distribution has taken place in accord with the program, and there is generally an adequate car supply in all parts of the country, and particularly in the agricultural sections of the West, where there are still a number of box cars stored awaiting grain movement."

Hardware Convention at Atlantic City

At the annual convention of the American Hardware Manufacturers' Association, to be held Oct. 16, 17, 18 and 19 at Atlantic City, N. J., group meetings will be featured with the transportation group and the mill supplies group on Oct. 18. Many speakers will be heard at both meetings with J E. Stone of the Stanley Works, New Britain, Conn., in charge of the transportation meeting, and J. Harvey Williams, of J. H. Williams & Co., Brooklyn, in charge of the mill supplies meeting.

Business Items

The Cleveland horizontal boring, drilling and milling machine, formerly manufactured by the Cleveland Machine Tool Co., Cleveland, Ohio, is now being made by the newly formed Sommer & Adams Co., Cleveland, Ohio.

The new plant of the Sullivan Machinery Co., Michigan City, Ind., was opened with ceremony on Aug. 11, being attended by many of the officials from the Chicago plant and prominent citizens in that part of the country.

The plant and offices of J. H. Williams & Co., Brooklyn, will be moved to Buffalo. A warehouse will be maintained in Brooklyn.

Machinery for the manufacture of automobile cushions is being installed by the National Spring & Wire Co. at its new plant in Albion, Mich. The new factory will be opened soon.

The Atwood Machine Co., Willimantic, Conn., has taken over all interests of the Willimantic Machine Co., formerly of Willimantic, Conn.

The Poole Engineering & Machinery Co., Baltimore, Md., has purchased the plant of the Maryland Metal Products Co., Hagerstown, Md. The property was sold at auction. The Poole company used the plant during the war.

Tangible assets of the Anderson, Ind., Foundry & Machine Works, which includes the value of grounds, buildings, machinery, material on hand and book accounts that are believed collectable, is $616,205.59, according to the inventory that has been filed in the circuit court by W. T. Durbin, receiver.

The Millholland Sales & Engineering Co., 540 Consolidated Building, Indianapolis, Ind., has been appointed exclusive distributors in Indiana of the products of the Rockford Milling Machine Co., Rockford, Ill.

The entire plant of the United States & Cuban Allied Works Engineering Corp., and the machinery equipment of the Tindall-Morris Co., Eddystone, Pa., will be liquidated through the Industrial Plants Corp., 25 Church St., New York City.

The Brown Hoist Co. of Cleveland, Ohio, has bought the plant of the Elyria Machine Co., Elyria, Ohio, making the second Elyria plant the Cleveland company has taken over, the other being the Duplex Foundry Co.

The Phillips Custom Body Co. headed by Frank W. Phillips of Cleveland and capitalized at $375,000 has purchased the Trumbull Mazda Lamp Co., Warren, Ohio, and is preparing the building for the manufacture of high-grade closed car bodies. It will employ when running at capacity between 350 and 400 men.

The plant of the Union Iron Works at Union, S. C., destroyed the latter part of September by fire at a loss estimated at $20,000, will be entirely rebuilt this Fall, it has been announced by J. M. Morse, head of the company.

Obituary

MERRIT A. POTTER, aged 68 years, last survivor of the original incorporators of E. C. Atkins & Co., died at the Methodist hospital, Indianapolis, Sept. 25, after a long illness. He had been identified prominently with the business and civic life of Indianapolis for forty years. Mr. Potter was born Aug. 1, 1855, at Clarkston, Mich. He was the son of the Rev. Aaron Potter, a Baptist minister, and Frances Augusta Potter. He attended the University of Illinois, coming to Indianapolis in 1874. In 1878 he became associated with E. C. Atkins & Co. For two years following his connection with the Atkins company he acted as manager of the Hecla Consolidated Mining Co. of Montana, of which Mr. Atkins was superintendent and one of the large stockholders.

When E. C. Atkins & Co. was incorporated, in 1885, he became treasurer and one of the incorporators. He served in that capacity until 1911, when he became secretary.

PHILIP WEISS, manager of the Philadelphia office of the Ingersoll-Rand Co., New York, died recently in Dayton, Ohio. He was 68 years of age.

ANTOINE JEAN LANGELIER, president, general manager and treasurer of the Langelier Manufacturing Co., Arlington, R. I., died suddenly recently in New York City where he was visiting on business. Mr. Langelier was a native of Canada, coming to the United States with his parents when he was still a youth. He followed the trade of a machinist and was for several years employed by the Brown & Sharpe Manufacturing Co., Providence, R. I. With his father he established the Langelier Manufacturing Co. in Providence. Later when the company was incorporated in 1917 it was moved to Arlington, R. I. Mr. Langelier was an inventor of a great many special machines.

SIMEON L. GUEST, for many years superintendent of the Joseph Dick Foundry Co., Canton, Ohio, died recently at his home in that city. He was one of the best known foundrymen in the state and came to Canton in 1869.

GORDON BATTELE, aged 40 years, widely known in the iron and steel industry, died recently in a hospital in Columbus, Ohio. He was a director in the American Rolling Mill Co. and the Inland Steel Co. of Chicago. He was also president and treasurer of the International Steel Products Co. and the International Derrick & Equipment Co. of Columbus and a director of the Republic Fuming & Refining Co. and the Ohio Mining Co.

CHARLES R. TRANSUE, aged 53 years, superintendent of the Transue & Williams Corp., Alliance, Ohio, died at his home in that city this week. He had been superintendent of the organization since its inception.

Salmon W. Putnam—Erratum

In the obituary of Salmon W. Putnam, published on page 198f, Vol. 59, of the *American Machinist*, it was erroneously stated that he was the founder of the Putnam Machine Works, Fitchburg, Mass.

Mr. Putnam was the son of one of the founders of the Putnam Machine Works, and was one of the founders of S. W. Putnam's Sons.

Personals

ROBERT D. BLACK, branch manager for the Black & Decker Manufacturing Co., Baltimore, in its Philadelphia territory, will return to headquarters about the middle of November to assume his new duties as advertising manager for the company. Mr. Black succeeds G. W. BROGAN as advertising manager on Jan. 1.

BLAKE D. HAY has been appointed district manager for the Chicago district of the Williams Tool Corp., Erie, Pa. He succeeds HUGO E. L. MEY who has resigned.

MILTON C. FIDGEON has been appointed Eastern machinery sales manager for Joseph T. Ryerson & Son, Inc., Chicago. His offices will be at 30 Church St., New York City.

G. W. BROGAN has resigned as advertising manager of the Black & Decker Manufacturing Co., Baltimore, to enter the advertising agency business as G. W. Brogan, Inc. He will handle the accounts of the Black & Decker Manufacturing Co., the Manley Manufacturing Co., and the Dieffenbach-Westendorf Manufacturing Co.

L. W. PETTINGILL, electrical engineer, and for the past five years connected with the Cincinnati Screw Co., Loveland, Ohio, has been named vice-president and general manager of the Cincinnati, Milford & Blanchester Traction Co.

GEORGE W. TYROL has joined the sales force of the Bonney Forge & Tool Works, Allentown, Pa. He will have the territory of Pennsylvania, southern New York, New Jersey and Delaware.

CHARLES DAY, representing Mirrlees Bickerton & Day, Ltd., London, is in the United States on a business trip.

W. S. CHASE is the Pacific Coast manager for the National Acme Co., Cleveland, Ohio.

W. D. THORNBURGH, of Atlanta, Ga., for the past five years Southern representative of the Pennsylvania Rubber Co., has been appointed Southern representative of the Russell Manufacturing Co., of Middletown, Conn., manufacturer of a number of automotive accessories. Headquarters will be in Atlanta where the Russell company maintains Southern offices and warehouses at 493 Whitehall St.

E. Howard Reed is now with the Reed Small Tool Works, Worcester, Mass.

E. L. Beisel will represent Charles H. Besly & Co., Chicago, in New York and Pennsylvania. His headquarters will be in Buffalo.

T. C. Cornell has joined the Cleveland office of the Black & Decker Manufacturing Co., Baltimore.

W. E. Sykes, formerly of the Power Plant Co., London, Eng., will join the Farrel Foundry & Machine Co., Inc., Buffalo, N. Y., as consulting engineer. Mr. Sykes spent last Winter in this country.

Henry Fox succeeds E. D. Allmendinger as salesman in the Detroit territory of the Black & Decker Manufacturing Co., Baltimore.

James F. Lyons is now representing the Brown & Sharpe Manufacturing Co., Providence, R. I., in Los Angeles, Calif.

E. D. Allmendinger, formerly in the Detroit district for the Black & Decker Manufacturing Co., Baltimore, has returned to headquarters where he will have charge of the export department that is now being formed.

Martin Kremer is now the consulting engineer with the Buffalo Foundry & Machine Co., Chicago, Ill.

S. T. Nelson, associated with the Sullivan Machinery Co. at the Chicago office, has been transferred to the Michigan City, Ind., plant.

H. G. Smith, at present resident salesman for the Pittsburgh and western Pennsylvania territory of the Black & Decker Manufacturing Co., Baltimore, will succeed Robert D. Black as branch manager in charge of the Philadelphia territory, which includes all of Pennsylvania, Delaware and the state of New Jersey, south of Trenton.

Herbert C. Poole was appointed works manager of the Colonial Steel Co., Pittsburgh. Mr. Poole has been in charge of the New York office of the company for the past thirteen years.

M. A. Weidmayer, formerly in the Philadelphia and eastern Pennsylvania office of the Black & Decker Manufacturing Co., Baltimore, will have charge of the industrial department with headquarters in the New York City office of the company.

Charles M. Brown was elected president of the Colonial Steel Co., Pittsburgh, Pa., succeeding D. W. Dun levy.

Jack Brady, who has been connected with the W. A. Jones Foundry & Machine Co., Chicago, for over 40 years, and for the last 30 years foreman of the foundry, retired from active service during the past month.

Harold P. Childs, formerly special representative of the executive offices of the General Electric Co., New York, has become associated with the Heine Boiler Co., St. Louis, as manager of the New York offices.

R. E. Mizener, formerly connected with the Cleveland office of the Black & Decker Manufacturing Co., Baltimore, will be connected with the industrial department with headquarters in New York City.

William Davie, formerly with the Toledo Machine & Tool Co., Toledo, Ohio, has been made superintendent of the Peninsula Foundry & Machine Co., Portland, Ore.

Edward G. Smith, for the past six years sales representative in the central states for the Matthew Addy Co., Cincinnati, will become manager of pig iron sales of the Belmot Iron Works, Irontown, Ohio, Oct. 1. He formerly was manager of sales and purchases of the Howe Scale Co.

Nelson Littell, formerly second assistant examiner in the United States patent office, has resigned and will engage in the practice of patent law. in Washington. Mr. Littell examined patents of metal working machinery while with the government.

E. F. Smeckel is in charge of engineering for the American Steam Truck Co., Elgin, Ill.

W. H. Kilpatrick, formerly with the Buick and Willys-Overland organizations, and a specialist in electrical equipment and power installation, has been made factory manager of the Chalmers plant.

Elliott B. Field, formerly of Detroit, has been appointed advertising and publicity manager for the Kissel Motor Car Co., Hartford, Wis., according to a recent announcement of the company.

H. E. Bridgwater is now the production engineer for the Smith Premier Works of the Remington Typewriter Co., Syracuse, N. Y.

J. E. Bachelder has been transferred to the St. Louis office as representative for Fairbanks, Morse & Co., Chicago.

Jacob Trautman, Jr., has been appointed assistant sales manager of the Colonial Steel Co., Pittsburgh, Pa.

Fine Exhibits at Buffalo Meeting of Steel Electrical Engineers

Buffalo was the scene of the annual gathering of the Association of Iron and Steel Electrical Engineers, who met on Monday to Friday, Sept. 24 to 28. The most striking feature of the convention was the exhibits made by manufacturers of equipment used in this industry. Each year the association attracts in greater degree the interest of exhibitors, and a very striking feature this year was a completely electrified foundry in operation at the Broadway Auditorium, where the exhibition was staged. This was made possible by the co-operative effort of several manufacturers, and the installation included an electric furnace, molding machines, air hammers, crane, cleaning outfit, crushers, grinders, sand blast and compressors. Two heats were conducted each day and commercial castings were produced.

The technical sessions of the convention were interesting and covered a wide variety of subjects. On Monday afternoon committee reports were heard and that of the standardization committee excited a great deal of discussion.

Recommends Co-operation with A.E.S.C.

The committee said that a big problem was encountered in getting the co-operation of the members and recommended more positive co-operation with the American Engineering Standards Committee. A resolution was passed asking the executives of each steel company to appoint one of its men, who must be a member of the association, o act as a standardization committee with authority to carry out the committee's decisions.

The chief reason for a greater degree of standardization, in the opinion of the committee, was to reduce the carrying charges incurred when there are big inventories of spare parts. Members in general agreed with the committee's recommendations.

On Tuesday morning the report of the bearings committee gave rise to an animated debate. In general the committee recommended the standardization of a few sizes of bearings and listed as tentative suggestions sizes 304, 305, 307, 309, 311, 314, 317, 320, 323, 329 and 336 for motors up to 150 hp. A committee of representatives of anti-friction-bearing manufacturers tentatively suggested the following sizes for motors of from 1-hp. to 100-hp. rating: 305, 306, 307, 308, 309, 310, 311, 312, 314, 315, 316, 317, 318, 320 and 322.

The committee stated that there was unanimous agreement as to the necessity for ball and roller bearings in the steel industry and added that ball and roller bearings should be interchangeable.

Many Good Papers

Other good papers presented on Tuesday dealt with motor-operated centrifugal pumps, skip hoists for blast furnaces and a system of coal and ore bridge traverse control against wind and "skewage" hazards.

The electrification of a foundry was the subject of a paper by L. W. Egan on Wednesday morning. The author stated there was great need of a rational and comprehensive engineering study of foundry production and maintenance methods. He outlined the advantages and disadvantages of electric foundry equipment and accented the fact that central-station energy should be used.

F. A. Coleman said that of the four types of ovens—coke, oil, gas and electric—used in core baking, the electric offered the best possibilities. Among all these agencies electricity only was on the decrease as regards price and on the increase as regards application. He asserted that another element making for a greater use of electric core-baking ovens was the fact that the electric oven was more accurately and readily controlled and eliminated the human element to a greater extent than any other.

Mr. Shepard of the Shepard Electric Crane & Hoist Co. said foundrymen had come to no agreement as to the relative advantages of alternating current and direct current and suggested the adoption of direct current for cranes. Officers of the association for the ensuing year were elected as follows: President, R. S. Shoemaker, Middletown, Ohio; vice-president, A. C. Cummings, Pittsburgh; secretary, J. F. Kelly, Pittsburgh; treasurer, James Farrington, Steubenville, Ohio.

The Industrial Review

September brings better business in most lines and the future appears brighter than during the Summer months—Machine tools needed in many industries this Fall

THE month of September ushered in a much better outlook in all lines of industries than had been prevalent during the two previous months. In nearly every classification of manufacture, production improved and in most cases sales took on an added impetus. The Japanese disaster was viewed by many in this country as having little present influence as far as business was concerned, but undeniably the cause of orders in many lines in the future. At the present time iron and lumber are about the only two commodities that have found a market in the stricken cities of Tokio and Yokohama. Orders for other articles are expected within from three to six months from now.

September brought a certain amount of optimism to the machine tool builders of the country when comparisons were made with the Summer months that had just been passed. In the New York district purchasing by railroads was experienced and further purchasing by the General Electric Co., the Western Electric Co., the American Locomotive Co. and some of the automotive plants around the Metropolis was recorded. Some little expansion was reported in September by general industrials, but nothing of great importance.

Other cities showed improvement on a par with New York. Pittsburgh maintained a steady volume of business with slight improvement noted; Milwaukee saw a determined improvement and a final breaking away from the lethargy into which it was plunged during the heated months; Chicago reported that railroads were both buying and inquiring freely, but complained because general industrials were not better customers; Philadelphia said that woodworking machinery was in good demand during September and that most machine tools showed signs of advancement; Detroit reported increases in employment and a resumption of work at most of the automotive plants around that district; Cincinnati claimed that production was satisfactory; Indianapolis reported a larger number of inquiries that is usual and prospects for increased business good; and Buffalo had but few complaints with condition. From Canada has come the cheering news that all lines are in a better condition than a year ago.

In the Electrical Field

Electrical goods for use during the Fall, Winter and Holiday seasons are selling, according to the latest advices from that field. While buying is later than usual this year it is more spirited, it is claimed, and the season will be one of the best recorded in that industry. In the other branches of this industry good reports are received. Heavy electrical machinery such as is made by several large manufacturing companies, is in good demand and the only complaint of makers of these lines is the lack of capable skilled labor.

The sale of electric delivery trucks is progressing steadily and this branch of the business is expected to be further increased each year.

Electric Railways

With the approach of Fall, the electric railways in the North are hurrying to complete all the outside work which they now have under way. The program of construction by the companies last Fall in anticipation of the new year included in the budget items of $105,000,000 for ways and structures, $90,000,000 for equipment, and $45,000,000 for power making a total of $240,000,000. A good portion of the work thus called for has been completed, but there is still much of the inside work that is yet to be started.

Right after the railway convention in Atlantic City early this month, work will be commenced on the budget of 1924 and it is expected that the schedule will call for even greater expenditures than were budgeted for this year. On the whole the electric railways have done well this year despite unfavorable factors in the cases of a few.

So far as the steam roads using electricity on any of their divisions are concerned, they appear to be working well ahead on their program for the coming year. The Long Island R. R. has already announced that it will spend $2,863,000. The New York Central R. R. has plans for about a hundred miles of electrification work around Albany and expending over the Boston & Albany R. R. as far as Springfield.

Railways and Buses

The purchasing of buses for use in city and suburban transportation continue at a surprising rate. A significant development is the growing appreciation on the part of the electric railways that the bus has a real place in the transportation world of today and that it lends itself to easy annexation to the railway company. A survey just completed shows that in 1922 there were 56 electric railways operating 350 buses and today there are more than 90 companies operating 725 buses. The use of buses by the railways necessitates the installation of entirely new machinery. In the case of the installation of five buses in Trenton, N. J., by the Trenton & Mercer County Traction Corp., a building has been especially set aside and new tools bought for the machine work to be done in connection with the operation of these vehicles and the additional new ones it has proposed to purchase.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb....	$0.0337	$0 0337	$0.0285
Cold finished shafting.....	per lb....	0.0433	0.0433	0.0373
Brass rods.....	per lb....	0.165	0.1741	0.171
Solder (½ and ½)	per lb....	0.262	0.276	0.2283
Cotton waste...	per lb....	0.1225	0.1231	0.1458
Washers, cast iron (½ in.)...	per 100 lb.	4.66	4.66	4.33
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100...	3.08	3.08	2.96
Lard cutting oil	per gal...	0.575	0.575	0.575
Machine oil....	per gal...	0.349	0.349	0.36
Belting, leather, medium.....	off list....	37%	37%	44½%
Machine bolts up to 1x30 in.	off list....	49½%	44¼%	50

The Chemical Market

The long chain of circumstances that causes improvement in the chemical lines has started to move and consequently improvement is at last noted in this industry. Consumers who use chemicals have been busy during the past six weeks and at this time it is reflected through several various channels in the chemical industry. Inducements for contracting for 1924 are being held out by makers of heavy chemicals.. The export business is reported as improved and further improvement is expected almost daily.

At the recent chemical show held in New York City, manufacturers of chemical machinery who exhibited stated that business was good and that the Fall season would be a busy one for them. In the expansion line, the Dupont interests are putting up a new cellaphane plant in Buffalo.

Work at the Mines

There is much construction work under way in the mines. In Arizona and in the Couer d'Alene district of Idaho improvements are being made and expansion work is going on at a good rate. At the New Cornelia's mine at Ajo, Ariz., a four million dollar flotation plant will be ready by the first of the year.

Coal Situation

The anthracite workers did not return to the mines as quickly as was anticipated. It was expected that all mines would open on Sept. 19, but most of them reported that only about half of the men returned to work and that it was doubtful if they would all be back by October. This has slightly retarded possible purchases of machinery.

Bituminous sales are not up to expectations, but production keeps up to a high level. Because of the anthracite strike scare, many manufacturers quietly bought up bituminous and stored it against their needs, hence the normal sales for this time of the year are totally lacking.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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WERE it not for the pall that seems to hang over the New York Stock Exchange, the week's developments would probably have inspired what was formerly called a boom. I would therefore again advise a disregard of the rather discouraging tone of the stock market.

The melancholia of the New York stock brokers was somewhat increased last week by a speech in which the president of their exchange charged that three or four politicians had attempted to blackmail his institution unless its management desisted from its pursuit of the bucketshops. The District Attorney has brought the charge to the attention of a Grand Jury and everyone is waiting to see what will happen.

As a market thus beclouded does not attract the optimistic, the bears have not encountered much opposition and it has been easy for them to depress quotations by selling the stocks that belonged to others and could be borrowed from the brokers by whom they were carried.

While this method of depreciating values is legal it has been so generally practiced of late that its ethical propriety is again being questioned and a movement to make it illegal is being considered.

It used to be supposed that the securities that were listed on the New York Stock Exchange were advantaged. Now a listing is coming to be regarded as a disadvantage, for it opens the door to the predatory short seller who seeks to depreciate values to his own profit when the public is timid or lethargic or an illusion of adversity can be created.

The depressing influence of such operations is intensified by the wide publicity given to the prices made on the New York exchange, and thus it often happens that constructive enterprise is halted and business activity chilled by the factitious operations of those who do not even own the securities they are selling.

This seems to be the case at present, for unless all of the many prominent business men who are quoted are mistaken, the prospects for a Winter of prosperity have rarely been brighter. Corn, our most valuable crop, is at 91 cents, the highest of the year and 22 cents above its value 12 months ago. Cotton, the second most valuable crop, is also at a very high price. Wheat is resilient at $1.10 for May delivery in Chicago.

Cattle, hogs, beef and pork are passing readily into consumption at figures that ought to be satisfactory to the producers. Sugar is selling at about twice the prewar normal. The dry goods trade is said to be excellent. The head of the American Woolen Co. says his business is satisfactory. In the foreign markets, wool is advancing. Silk, both natural and artificial, is eagerly bought at advancing prices.

The Baltimore & Ohio has resumed the payment of dividends on its common stock at the rate of 5 per cent. Other railroads seem likely to follow its example soon and nearly all of them report an enormous traffic with earnings to correspond. Bank clearings tell the same story. Anthracite coal is high, but the bituminous product is cheaper as is petroleum, although the production shows signs of decreasing.

> "Looking abroad the prospect seems equally reassuring. Germany has announced that she will abandon passive resistance in the Ruhr and France has answered that she will make her occupation of the district 'invisible'. On their face, these concessions seem to deal with 'imponderables' but practical men understand that they mean that both parties are tired of the struggle and are willing to get together."

The automobile production keeps up and the amount of Autumnal building planned is unusual. There is an abundance of bank credit. At 76.4 per cent the reserve ratio of the Federal Reserve System is nearly double the legal minimum, and about the only flaws in an otherwise flawless domestic situation are what is called a "waiting market" in the steel industry and a sluggish demand for copper at 13½ cents.

Looking abroad the prospect seems equally reassuring. Germany has announced that she will abandon passive resistance in the Ruhr and France has answered that she will make her occupation of the district "invisible." On their face, these concessions seem to deal with "imponderables" but practical men understand that they mean that both parties are tired of the struggle and are willing to get together. The optimists in England are meantime working to bring about the Anglo-Franco-German economic and industrial *entente* of which they have been talking so long.

Some things indicate that it is now nearer than it ever has been previously and if Secretary Mellon is quoted aright he has given it a boost by saying that a German loan could and should be floated in this country.

The Council of the Ambassadors has decided that the 50 million drachmas that Greece put up should be paid to Italy and Mussolini has surrendered Corfu. A big loan of one or two hundred million dollars to Japan is under consideration and the lumber markets on the Pacific Coast are firm in the confident expectation that a large share of the money borrowed will be spent there.

Increased activity in our trade with Mexico is reported and American capitalists are again commencing to look across the Rio Grande for speculative opportunities. Even Russia is inviting the *entrepeneur* to inspect and develop her undeveloped resources, and Brazil is becoming excited as she feels the dangerous stimulus of an inflation caused by the issue of a depreciating paper currency.

If this summary of conditions is fair and is considered in connection with the fact that everyone in this country is employed at good wages, then there is no reason why the pessimism of the New York Stock Exchange should be allowed to discolor the roseate business outlook and every reason why the merchants, manufacturers and farmers of the United States ought to be satisfied and hopeful.

The markets will continue to fluctuate, the careless and ignorant will continue to make mistakes, efforts to correct them by the enactment of special legislation will continue to be made, but in essentials the position is sound and those who conduct their business with reasonable circumspection ought to make reasonable profits and enjoy a reasonable prosperity.

From their utterances most men of affairs would seem to be in agreement with the optimism of the foregoing. There are, however, some who may challenge it in so far as the farmer is concerned. To such there is offered by way of consolation and rebuttal the following quoted from the instructions issued by Senator Capper's publishing concern to the salesmen who sell his agricultural papers to the farmers:

"I want to suggest yet once again that all salesmen for the House of Capper keep close to the favorable news which is developing. With advancing security markets which will soon become evident, better hog prices, the largest corn crop in years, and abundance of grass in pastures, huge hay crops, satisfactory dairy and poultry prices, abnormally big sales by the mail order houses, and an improved psychological attitude on the part of the people generally with respect to buying, we have some real sales arguments."

Even the members of the Farm Bloc ought to cheer up when they read this.

Westinghouse Man Tells of Japan's Earthquake

Letter to American office vividly describes horrors of recent disaster—Steel skeleton buildings withstand all tremors—Plans for Tokio and Yokohama rebuilding

WHAT terror and disaster ensued during the terrible Japanese earthquake and the scenes left in its wake are contained in a dramatic story just received from F. C. Middleton, a representative of the Westinghouse Electric International Co. in Tokio, who was in the midst of the holocaust. The men he mentions in his account are L. A. Osborne, vice president of the Westinghouse Electric & Manufacturing Co.; I. F. Baker, manager for Japan, and R. A. McManigal, another representative of the company. The Takata & Co. building mentioned is the Company's headquarters in Japan.

Part of Mr. Middleton's account of the earthquake follows:

"At two minutes to twelve o'clock noon, Sept. 1, I was in the very middle of a letter to Mr. Osborne, when a giant subterranean ice wagon seemed to drive under the building. The building lifted gently four times. I looked up at Mr. Baker and as I did so he shouted 'get out,' and the three of us, (Baker, McManigal and the writer), started for the door. Immediately following the vertical vibrations a giant hand seemed to seize the building and shake it, exactly as a terrier would shake a rat. We reached the corridor and tried to rush down the stairway from the second floor to the entrance. Plaster was falling about our ears and the tiles of the wainscoting popped out horizontally at us. Although we were only on the second floor, it must have taken fifteen seconds to get into the street, owing to the rapid vibrations and the debris under foot. We ran across the street to keep away from possible falling walls and looked about. Tokio was covered by a haze of dust and plaster. The Takata building was swaying backward and forward through an arc of at least two feet. As we watched it, the second quake came and thereafter at intervals of say, twenty minutes, other minor quakes occurred. We had all left the office without our hats or coats and the writer never returned.

More Severe than Frisco

"Although the Tokio quake was much more severe than the San Francisco quake no one realized what had happened. The three of us shook hands and congratulated ourselves on our escape and I, at once, asked Mr. Baker for permission to proceed immediately to Yokohama to ascertain what had happened to my wife. Of course, Mr. Baker realized that we all wanted to know how things were going at home, so I started off, without a hat or coat, to the Tokio station. I went up to the platform and there noted the first serious quake damage. The roofs of the steam platform and departing electric platform had both collapsed. Even then, probably two hundred passengers were expecting the next electric train to leave in a minute or so. Looking Southward from the platform the rails were all in perfect alignment and we all supposed that traffic to Yokohama would be unimpeded. This was probably ten minutes after the first quake. From the platform, I noted a large fire in the direction of the Imperial Hotel, which was, I believe, the Tokio Telephone Co. To the North, just beyond Mitsukoshi, another large fire had broken out in the fish market. After twenty minutes, I realized that there was no possibility of getting a train to Yokohama. I then went to the front of the Tokio station and looked about for a taxi. There was none.

"The Marunouchi building completed six months ago by the Fuller Construction Co. of the Orient, was still standing. Most of the facing brick had been shaken to the sidewalk. Several persons had been killed or injured by these falling pieces. Foreigners reported the inside decorations mostly destroyed. However, owing to its steel skeleton construction, it did not collapse. The Nippon Oil Co. building immediately adjoining the Marunouchi building, another steel skeleton structure, was still standing but the second floor was completely wrecked.

"Adjoining the Nippon building there had stood an eight story reinforced concrete building without a steel skeleton. This had completely collapsed. It is reported that two hundred workmen were killed. This is easily credible as the writer does not see how any living thing could possibly have escaped the tons of concrete that crushed through the basement.

Had To Walk

"Five foreigners and the writer, after endeavoring to charter or even buy a taxi, started from this point to walk to Yokohama. As we came past the Metropolitan police station, the Tokio Telephone Co. fire had gained such headway that it was seen that the police station, Imperial theater and Tokio Kaikwan were doomed. There was no water pressure. One fire engine was pumping a futile stream from the moat surrounding the palace grounds.

"As we passed from the Marunouchi (business) district, we noticed that small Japanese shops were standing, although most of their tile roofs had slid off into the street, making walking rather difficult. The writer still hatless and coatless, once thought of purchasing a cap or straw hat at one of the numerous shops, but the constantly recurring quakes kept everybody away from the buildings.

"Four stations south of Tokio, 2½ miles, we saw the first distortion of the electric line running from Tokio to Yokohama. From here on, the quake was of incredible violence. As we walked along the railroad road bed, we noted factories on either side, completely demolished. The railway semaphores were frequently overturned and prostrate across the rails.

"At Omori, the writer began to realize that Yokohama and other points south of Tokio had received a very much more severe shock. An ominous haze enveloped the horizon in the direction of Yokohama. Several factories all in flames or already burned out were passed. At Kawasaki, the General Electric plant was still intact, except for what I supposed was the main office building, composed chiefly of windows, which had simply fallen inward on itself, so that it was a total wreck. This plant was situated in the center of a large number of rice fields and was bounded on the East by the railroad. It may possibly have escaped the flames, although the smallest spark from the burning Japanese village to the East of the railroad would have started a fire which would have consumed the entire plant, as there was no one to put his foot on an incipient blaze.

"Finally after a walk of thirty-five miles we reached the Southern outskirts of Yokohama. The scene from the hill on which we stood is utterly unimaginable. What had been a city of nearly half a million that morning was now as complete a desert as the heart of the Sahara. With the exception of perhaps six Japanese who had probably taken refuge in one of the numerous canals, not a living thing was to be seen, and not one solitary building was standing. The only route we could follow was the street car line leading from past the prison northward to the city.

"Of course, there were no electric lights nor were they needed as a dense pall hung over the entire region and reflected the glow from the burning oil tanks at Konagawa.

"Yokohama Park is approximately one block and a half square. Thousands of Japanese had succeeded in reaching this little oasis, but countless more thousands never had a chance to even get started. The writer reached this park at 2 o'clock in the morning, hatless, coatless, shoeless and completely exhausted. Here, I learned that Mrs. Middleton had been seen in the park after the quake and was presumably as safe as anyone. From 2 to 4 a.m. I lay in the mud of the baseball field, too tired to think or even move or sleep.

"At 4 o'clock it became light enough to make it possible to walk about in the park. Only those who have been in Japan will realize what the park must have been. Immediately after the quake, the water mains had burst, so that the park was a sea of filthy, soupy mud, from two inches to five feet deep.

Refugees on Ship

"I crisscrossed the park in every direction calling for my wife, but was unable to locate her. Finally at eight o'clock Sunday morning, our Japanese cook and her husband saw me and told me she had just been taken aboard the steamship Empress of Australia.

"Almost immediately after reaching the Empress, I discovered my wife, barefooted, hatless and clad only in the remains of a house-dress and a raincoat.

"It seems to the writer as though it would be more probable that a new Yokohama would have to be built somewhat to the North of the present site. Tokio will be rebuilt and should be infinitely a finer city than that which was just destroyed.

"Just as there was an industrial slump in America at the outbreak of the war which was followed by a rush of large orders, so it seems to the writer that business with Japan will become very brisk in a short time, especially as regards steel, building materials and machinery."

News of Washington Activities

By Paul Wooton

Pending the filing of a formal report, no official comment is available as this is written, as to the cause of, and the responsibility for, the fatal explosion in the dynamometer laboratory of the Bureau of Standards on Sept. 20. The coroner's jury pronounced the death of the victims to have been due to "an accidental explosion of a gasoline and an air mixture in the altitude chamber."

An exhaustive investigation of the accident, which resulted in the death of four, and the injury of six of the Bureau's staff, is proceeding as rapidly as possible, but no announcement will be made until the investigation is completed. It is expected, however, that the investigating committee will find that the cause of the accident was due to leakage of gas fumes into the chamber.

The dead are: Logan L. Lauer, assistant physicist; Urban J. Cook, machinist; Stephen M. Lee, mechanical engineer; J. E. Kendig, assistant electrical engineer. Among the injured Herbert K. Cummings, an associate physicist, continues in a critical condition.

Secretary Hoover referred to the dead as "martyrs to science." The damage done by the explosion can be repaired for less than $10,000, Director Burgess states. No delay will result in the testing of engines as a similar chamber is available.

The experiment in progress at the time of the explosion was on an automobile engine at atmospheric pressure. The effect of low temperatures on the working of the engine was being watched. The mixture of gasoline fumes and air in the chamber was thought to have been highly favorable for explosion when ignited by the blowing out of a gasket. Had the chamber been used for testing of airplane engines, usually conducted under vacuum, no such favorable conditions for an explosion would have existed, it was stated.

The force of the explosion may be judged from the fact that the heavily reinforced twelve-inch walls of the altitude chamber were cracked badly. As the door was the weakest spot in the room, the men watching the instruments there were at the point of greatest danger.

It is pointed out that this accident will tend to emphasize the importance of the resolution adopted by the executive board of the American Engineering Council at its meeting in Cincinnati on March 23. In that resolution, it was pointed out that the government "is paying heavily in the form of employees' compensation, as well as in loss of time and efficiency, for its failure to adopt a thorough-going safety program." Attention is called to the fact that the government falls far short of the standard set by many private employers, the more progressive states and some of the municipalities. Federal safety standards were drawn up during the war, but there is no officer having the authority to enforce such standards as appear in the ruling, the resolution states.

Urge Industries to Store Coal

"Storage of coal by consumers is the all-important balance wheel between fluctuating consumption and variable production," states a report of the Coal Commission, recently sent to the President. "It is the consumers' insurance against temporary failures of transportation, such as caused by storms. It is the only protection yet devised for the consumer against protracted general stoppage of coal mining or of railroad deliveries.

"From having a few days' coal supply on hand it has been but a step forward for the consumers to accumulate a week's or month's surplus. The more distant from the coal field the larger the surplus of coal it has become the natural thing for the consumer to pile up.

"After the experience of this country in 1917-1918, in 1920, in 1922 and finally in 1923 in the storage of bituminous coal, it seems hardly necessary to call attention to the subject. In 1918 some 63,000,000 tons of soft coal were in consumers' storage piles on armistice day, an unprecedented quantity. In 1920 the lack of storage, for which the consumers were in part responsible for having so generously burned up their surplus coal in 1919, cost the buyers of soft coal millions of dollars when they precipitately sought to refill their bins during the Summer of that year.

"In anticipation of the general strike of soft coal miners on April 1, 1922, the country bought and stored more than 60,000,000 tons of soft coal in the Fall and Winter of 1921-22. This huge stock pile, largely depleted during the 5 months' strike, has been nearly rebuilt in the past Spring and Summer. More than 50,000,000 tons were on hand on Sept. 1, 1923.

"Regular, systematic, large-scale storage of bituminous coal by consumers during the seasons of low consumption is the public's largest opportunity and responsibility in solving the coal problem. Another direction in which the buyer can and should help not only himself but the coal business, is in proper selection of his fuel. The direct bearing of consumers' storage in regularity of mine operation, the reduction of over-development and the lengthening of the mine workers' year are discussed in other chapters of this report. The Commission seeks here to emphasize what it means to the consumers, that is, the public.

"The Commission made a systematic field investigation among industrials, railroads and public utilities of methods and costs of storage of soft coal. In this study, which was conducted by R. H. Kudlich, mechanical engineer of the Bureau of Mines under the direction of F. R. Wadleigh, Federal Fuel Distributor, particular attention was given to the policy of these buyers toward accumulation of reserve coal. It was found that in general the larger railroads and the public utilities have a definite policy on storage. It is, briefly, that small reserves must always be maintained and that unusual reserves are only to be accumulated against impending stoppages in supply. In areas as remote from the mines as New England and the Northwest what might elsewhere be considered a large reserve becomes inadequate insurance against interrupted supply, and the reserves in these distant markets are nearly always the largest in the country both in tons and in terms of days' supply."

Vocational Training by Cleveland Y. M. C. A.

Improvements to the combined automobile school, machine shop and gas and electric welding instruction division of the Central Y. M. C. A., Cleveland, Ohio, have been completed, and the work of turning out capable and practical men from the student body may now go forward as originally planned.

These schools have been established in a new building, ideally laid out for the purpose and particularly satisfactory for its reduction in operating expenses. The schools now have a capacity for training 215 students at one time, according to J. C. Nichols, director of the department, and can now turn out yearly between 900 and 1,000 qualified men.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Automobile and motorcycle accessories. Bulawayo, South Africa. Exclusive agency. Reference No. 7776.

Automobile accessories and parts. Santiago, Chile. Agency. Reference No. 7788.

Low priced automobile parts and accessories. Bombay, India. Purchase. Reference No. 7791.

Twist drills, taps and dies, and threading tools. Malmo, Sweden. Purchase. Reference No. 7787.

Forthcoming Meetings

National Safety Council. Twelfth annual congress at Buffalo, N. Y., Oct. 1 to 5. All meetings will be held at the Statler Hotel. Headquarters, 168 No. Michigan Ave., Chicago, Ill.

American Society for Steel Treating. Annual convention at Pittsburgh in connection with the International Steel Exposition, Oct. 8, 9, 10, 11 and 12. W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio, national secretary.

Society of Automotive Engineers. Production meeting at Cleveland, Ohio, Oct. 25 and 26. Headquarters, 29 West 39th St., New York City.

American Gear Manufacturers Association. Fall meeting, Mountain House, Lake Mohonk, N. Y. Oct. 25, 26 and 27. T. W. Owen, secretary, 2,443 Prospect Ave., Cleveland, Ohio.

American Management Association. October 29, 30, and 31, Hotel Astor, New York City.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8. Headquarters, Grand Central Palace, New York City.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Iron and Steel—Iron market weak, with prices tending downward. Iron still being piled up, despite high production costs due to increased cost of labor. Quotations under $23 per ton for No. 2 foundry iron have been made at Birmingham. New buying of plates and structurals extremely quiet. Numerous small orders received for new plate tonnages. Bulk of plate tonnage for car and tank construction. New structural business firm at $2.50 base, but mostly confined to small tonnages. Plates quoted as low as $2.40 per 100 lb., Pittsburgh, with very small tonnages at $2.50. Bars at $2.40 base; buying more active for fourth quarter requirements.

Advances—Electrolytic copper quiet; ⅛c. per lb. higher than week ago. Chinese antimony up $\frac{5}{16}$c. per lb., due to slight scarcity in New York market. Solder and babbitt metal higher in Cleveland warehouses.

Declines—Zinc down 5c. and lead 12½c. per 100 lb. in New York market. Fabricated brass and copper products reduced from ½c. to 1½c. per lb. in Cleveland warehouses.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$28.05
Northern Basic	25@26
Southern Ohio No. 2	26.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	31.00
BIRMINGHAM	
No. 2 Foundry	24.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	26.75
Virginia No. 2	30.17
Basic	26.00
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	27.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	26.90
Basic	26.90
Bessemer	27.90

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5 00@5.50

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.95	4.45	5.05
Nos. 22 and 24.	3.75	5 00	4.50	5.05
Nos. 25 and 26.	3.80	5 05	4.55	5.10
No. 28	3.85	5.15	4.65	5.20
Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00	5.15	4.70	5.35
Nos. 12 and 14.	4.10	5.25	4.80	5.45
Nos. 17 and 21.	4.40	5.55	5.10	5.75
Nos. 22 and 24.	4.55	5.70	5.25	5.90
No. 26	4.70	5.85	5.50	6.05
No. 28	5.00	6.15	5.80	6.35

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel		BUTT WELD		Iron	
Inches	Black	Galv.	Inches	Black	Galv.
1 to 3	62	50½	¾ to 1½	30	13
		LAP WELD			
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	28	13
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	60	49½	¾	28	12
2 and 3	61	50½	1 to 1½	30	14
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.65	3.90	4.55
Cold finished flats, squares	5.15	4.40	5.05
Structural shapes (base)	3.64	3.46	3 40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, $\frac{3}{32}$, 8.35c.; ⅛, 7.85c.; $\frac{5}{32}$ to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.12½
Tin, 5-ton lots, New York			42.25
Lead (up to carlots), St. Louis	6.72½	New York	7.37½
Zinc (up to carlots) St. Louis	6.37½	New York	6.82½

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.20	27.00	25.50
Antimony (Chinese), ton spot	8.75	10.50	7.50
Copper sheets, base	21.75	21.50@22.50	23.00
Copper wire, base	16.00	18.75	16.25
Copper bars, base	20.25	22.00	19.50
Copper tubing, base	24.50	27.00	23.00
Brass sheets, base	18.00	22.00	18.75
Brass tubing, base	23.00	27.00	20.50
Brass rods, base	15.75	18.00	15.75
Brass wire, base	18.50	22.00	.....
Zinc sheets (casks)	10.25	10.45	.....
Solder (½ and ½), (case lots)	29.50	29.00	20.00
Babbitt metal (83% tin)	52.00	53.50	40.00
Babbitt metal (35% tin)	25.00	17.50	17.00
Nickel (ingot and shot)	29.00	.....	35 00
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.75	11.75	12.00
Copper, heavy, and wire	11.25	11.25	11.25
Copper, light, and bottoms	9.50	9.25	10.25
Lead, heavy	5.75	5.50	5.75
Lead, tea	4.75	4.25	4.75
Brass, heavy, yellow	7.00	....	7.25
Brass, heavy, red	9.50	9.50	9.00
Brass, light	5.50	5.25	6 50
No. 1 yellow brass turnings	6.50	6.00	7.00
Zinc	3.75	3.00	4.00

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$25.10	$19.50	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.40	17.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	12.60	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7 40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13¼x13¼, per lb.	11.00	36.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.95	1.06	1.14
White lead, dry or in oil	100 lb. kegs.	New York,	14.00
Red lead, dry	100 lb. kegs.	New York,	14.00
Red lead, in oil	100 lb. kegs.	New York,	15.50
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.25@4.75	
Coke, prompt foundry, Connellsville	per net ton	5.25@5.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40-10%	50-10%	45-5%
1⅛ and 1¼x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	25-10%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30-10%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	40-10%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30-10%	45%	40-5%
Bolt ends, with hot pressed nuts	40-10%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 9/16 and smaller	60%	.....	....
Semi-finished nuts, ⅝ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.. ....	.....
Washers, cast iron, ⅛ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	3 50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	0.50	2.75	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	50-10%	50-10%	60%
Rivets, tinned	50-10%	50-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30–10%	30–10%	30–10%
Heavy grade	20–5–2½	30%	20–5–2½%
Rubber and duck:			
First grade	.50–10–5%	50–10%	40–10%
Second grade	60–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20

New and Enlarged Shops

Machine Tools Wanted

Ark., Texarkana — Liddell Motor Co. — lathe and drill press.

Fla., Buena Vista (Miami P. O.)—Freeman & Sons, 3644 North East 2nd Ave.—drill press and lathe for automobile repairs.

Fla., Clearwater—Ford & Fordson Dealer —lathe, drill press and grinding in machine.

Fla., Dade City—Dodge Motor Co.—drill press and lathe.

Kan., Treece—Treece Garage—lathe.

Mich., Detroit—Dept. Purchases & Supplies, 700 Marquette Bldg., G. J. Finn, Comr.—one wheel grinding machine for street railway department.

Minn., Wadena—G. M. Blair & Co.—sheet metal working machinery, including brake, bender, beader, etc.

Mo., St. Louis—Owen Baskett Motor Co., 3333 Washington Ave.—drill press and lathe.

N. Y., Buffalo—J. Gleason,—1095 Sycamore St.—sheet metal machinery and breaker shears.

N. Y., Buffalo—Income Property Corp., 573 Elmwood Ave.—equipment for garage and repair shop.

N. Y., Penn Yan—E. L. Geer—equipment and tools for proposed garage and service station.

O., Columbus—Moore Motors Co., 66 East Broad St. (manufacturer of automobile accessories), T. E. Moore, Mgr.—grinder, drill press, lathe, etc.

O., Columbus—Norris Mfg. Co., 1424 East Cherry St. (manufacturer of vending machines), G. Norris, Pres.—24 in. lathe, drill press, small grinder, etc., for new shop.

Okla., Cardin—Jefferson Highway garage, G. Lawyer, Purch. Agt.—drill press (used preferred).

S. C., Greenville—C. O. Allen & Co.—lathe and drill press for garage.

Tenn., Knoxville — Duncan Mchy. Co., Dempster Bldg., 721 North Central Ave., J. G. Duncan, Purch. Agt.—16 to 20 in. swing, by 6, 8, 10 or 12 ft. bed engine lathe for repair shop in mill; 16 to 24 in. swing drill press (used).

Tex., Huntsville—Bd. of Prison Comrs., S. J. Dean, Finance Comr., State Penitentiary —receiving bids until Oct. 22 for woodworking machinery for wagon factory, including

No. 1 bandsaw filing and setting machine, automatic.
No. 3 heavy power feed rip saw.
No. 2 heavy swing saw.
No. 8 variety sawing, shaping and boring machine.
No. 14 post boring machine.
No. 6 vertical boring machine.
No. 6 automatic double mortising and boring machine.
No. 1 lag screw boring and driving machine.
No. 3 iron bed wood turning lathe.
No. 1 automatic axle lathe.
No. 4 double spindle shaper.
No. 1 spoke facing machine.
No. 3 iron frame double belt sander.
Model M automatic spoke driver.
No. 2 wheel tenoning and cutoff machine.
No. 1 wheel rim finishing machine.
No. 4 automatic wheel boxing machine.
No. 2 automatic skein setting and fitting machine.
All machines complete with countershafts and pulleys.

Va., Portsmouth—Doronie & Co. (manufacturer of cultivators)—lathes, drill press and forges.

W. Va., Logan—Logan Cutout Switch Mfg. Co., P. O. Box 874—lathe, drill press and buffing machine for the manufacture of electric switches.

Wis., Markesan — W. Dehn—automobile repair machinery, small tools and belting for proposed $40,000 garage.

Wis., Mauston—G. J. Moriarty (machinist)—22 in. drill press, emery grinder and one large lathe.

Wis., Milwaukee—Hoyer Eng. Co., 281 Grove St.—machine tools for proposed $40,000 machine shop.

Wis., New Lisbon—F. J. Bunker—automobile repair machinery, gasoline tanks and pumps for proposed $40,000 garage.

Wis., Portage—E. Weinke—automobile repair machinery, gasoline tanks, pumps and free air equipment for proposed $40,000 garage.

Wis., Spring Valley—Pierce Auto Co., C. W. Pierce, Mgr.—automobile repair machinery, gasoline tanks and pumps for proposed $40,000 garage.

Wis., Viroqua—Bann & Fehlberg (heating and plumbing shop)—one pipe threading machine.

Ont., Hawkesbury—E. C. Lightall, McGill St.—tool grinder, etc., for garage and repair shop.

Ont., Ridgetown—E. Fysh—equipment for proposed $40,000 garage, automobile repair shop and service station.

Ont., Rockland—F. Houle—small lathe and puncher for garage.

Ont., Rockland — O. Rousson — garage equipment.

Ont., Welland—W. G. Somerville & Son, 36 Main St., North—equipment for proposed $50,000 garage, automobile, tire and battery repair shop.

Que., Bourget—P. Tasse—drill press, etc., for blacksmith shop.

Que., Buckingham — E. C. Levesque, Joseph St.—drill press, etc., for garage.

Que., Calumet—Weldon Bros.—garage and repair shop equipment.

Que., Hudson—L. Dufresne—equipment for garage and service station.

Que., Lachute — A. C. Bradford — lathe and emery stand for automobile repairs.

Que., Montreal—D. Veseau, 231 Manufacturers St.—equipment for garage and automobile repairs.

Que., Riguad—A. Mercier—emery wheel and other equipment for garage and repair shop.

Que., St. Agathe—M. Paquette—equipment for automobile repair shop.

Que., St. Anne de Bellevue—L. Lefebvre —garage equipment.

Que., St. Jerome—Campeau & Desjardins —boring machine, gasoline tank and pump for garage.

Que., St. Rose—O. Laplante—equipment for garage and repair shop.

Que., St. Scholastique—J. Fortier—drilling machine, emery wheel, etc., for garage and blacksmith shop.

Que., St. Vincent de Paul—R. Meunier & Frere—garage and repair shop equipment.

Que., Terrebonne—F. W. Moreau—drill press, emery grinders, etc., for garage.

Machinery Wanted

Ala., Anniston—Anniston Mfg. Co.—carding machinery for proposed addition to plant.

Ala., Birmingham—W. M. Smith & Co., 1st Ave. and 46th St.—crane.

Ark., Little Rock—Arkansas Power Corp., Boyle Bldg.—electric crane.

Ark., Pine Bluff—Jefferson Cotton Mills Co.—$300,000 worth of machinery for mill, 10,000 spindle and 340 loom capacity.

Calif., Azusa—Union Rock Co.—machinery for additions to plant.

Conn., Hartford—Fuller Brush Co., 547 Asylum St.—sheet metal shear to handle 24 to 36 in. material.

Ill., Chicago—Chicago, Indianapolis & Louisville R.R. Co., 608 South Dearborn St., J. H. Liebenthal, Purch. Agt.—one double cylinder planer for 12 in. material and one 40 ft. vertical and horizontal chisel mortiser.

Ill., Chicago—Foell Supply Co., 331 West 22nd Pl.—canning machinery for proposed $125,000 plant.

Ind., Bicknell—Bicknell News—linotype machine.

Ind., Mount Vernon — B. O. Hanly — Omaha folding machine.

Ia., Mason City—W. M. Temple—8 x 12 in. Chandler & Price and Pearl job printing press.

Kan., Paola—E. M. Pinneo—rock crusher.

Kan., Treece—Miners Press—paper cutter.

Kan., Treece—J. Schnitzer—blacksmith's tools, vise and tire shrinker.

Kan., Treece—Wheeling Shoe Shop, W. M. Wheeler, Purch. Agt.—electric stitcher (used).

Ky., Wallins Creek—M. H. Thompson—complete laundry machinery.

La., Washington—The city—oil storage tank.

Md., Baltimore—Archer Laundry Co., Eutaw and Franklin Sts.—complete machinery.

Md., Baltimore—Chicago Nipple Co., 4100 1st Ave.—machinery for the manufacture of pipe nipples, also pipe bending machines.

Mich., Detroit—Nizer Corp., 3980 Gibson Ave.—equipment to enlarge plant for the manufacture of automatic refrigerating cabinets.

Mich., Detroit—D. J. Osgood Co., 814 West Elizabeth St.—equipment, including rip saw for portable woodworking shop.

Mich., Parma—News—proof press for 3 or 4 column width.

Minn., Sauk Center—Service Job Shop—7 column newspaper press and Omaha newspaper folder.

Minn., Winona—Westlicher Herold—No. 5 or No. 8 linotype magazine.

Miss., Gulfport—Herald—proof press.

Mo., Birmingham—D. E. Staggs—newspaper press (used), belting, hangers and pulleys.

Mo., Dawn—B. W. Purcell—newspaper press and equipment (used).

Mo., St. Louis—J. W. Bland, 1000 Federal Reserve Bldg.—electrically driven floor surfacing machine.

Mo., Willow Springs—J. O. Brown—single drum hoist.

Neb., Beaver Crossing—Times—newspaper press.

N. Y., Buffalo—Bd. Educ., 1400 Telephone Bldg.—receiving bids until Oct. 8 for vocational and manual training equipment for various grade schools.

N. Y., Buffalo—E. Eberl, 124 Sycamore St.—equipment for light ornamental works.

N. Y., Buffalo—W. H. Fitzpatrick, 1920 Seneca St.—woodworking machinery for small mill at 128 Hensey Ave.

N. Y., Buffalo—W. Lerandosky, 1377 East Delevan Ave.—bakery equipment.

N. Y., Buffalo—MacLean Box Co., 166 Elk St.—equipment for box factory to replace fire loss.

N. Y., Buffalo—Mitchell & Frank, 1021 Main St.—equipment for proposed knitting mill on Woodlawn Ave.

N. Y., Buffalo—Morrison & Risman Co., 1437 Bailey Ave. (iron and steel scraps)—friction saw similar to Ryerson No. 3.

N. Y., Buffalo—W. H. Prentice, Inc., 669 Main St.—equipment for addition to furniture factory at 472 Franklin St.

N. Y., Geneva—J. G. Henry, Patterson Ave.— saws, carpenter tools and shop equipment. to replace that which was destroyed by fire.

N. Y., Mayville—Brace Mfg. Co., W. D. Brace, Purch. Agt.—machinery and equipment for small plant for the manufacture of pet-cock control device.

N. Y., Newark—United States Pulp Product Co., Inc. (manufacturer of pulp egg carrier)—machinery and equipment for proposed plant, to replace that which was destroyed by fire.

N. Y., New York—Patron Machine & Millwright Co., 118 Center St., E. Patron, Purch Agt. — miscellaneous woodworking machinery and one wood top saw table.

N. C., Durham—Star Bakery Co.—dough mixer.

N. C., Washington—Susman Gin Co.—machinery for the manufacture of cotton batting.

N. C., Waynesville—Rhodolite Corp., c/o S. A. Jones—mining machinery for mining rhodolite, red garnet and corundum for output of 600,000 ton per year.

O., Cleveland—Lees-Bradner Co., 6210 Carnegie Ave.—Cincinnati Bickford radial drill.

O., Columbus—Central Refractories Co., Atlas Bldg. (manufacturer of brick and clay products), C. B. Young, Pres.—brick making machinery for plant at Shawnee.

O., Columbus—Ohio Co., 391 Dennison Ave., C. H. Slaughter, Genl Mgr.—metal working machinery, also shearing and slotting equipment.

O., Dayton—Burba Service, Box 1046—8 x 12 in. Chandler & Price and 8 x 12 in. Gordon job press, both for electric power.

O., Elyria—The city, Director of Public Service—receiving bids until Oct. 10 for a small gas driven locomotive crane with ½ yd. bucket for handling coal.

O., Mansfield—Humphrey Mfg. Co.—5 ton and 7½ ton electric traveling cranes.

O., Warren—Packard Electric Co. (manufacturer of transformers)—machinery for proposed $350,000 addition to plant.

Okla., Cardin—J. T. Henderson—Landis stitcher for shoe shop.

Pa., Pittsburgh—Carnegie Steel Co., Carnegie Bldg.—stationary crane on concrete caisson foundation, ice breakers, etc., for coke unloading dock at Mingo Junction, O.; conveyor system for loading coal on river barges at Wilson.

Pa., Pittsburgh—Hachmeister-Lind Chemical Co., Island and Leonard Sts.—machinery for the manufacture of magnesite building materials for plant at Sarnia, Ont.

Pa., Sharon—Maniscalco New Power System Co. (manufacturer of power plant equipment), P. Maniscalco, Purch. Agt.—equipment for proposed plant at Bellevue, O.

S. C., Lancaster—Harker Hardware Co.—machinery for the manufacture of horse collar pads.

S. D., Woonsocket—F. Oddy (job printer)—linotype.

Tenn., Memphis — Rhea Coal Co., 831 Rezelle St.—loading and unloading equipment.

Tex., Temple—D. H. Buchanan—air drill with tank and compressor, 6 x 6 in.; double hoist and gas engine.

Va., Danville—Smith Cutlery Co.—machinery for the manufacture of shears, trimmers, etc.

Va., Suffolk—Planters Nut & Chocolate Co.—complete machinery.

Wash., Tacoma—Port of Tacoma, Natl. Bank of Tacoma Bldg., G. M. Osgood, Ch. Engr.—90 ft. electric crane with track and equipment.

Wis., Cambria—Arlington Canning Co., c/o Cambria Canning Co.—vegetable canning machinery, belting, shafting and hangers for proposed $50,000 plant at Arlington.

Wis., Cedar Grove—Cedar Grove Shoe Mfg. Co.—shoe working machinery equipped with individual motors for proposed $42,000 factory.

Wis., Denmark—Dufleck Bros.—woodworking machinery for proposed $50,000 factory for the manufacture of cheese boxes, etc.

Wis., Elcho—C. W. Fish Lumber Co.—woodworking machinery for proposed $75,000 factory.

Wis., Grandmarsh—A. L. Peters—conveyor, chutes, etc., for lime bins, 2 car capacity.

Wis., Janesville—Wilcox Co., 859 South Main St.—equipment, including crushers, hoppers, conveyors, hoists, etc., for gravel plant.

Wis., Knellsville (Belgium P. O.)—N. J. Johnannes—pea canning machinery, conveyors, belting and shafting for proposed $40,000 canning factory at Cleveland.

Wis., Madison—Madison Medical Assn., c/o R. S. Ingersoll, Lakeside St.—laundry machinery, including dryers.

Wis., Milwaukee—Braman Coal Co., 1283 8th Ave., P. Braman, Purch. Agt.—coal hoisting and conveying machinery.

Wis., Milwaukee—Kelly Candy Co., 656 49th St., P. L. Kelly, Purch. Agt.—candy making machinery, including dippers, mixers, heaters, kettles, etc.

Wis., Milwaukee—Larsen Bros., 1201 Oakland Ave. (millwork)—large circle saw.

Wis., Milwaukee—Quality Envelope Co., c/o T. P. Luker, 714 Hadley St.—paper cutter and trimmer.

Wis., Monroe—Harvey Paper Products Co., Knight Bldg.—one trimming and one folding machine, also presses to stamp out paper cups and containers.

Wis., North Milwaukee—W. P. Schwartzburg, 43rd St. and Hammond Ave.—air compressor and gasoline pumps for proposed $40,000 garage.

Wis., Portage—Genl. Cigar Co., B. Shannon, Mgr.—conveyors for proposed $40,000 sorting plant at Prairie du Chien.

Wis., Tripoli—H. H. Stolle, R. F. D. (sawmill)—resaw, bandsaw and rip saw, all belt driven.

Wis., Wausaukee—Laun Bros. Co.—circular and bandsaws, woodworking machinery, etc., for lumber and sawmill.

N. S., Halifax—E. B. Batson Co., Lower Water St. (machinery dealer)—sawmill blowers, lathes, etc.

Ont., Buckland — P. Lawson — planing mill machinery.

Ont., Coyne—White Rock Mining Co., Ltd., W. McVittie, Purch. Agt.—sawmill equipment and small stamp mill, probably 2 stamp.

Ont., Hawkesbury—O. Menard, Vankleek Hill Rd.—dovetailer, etc., for sash and door factory.

Ont., Hawkesbury—Rochon & Fils, Main St., E.—vise, drill, emery wheel, etc., for garage.

Ont., Kenebec—Triangle Silver Mines, Ltd., W. H. Jeffrey, Purch. Agt.—4 drill compressor.

Ont., Kirkland Lake—Baldwin Gold Mining Co., Ltd., J. A. Cherry, Secy.—mining machinery and mill.

Ont., Kitchener—Salts & Chemical, Ltd.—equipment for proposed $1,000,000 plant for the extraction of glauber and other salts from a mineral lake at Dana, Sask.

Ont., L'Orignal—E. Le Blanc—forge, punch, shears, etc., for blacksmith shop.

Ont., Plantagenet—A. Robinson—emery stand and wheel for garage.

Ont., St. Eugene—O. Surprenant—vise, hand tools and chain hoist for garage.

Ont., South Indian—L. Bellefeuille—blacksmith shop equipment.

Ont., Sankleek Hill—T. D. McConnell, Main St.—emery wheel, stand, etc., for garage.

Ont., Sankleek Hill—Review Printing Co., W. J. Duncan, Purch. Agt.—job printing press.

Que., Barrette—H. Briere—sawmill equipment.

Que., Bellerive—E. Godard—drag saw, bandsaw, etc., for sawmill.

Que., Bellerive—S. Lacaille—woodworking machinery for veneer mill.

Que., Belle Riviere—H. Urbain—panel and mortiser machinery for sash and door factory.

Que., Hebert—Painchaud & Miquelon (sawmill)—bandsaw, rip saw, etc.

Que., Lachute—E. Charlebois—equipment for cabinet work, also for the manufacture and repair of furniture.

Que., Lachute—O. B. Lafleur & Fils, Ltd.—woodworking machinery for the manufacture of furniture.

Que., Lachute—W. M. Scott—stone cutting machinery.

Que., Mont Joli—R. Fournier—vise, bench tools, etc., for blacksmith shop.

Que., Mont Laurier—S. Ouellette—planing mill equipment.

Que., Mont Laurier—I. H. Portelance—cold saw, forge, etc., for blacksmith shop.

Que., Montreal—Z. Berthiaume & Fils, 694 Alma St., A. Berthiaume, Purch. Agt.—reamers, saws, etc., for lumber mill.

Que., Montreal—N. Blain, Ltd., 68 Casgrain St. (carriages, etc.)—wood and metal working equipment.

Que., Montreal—M. Carson, 421 Colonial Ave.—paper cutter with 20 in. blade.

Que., Montreal—The city, R. Bauret, Clk.—two automobile pumps, 1,000 gal. capacity.

Que., Montreal—Denmans, Ltd., c/o S. H. R. Bush, 112 St. James St.—machinery for manufacturing, curing and packing food products.

Que., Montreal—E. B. Evans, 600 Clarke St.—complete equipment for blacksmith shop.

Que., Montreal—J. Galipeau, 508 Moreau St. (patterns and models)—burr planer, etc.

Que., Montreal — Grauel & Co., 28 St. George St.—rip saw, cutoff saw, etc., for pattern shop.

Que., Montreal—Kenehan Wagon Co., Ltd., 225 William St., F. Kenehan, Purch. Agt.—shears, drills, etc.

Que., Montreal—Laurier Pattern Wks., 346 Delormier Ave., J. Laurie, Purch. Agt.—wood turning lathe.

Que., Montreal—P. T. Mitton, 1106 Clarke St.—woodturning lathe, planer, etc.

Que., Montreal—Nichols Chemical Co., Ltd., 222 St. James St.—compressor and concentrating mill.

Que., Montreal—Quebec Felspars, Ltd., c/o H. N. Chauvin, 232 St. James St.—crushing, washing and smelting equipment.

Que., Montreal—M. Zarbatany, 429 Viger St.—oil tank, pump and compressor.

Que., Rigaud—D. Brazeau—forge, bench tools, etc., for blacksmith shop.

Que., St. Amour—A. Legault—sawmill equipment.

Que., St. Anselme—A. Begin—foundry equipment.

Que., St. Hippolyte—D. Labelle—mortiser, planer, etc., for sawmill.

Que., St. Jovite—J. Venchestein—traveling carriage saw and bandsaw.

Que., St. Vincent de Paul—A. Jolicoeur—bench tools, etc., for automobile repair shop.

Que., Three Rivers—Three Rivers Harbour Comn., J. J. Ryan, Secy.—machinery for loading and unloading ships.

Que., Turgeon—A. Robidoux—swing cutoff saw, etc., for sawmill.

Nfld., St. Johns—Newfoundland Milling Co., Ltd., C. B. Jaqua, 453 Park Ave., Paterson, N. J., Dir.—equipment for flour mill at Harbour Grace.

Metal Working Shops

Calif., Alhambra (Los Angeles P. O.)—The Southern California Edison Co., 306 West 3rd St., Los Angeles, will build a general supply plant, including warehouses, shops, sheds, etc., here. Cost between $500,000 and $650,000.

Calif., Glendale (Los Angeles P. O.)—The Rogers Una-Drive Truck Corp., 105 East Colorado St., is having plans prepared for the construction of a 1 story, 70 x 390 ft. motor truck factory on Colorado St. Estimated cost $200,000. Austin Co., Bartlett Bldg., Los Angeles, Archts. Noted May 31.

Calif., Los Angeles—The Baldwin Motor Co., 1201 South Figueroa St., awarded the contract for the construction of a 4 story, 75 x 200 ft. garage. Noted Sept. 13.

Calif., Los Angeles—J. Delmas, San Francisco, is having plans prepared for the construction of an 8 story, 150 x 150 ft. garage on 6th St. and Kenmore Ave., here. Estimated cost $500,000. Walker & Eisen, Pacific Finance Bldg., Los Angeles, Archts.

Calif., Los Angeles—Gibson & Goodspeed, c/o Edwards Bldg. Co., contractors, 6330 Hollywood Blvd., awarded the contract for the construction of a 2 story, 65 x 225 ft. garage on Selma Ave. Cost will exceed $40,000.

Calif., Modesto—W. D. Miller awarded the contract for the construction of a 1 story, 80 x 100 ft. automobile service building on 11th and G Sts. Estimated cost $40,000. Shaw Motor Co., lessee.

Calif., Oakland—The Pacific Spring Bed Co., 180 New Montgomery St., San Francisco, plans to build a plant on a 3 acre site, here.

Calif., Oakland—The Victor Talking Machine Co., Front and Cooper Sts., Camden, N. J., will build a 1 and 2 story factory on 78th Ave., here. Noted June 7.

Calif., San Francisco—The Grinnell Co., 453 Mission St., manufacturer of automatic sprinklers and supplies, is having plans prepared for the construction of a 1 and 2 story, 90 x 240 ft. factory on 5th and Brannan Sts. Austin Co. of California, Santa Fe Bldg., San Francisco, Archts.

Calif., San Francisco—The Otis Elevator Co., 2300 Stockton St., has had plans prepared for the construction of a 2 story, 137 x 275 ft. shop and office building on Grant Ave. and Beach St. Cost will exceed $250,000. Private plans.

Calif., San Francisco—The Pelton Water Wheel Co., 19th and Harrison Sts., awarded the contract for the construction of a 2 story factory on Florida St. Estimated cost $100,000. Noted Sept. 6.

Calif., San Pedro—L. J. Harris, 1939 Gaffney St., is having plans prepared for the construction of a 1 story, 50 x 150 ft. garage on 13th and San Pedro Sts. A. G. Bailey, Junior Orpheum Bldg., Los Angeles, Archt.

Conn., Hartford—Long Bros., State St., are having plans prepared for the construction of a 1 story, 60 x 240 ft. garage on Market St. Estimated cost $40,000. F. C. Walz, Trumbull St., Archt.

Conn., New Haven—The Connecticut Co., 22 Church St., awarded the contract for the construction of a 1 story, 68 x 208 ft. garage and machine shop for automobile buses. Estimated cost $60,000. Noted Aug. 16.

Ill., Chicago—C. W. Lampe, Archt., 155 North Clark St., is receiving bids for the construction of a 1 story, 112 x 150 ft. factory on Adams and California Sts. for J. D. Wallace & Co., 1401 West Jackson Blvd., manufacturer of machinery. Estimated cost $50,000.

Ill., Chicago—The G. F. Marchant Co., Rockwell and 14th Sts., machinists, awarded the contract for the construction of a 1 story, 73 x 124 ft. addition to its factory. Estimated cost $40,000.

Ill., Chicago—Morton, Leviton & Co., Archts., 123 West Madison St., are receiving bids for the construction of a 1 story, 125 x 127 ft. garage and store at 921-35 North California St. for S. Skobel, c/o Archts. Estimated cost $60,000.

Ill., Mason—The Illinois Coal Corp., Old Colony Bldg., Chicago, awarded the contract for the construction of a 1 story, 40 x 140 ft. warehouse, 50 x 140 ft. shop, 60 x 60 ft. power plant, also hoist engine house. Estimated cost $150,000.

Ill., Maywood—Ulrich & Esch, 815 North 2nd St., are receiving bids for the construction of a 1 story, 57 x 100 ft. garage on 5th St. Estimated cost $40,000. J. A. Chicare, 8 North 5th St., Maywood, Archt.

Ky., Lexington — The Baker Car Co., Lafayette Bank Bldg., plans to build a 1 story, 80 x 400 ft. factory. Estimated cost $30,000.

Ky., Louisville—The Standard Sanitary Mfg. Co., 6th and Shipp Sts., is having plans prepared for the construction of a 1 story, 65 x 200 ft. enameling shop, including six ovens. Estimated cost $75,000. F. Erhart, Norton Bldg., Louisville, Archt.

La., Shreveport—Hughes Bros. are having plans prepared for the construction of a 1 story garage and salesroom. Estimated cost $20,000. S. Van Os, Merchants Bldg., Shreveport, Archt.

Md., Baltimore—The Bd. of Fire Comrs., Cay St., plans to build a repair shop.

Mass., Boston—The Hunt-Spiller Mfg. Co., 383 Dorchester Ave., awarded the contract for the construction of a 135 x 140 ft. foundry. Estimated cost $150,000. Noted May 31.

Mass., Boston—T. S. and E. J. Owen, 174 Blue Hill Ave., awarded the contract for the construction of a 2 story, 75 x 112 ft. garage on Rand St. Estimated cost $50,000.

Mass., East Walpole—Bird & Son, manufacturer of roofing products, awarded the contract for the construction of a 1 story, 80 x 140 ft. machine shop. Estimated cost $40,000.

Mass., Waltham—The J. L. Thomson Mfg. Co., South St., manufacturer of riveting machines and hammers, awarded the contract for the construction of a 3 story, 50 x 225 ft. machine shop. Estimated cost, including machinery, $100,000.

Mass., Williamsett (Holyoke P. O.)—B. F. Perkins & Son, 1 Crescent St., Holyoke, awarded the contract for the construction of a 2 story mill building on Chicopee St., here, the first unit of larger plan. Estimated cost $50,000.

Mass., Worcester—The Hyde Machine Co., 13 Hope Ave., awarded the contract for the construction of a 2 story, 72 x 100 ft. addition to its factory. Cost between $40,000 and $50,000.

Mich., Lansing—The Federal Drop Forge, South Washington St., awarded the contract for the construction of a 1 story, 50 x 60 ft. heat treatment plant.

Mich., Lansing—The Olds Motor Wks., foot of Division St., awarded the contract for the construction of a 1 story, 37 x 100 ft. heat treatment plant and a 1 story, 40 x 40 ft. oil storage building.

Mo., Kansas City—A. F. Seested, c/o Kansas City Star, 1715 Grand Ave., is having plans prepared for the construction of a 3 story, 64 x 246 ft. garage, machine shop and sales rooms. Estimated cost $100,000. J. G. Brecklein, Federal Reserve Bank Bldg., Kansas City, Archt. Oakland Motor Car Co., 1521 McGee St., lessee.

Mo., St. Louis—N. B. Howard, Arcade Bldg., is receiving bids for the construction of a 2 story, 106 x 124 ft. garage.

Mo., St. Louis—W. E. Rhodes, 715 Chestnut St., awarded the contract for the construction of a 1 story, 50 x 100 ft. garage on Easton St. Estimated cost $40,000.

Mo., St. Louis—A. Roy, 4455 Manchester Ave., will build a 1 and 2 story, 98 x 125 ft. garage. Estimated cost $40,000.

Mo., St. Louis—The Wabash Ry. Co., Railway Exch. Bldg., awarded the contract for the construction of an addition to its locomotive and car repair shop on 7th St. Estimated cost $175,000.

N. Y., Brooklyn — The Kenmore Bldg. Corp., c/o M. Courland, Engr. and Archt., 389 5th Ave., New York, will build a 2 story garage on Tillary St., here. Estimated cost $50,000.

N. Y., Brooklyn—G. Merceca, c/o C. P. Cannella, Engr. and Archt., 1163 Herkimer St., will build a 1 story garage on Norwood Ave. Estimated cost $45,000.

N. Y., Brooklyn—C. Modica, c/o T. Goldstone, Engr. and Archt., 50 Graham Ave., will build a 1 story garage on East 29th St. Estimated cost $75,000.

N. Y., Buffalo — The Ford Motor Co., Highland Park (Detroit P. O.), plans to build an assembly plant on a 40 acre site, here. Cost will exceed $500,000.

N. Y., New York—The Dykman Heights Realty Co., c/o Shampan & Shampan, Archts., 188 Montague St., Brooklyn, will build a garage on 213th St., here. Estimated cost $100,000.

N. Y., New York—H. Hoffman, c/o H. A. Koelble, Archt., 114 East 28th St., awarded the contract for the construction of a 4 story garage on Mt. Eden Ave. Estimated cost $80,000.

N. Y., New York—The Lorington Constr. Co., c/o G. E. Milter, Engr. and Archt., 1482 Bway., will build a garage on Longfellow Ave. and 139th St. Estimated cost $150,000.

N. Y., New York—The Maxmoor Realty Co., c/o J. M. Felson, Engr. and Archt., 1133 Bway., will build a garage on Jackson Ave. Estimated cost $75,000.

N. Y., North Tonawanda—The Amer. Kardex Co., Inc., Main St., plans to build an addition to its plant. Cost will exceed $100,000.

N. C., Charlotte—The Pyramid Motor Co., 403 North Tryon St., plans to build a 3 story, 70 x 200 ft. garage. Estimated cost $75,000. Engineer or architect not selected.

N. C., South Rocky Mount (Rocky Mount P. O.)—The Atlantic Coast Line Ry., Atlantic Coast Line Bldg., Wilmington, will receive bids until Oct. 10 for the construction and 1 and 2 story, 100 x 320 ft. and 50 x 150 ft. coach shop and a 1 and 2 story, 100 x 320 ft. and 50 x 200 ft. paint shop, here. J. E. Willoughby, Ch. Engr.

O., Akron—The Anaconda Copper Mining Co. plans to build four 2 story mill buildings at Bettes Corners. Estimated cost $500,000.

O., Canton—The Arctic Ice Machine Co., 916 Market Ave., S., plans to build a 2 story addition to its factory. Estimated cost $23,000.

O., Cleveland—The Cleveland Refrigerator Co., 6600 Sideway Ave., awarded the contract for the construction of a 1 story, 88 x 124 ft. factory. Estimated cost $5, 000. F. Pietrowsky, Pres.

O., Cleveland—The Eaton Axle & Spring Co., East 65th St. and Central Ave., is having plans prepared for the construction of a factory. Estimated cost $100,000. G. S. Rider & Co., Century Bldg., Cleveland, Archts.

O., Cleveland—A. W. Harman, Society for Savings Bldg., is having plans prepared for the construction of a 3 story, 65 x 120 ft. garage at 1718 East 18th St. Estimated cost $100,000. A. Sogg, 319 Hippodrome Bldg., Cleveland, Archt.

O., Cleveland—R. C. Patton & R. T. Hisey, 536 Engineers Bldg., are receiving bids for the construction of a 1 story, 45 x 280 ft. garage on East 82nd St. and Crawford Rd. Estimated cost $60,000. L. Skolnik, 6th St. Clair Bldg., Cleveland, Archt.

O., Galion—The Galion Iron & Mfg. Co. is having plans prepared for the construction of a 1 story, 50 x 160 ft. foundry. Estimated cost $50,000. A. Jones, Market Bldg., Galion, Engr.

O., Steubenville—F. Scott, Studebaker agent, is having plans prepared for the construction of a 2 story automobile service station and garage. Estimated cost $100,000. W. S. Ferguson Co., 1900 Euclid Ave., Cleveland, Archts.

O., Warren—The Packard Electric Co., manufacturer of transformers, awarded the contract for the construction of a 2 story, 110 x 220 ft. addition to its plant. Estimated cost $350,000.

Pa., Johnstown—The Penn Public Service Co., 535 Vine St., awarded the contract for the construction of a 2 story, 56 x 106 ft. garage on Fend St. Estimated cost $70,000. Noted Aug. 30.

Pa., Phila.—The R. W. Hartnett Co., 1010 Race St., awarded the contract for the construction of a 3 story, 49 x 93 ft. factory for the manufacture of printing machinery at 1025-27 Cherry St. Estimated cost $50,000. Noted Sept. 6.

Pa., Phila.—C. W. Rudisnill, c/o N. Pealey Co., 1615 Spruce St., is receiving bids for the construction of a 2 story, 130 x 156 ft. garage on 55th and Sansom Sts. Estimated cost $200,000. Private plans.

S. D., Rapid City—H. E. Swander is having plans prepared for the construction of a 2 story, 75 x 140 ft. garage. Estimated cost $40.000. J. C. Ewing, Rapid City, Archt.

Tenn., Memphis—The Ford Motor Co., 740 Union Ave., C. Alexander, local representative, plans to build an assembly plant on Riverside Blvd.

Tex., Amarillo—The Amer. Metal Co., c/o Chamber of Commerce, is having plans prepared for the construction of a zinc smelter. Cost will exceed $500,000. Private plans.

Tex., Amarillo — The New Jersey Zinc Co., c/o Chamber of Commerce, is having plans prepared for the construction of a zinc smelter. Private plans. Cost will exceed $500,000.

Tex., Dallas—The Ford Motor Co., Highland Park (Detroit P. O.), Mich., is having plans prepared for the construction of a 2 story, 150 x 200 ft. automobile assembly plant, here. A. Kahn, 1000 Marquette Bldg., Detroit, Archt.

Tex., Dallas—J. E. Morris, 120 North Lancaster St., plans to build a 1 story, 75 x 185 ft. garage on 9th and Lancaster Sts. Estimated cost $50,000. Engineer or architect not announced.

Tex., Fort Worth—The Edrington Investment Co., 13th and Lamar Sts., awarded the contract for the construction of a 2 story garage. Estimated cost $115,000.

Tex., Fort Worth—The P. Garrett Motor Co., 1107 Commerce St., plans to build a 2 story garage. Engineer or architect not announced.

Tex., Fort Worth—The Texas Steel Mills will build a steel mill, including blast furnace, etc., on South Hemphill St. Estimated cost $80.000. J. F. Foster, Supt. Constr.

Va., Portsmouth — The Southern Brake Shoe Co. plans to build a foundry along tracks of the Belt Line R.R.

Wis., Delevan—A. Schumacher is having revised plans prepared for the construction of a 2 story, 36 x 68 ft. and 20 x 62 ft. garage. Estimated cost $50,000. H. C. Hengels, 445 Milwaukee St., Milwaukee, Archt. Noted May 24.

Wis., North Milwaukee—The North Milwaukee Fdry. Co., Commerce Ave., is receiving bids for the construction of a 1 story, 65 x 100 ft. addition to its foundry. Estimated cost $40,000. Private plans.

Wis., Racine—The Racine Investment Co., 401 Lake Ave., awarded the contract for the construction of a 2 story, 80 x 120 ft. garage on Lake St. Estimated cost $50,000.

Wis., Rice Lake—The C. O. Ronning Co. will soon re-advertise for bids for the construction of a 2 story, 50 x 160 ft. garage. Estimated cost $60,000. Johnson & Griswold, Wisconsin Block, Superior, Archts. Former contract rescinded. Noted July 26.

Wis., Plymouth—J. E. Curtiss plans to build a 2 story garage and repair shop. Estimated cost $40,000 Engineer or architect not selected.

Ont., Elora—The T. E. Bissell Co. plans extensions and alterations to its plant for the manufacture of farm implements. Estimated cost $30,000.

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Pratt & Whitney Gear Tooth Grinding Machine

By ELLSWORTH SHELDON
New England Editor, *American Machinist*

A machine built around an idea—Faces of grinding wheels represent tooth profiles of rack—An ingenious adaptation of a mechanical movement—A true generating machine

AS AN incentive to the study of mechanical problems and to the consistent progress of development toward perfection of detail, not alone in accuracy of workmanship but in strength and adaptation of materials, in the conception of ingenious mechanisms, in the concentration of design and in the remarkable advance in processes of production, the automobile easily takes precedence over any single invention within the realms of mechanics.

To few of the parts that go to make up an automobile has the research engineer contributed more of his attention than to the gears through which the power of the motor is applied. These gears are called upon to carry heavier loads in proportion to their size than almost any other form of gearing, and in their regular service are subjected to conditions that none but the most carefully calculated and accurately made gears would be able to withstand.

It is necessary that such gears be hardened, but the hardening process causes distortion, and the effect of distortion is noise. The ideal transmission gear is one upon which the tooth profiles have been ground to shape after hardening, so that not only are the evil effects of distortion counteracted but slight errors in cutting are eliminated as well.

The grinding of such gears is by no means impracticable and in many of the better cars ground gears are used in the transmissions, but this grinding is looked upon as a comparatively slow operation, adding its burden of expense to production, and it is not practiced so generally as it otherwise would be. The purpose of this article is to set forth a new conception in the art of gear grinding and to describe an ingenious machine that has been built around the idea.

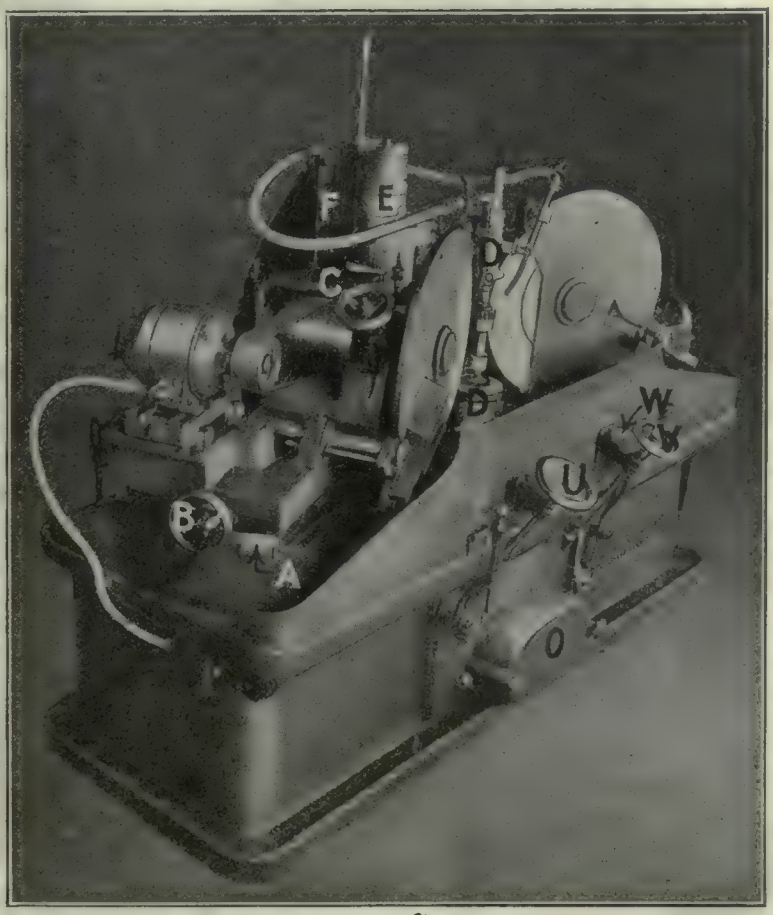
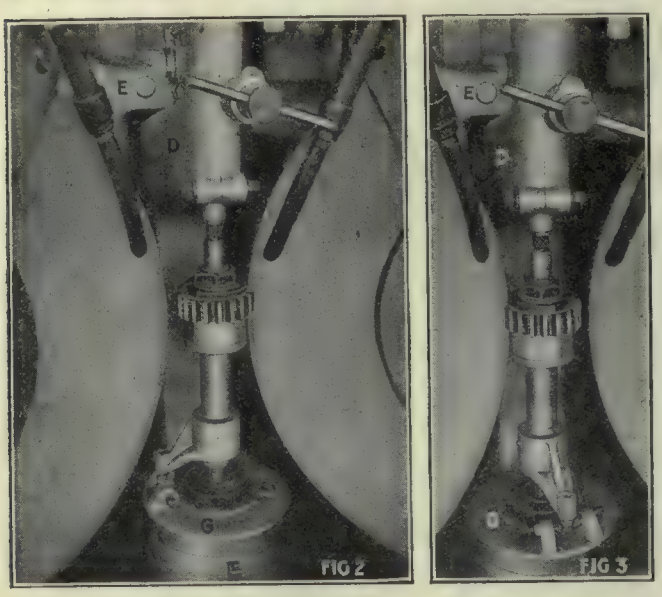


FIG. 1—THE PRATT & WHITNEY GEAR GRINDING MACHINE

The premises upon which the conception is based are: First, that the high degree of accuracy of tooth contour necessary to the quiet performance of gears running at high speeds under heavy loads can most certainly be attained by the continued application of very light grinding cuts rather than by a lesser number of proportionately heavier cuts, because of the reduced tendency of possible original errors to persist by reason of the inevitable "spring" of the grinding

wheel, work and work carrying mechanism, as well as because of the wider distribution and consequent reduction of error due to wheel wear; and second, that in order to reach a satisfactory rate of production by this means the cuts must be made in extraordinary rapid succession and with unerring precision. To whichever part it is applied—wheel or work—the movement must



FIGS. 2 AND 3—OPPOSITE POSITIONS OF THE WORK

be continuous, without reversal of direction or appreciable pause for indexing.

How simple, and yet how complete, has been the solution of the apparently prohibitive mechanical difficulties involved, may be discerned in the following description of the rotary gear-tooth grinding machine developed by the Pratt & Whitney Co., New York, N. Y., from a conception based upon the above premises.

In Fig. 1 is shown the general appearance of the machine. The grinding wheels are two in number, 24 in. in diameter, and of a modified saucer shape. The active grinding surface is a narrow band at the edge of the outer side (nearest the observer) of each wheel, and is a plane surface. The periphery of the wheel does not touch the work and the wheel thickness is somewhat less than the space between two consecutive teeth of the gear, so that only the plane surface referred to touches the gear being ground.

Each wheel is independently mounted upon a head that is capable of adjustment in two directions in a horizontal plane, and of swiveling to any desired angle within the limitations required by the various practical pressure angles of gears. A graduated arc and vernier reading to minutes are provided at *A** to facilitate the angular setting. The primary slide, operated by a screw and the handwheel *B*, may be moved in a direction at right angles to the wheel spindle, and the secondary slide, operated by the handwheel *C*, provides for adjustment in a direction parallel to the wheel spindle. All of these movements are for adjustment only; the wheels in action have no movement other than that of rotation.

The wheels are independently driven by electric motors mounted upon the respective primary slides. The pulleys upon the wheel spindles are considerably wider of face than the driving belts, so that adjustment of the secondary slides will not disturb their alignment.

The gear to be ground is held, with its axis vertical, between centers that are carried by the frame *D*, which is so suspended from the column of the machine that, while the line of its work centers is rigidly confined to parallel positions, it cannot move vertically, but is otherwise free to move in any direction. The restraining influences which confine the movement of the gear to an arbitrary path are within the base of the machine below the frame.

In Figs. 2 and 3 are shown two opposite positions of the work, Fig. 2 showing the gear as it is receding from the point of observation and rolling a tooth profile over the face of the grinding wheel to the right, exactly as if the latter were the tooth of a rack. Fig. 3 shows the same gear coming forward after the machine has passed through one-half of its cycle, and rolling the opposite profile of a different tooth in a similar manner over the wheel to the left.

The Swinging Work Carrier

In these two figures the letter *D* indicates the first member of the movable frame, which is supported by ball bearings at top and bottom of the secondary member *E*, the latter being swung in a similar way from a bracket on the column of the machine. This bracket, which may be seen at *F* in Fig. 1, has a vertical movement for convenience of assembly only, but does not move during the operation of the machine.

In Fig. 4 is a view of the machine from about the same point of observation as in the preceding illustration; but with the grinding wheels separated by running back their respective slides, and the work head raised about 8 in. for the purpose of making the necessary changes to adapt the machine to the grinding of a different sized gear. The position of the upper end of the work spindle is indicated by the letter *G*, which part is a circular driving plate screwed to the spindle, and which also acts as a guard to prevent water and abrasive dust from working into the bearings.

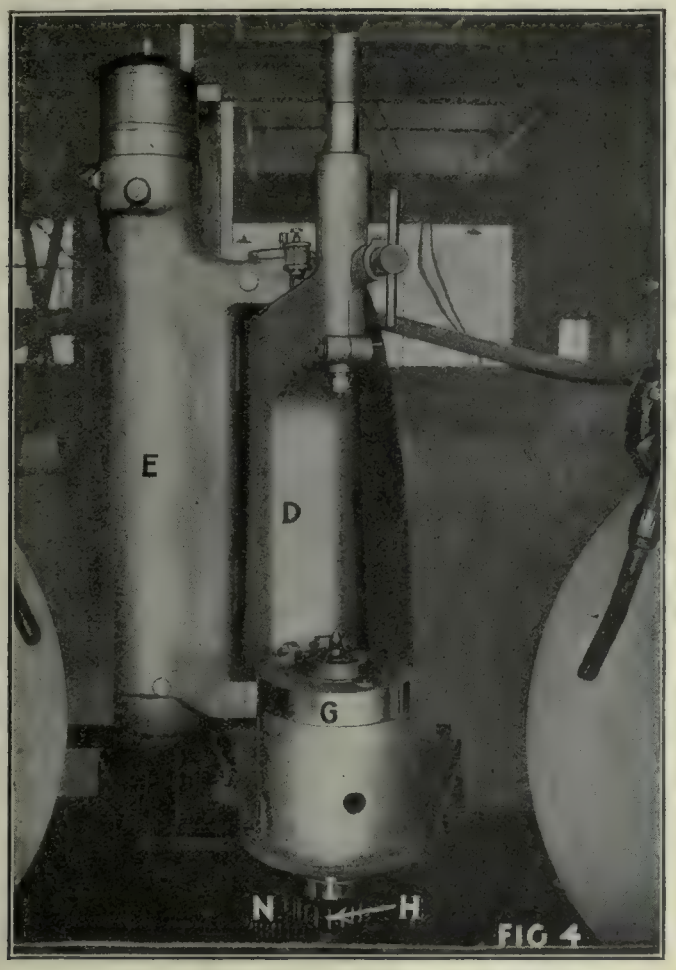
At *H* and *I* may be seen, respectively, the master-gear and the guide bearing or roller, which, with the toothed track *J* and smooth track *K*, Fig. 5, are the elements that define the arbitrary path in which the work must travel. All of these parts (which are in effect but two, as *H* and *I* are mounted as one unit, while *J* and *K* are similarly united as another unit) must correspond to the characteristics of the gear to be ground, and are therefore changed each time the machine is changed from one size of gear to another.

The Feeding Movement

The casting *L*, Fig. 5, is called the "feed slide." It is not, strictly speaking, a slide, although it has a slight movement forward and back under control of a feed cam within the base. Instead of sliding on bearings it is supported by three heavy flat springs, placed in a vertical position, and its movement of ⅛ in. is by flexure of these springs.

The upper surface of the slide is level and its position in the machine is directly under the master-gear *H*, as shown in Fig. 4. All parts shown in Fig. 5 are in working position except frame *D*, which is raised and swung to one side. To the master-gear is fastened the frame *M*, containing the toothed track *J* and smooth track *K* which, once their final position is determined, become permanently a part of the frame. To change

*Each individual reference letter used in this description indicates its respective part of the machine without regard to the number of the figure in which it may appear.



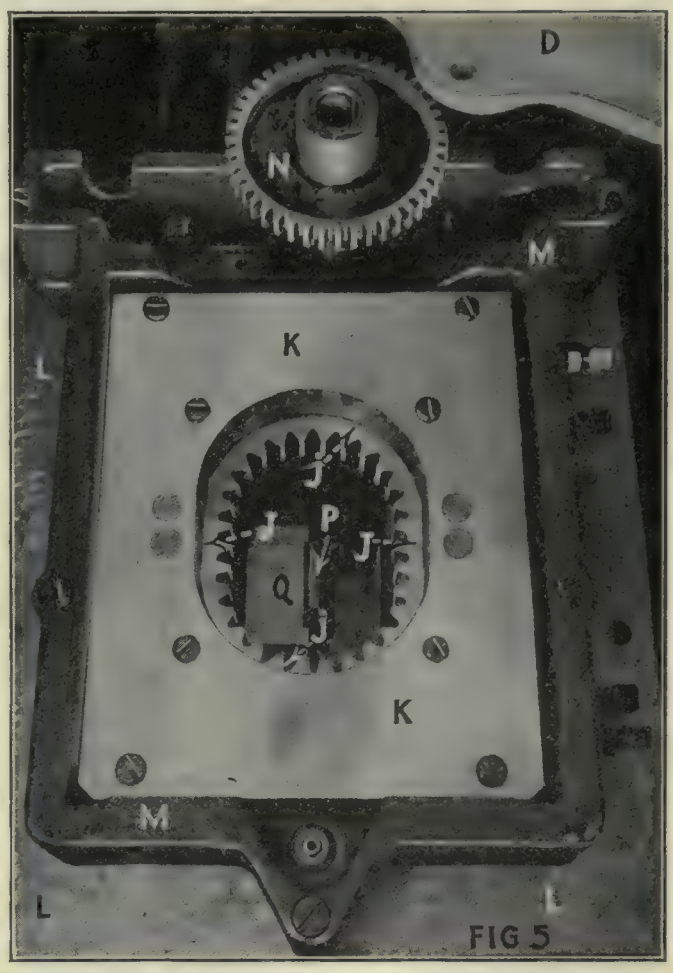


FIG. 4—FRAME LIFTED FOR CHANGING OVER THE MACHINE. FIG. 5—CONTROLLING UNIT AND DRIVING GEAR

these parts for others when resetting the machine, it is necessary only to draw the fillister-head screws that hold the frame and to lift the latter off the key that locates it on the slide.

It must be understood that the frame *D* is in no way attached to the feed slide *L*. The master-gear *H* and guide bearing *I* are within the opening formed by the parts *J* and *K* when the machine is assembled in operating position, and these parts therefore confine the movement of the free end of the frame to their own shape and limits. As the feed slide is moved forward or back the outer end of the frame must, perforce, follow it; but this does not interfere with the movement of the frame as the master-gear rolls in its orbit.

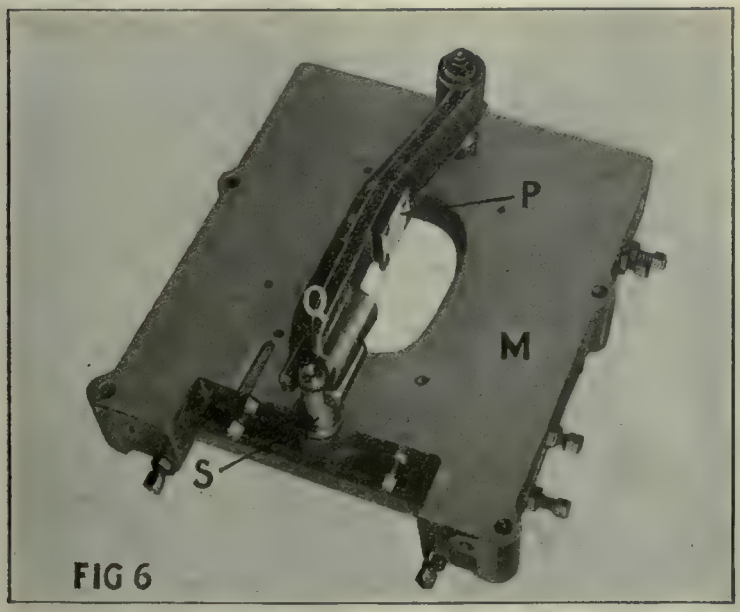




FIG. 6—UNDER SIDE OF CONTROLLING UNIT. FIG. 7—FACE OF CONTROLLING UNIT (REMOVED FROM MACHINE)

The gear N is keyed to the upper end of a shaft in which there is a universal joint, so that the gear, while rotating, is free to move a limited distance in any direction in a horizontal plane. A stud in the under side of the frame fits into the bronze bushing of the gear and thus constrains the latter to follow its movements. Gear N meshes with an intermediate gear, also running upon a stud in the underside of the frame, and that gear in turn with a gear that is keyed to the work spindle above the master-gear. Gear N is thus the driving element, receiving its power through the universal jointed shaft from a separate motor located in the rear of the machine base and transmitting it through the intermediate to the master-gear H, which is at once the cause and the controlling influence of the rolling motion of the work.

Construction of the Tracks

The smooth track K has the appearance of being an ellipse but is not so in fact, its contour being oblate rather than elliptical. The toothed track J, to the shape of which K must conform, is made up of the four separate pieces $J\,J$ and $j\,j$, of which $J\,J$ are straight racks and $j\,j$ the halves of a truly circular internal gear, separated from each other by the length of the racks.

Parts $J\,J$ lie parallel to each other, and are made as nearly to theoretical perfection as is possible to accomplish. Accuracy of tooth form in parts $j\,j$ is a minor consideration, as the work does not contact with the grinding wheels while the master-gear is engaged with them, but the number of teeth in each is of vital importance.

The number of teeth in the master-gear must bear a definite *aliquant* relation to the total number in the toothed track; that is, the relative number of teeth must be such that a given tooth of the master-gear will not again enter the *same* tooth of either rack $J\,J$ until the machine has completed a number of cycles equal to the number of teeth in the gear to be ground.

With the above conditions in mind, together with a knowledge of the functions of the various parts, we can now trace the action of the machine.

As the master-gear H travels around its oblate path, the gear to be ground rolls in harmony with it around a similar, but imaginary, path upon a level with the centers of the grinding wheels. As the master-gear rolls over either of the rack sections $J\,J$ the gear above it rolls over a very real rack tooth projecting into its imaginary path—which rack tooth is the active surface of one or other of the grinding wheels.

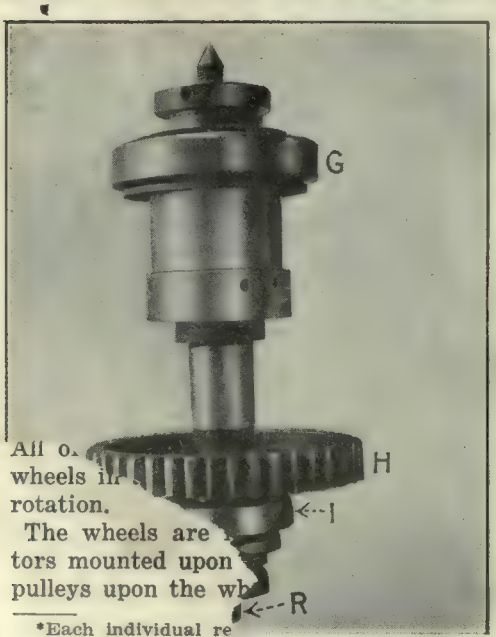
As the total number of teeth in the track is necessarily greater than the number of teeth in the master-gear, the first impression is that the latter in passing through one cycle must have made more than one complete revolution about its axis. As a matter of fact it has not done so, for the reason that while it is rotating in a clockwise direction about its own axis, the axis is being carried around the orbit in a counter-clockwise direction, and one full revolution of the gear in each cycle has been nullified, or cancelled, by this reverse movement. The actual forward rotation of the gear in any one cycle is, therefore, equal to the difference between the numbers of teeth in the master-gear and the track.

This differential progress constitutes the indexing movement. There is no pause or hesitation in either the continuous clockwise rotation of the gear or in the counter-clockwise rolling of the parts around the orbit; yet the grinding wheels cannot possibly come a second time in contact with any given tooth of the gear until all the teeth have passed once over them.

Indexing and Feeding the Work

What has been said of one grinding wheel is, of course, equally applicable to the other. The second wheel grinds the opposite profiles of the teeth as the master-gear rolls over the corresponding rack, and therefore both sides of every tooth have been ground once when the number of cycles has equalled the number of teeth in the gear.

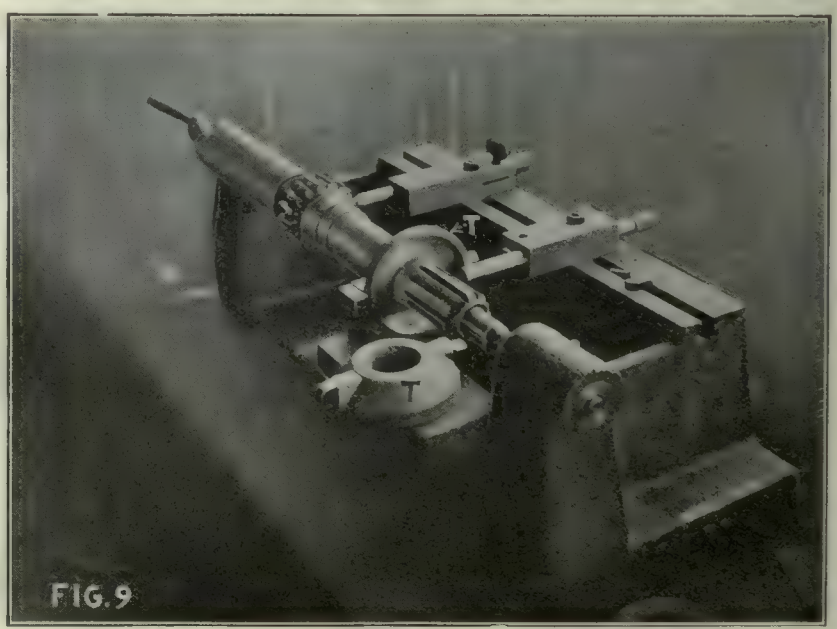
At the beginning of the operation the feed-slide is in such position that neither grinding wheel touches the work. As the slide slowly and continuously advances under the action of the feeding cam, the teeth of the gear are brought into contact with the grinding wheels. This feeding movement continues until the gear is ground approximately to size. The grinding, however, continues after the feed has stopped until sufficient



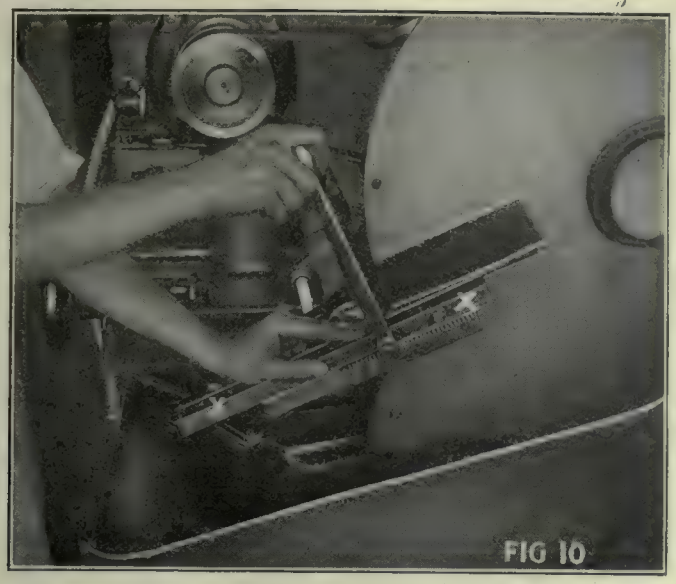
All o… wheels i… rotation.

The wheels are … tors mounted upon … pulleys upon the wh…

*Each individual re… cates its respective … number of the figure



WORK SPINDLE, MASTER-GEAR AND GUIDE BEARING. FIG. 9—WORK SETTING DEVICE



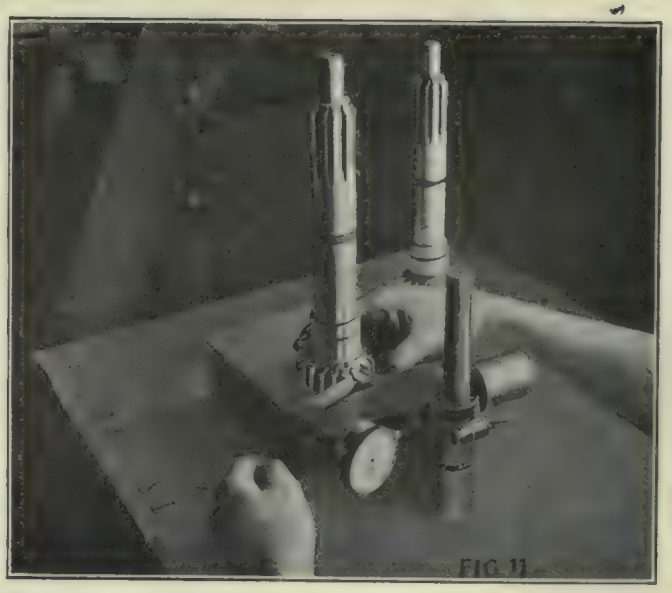


FIG. 10—DRESSING THE GRINDING WHEELS. FIG. 11—MEASURING THE NORMAL PITCH WITH THE ODONTOMETER

"spring" has been ground out to bring the gear to the desired accuracy, as is common to all precision grinding operations. A small amount of stock is, of course, removed after the feeding movement is stopped, but it is removed in very minute quantities.

To take a concrete example: Let us assume the machine running at the rate of 150 cuts per minute, the feed being 0.0004 in. per cut and the stock to be removed 0.004 in. At this rate ten cuts per tooth will remove the stock and ten cuts more per tooth will be sufficient to remove the "spring." A total of 20 cuts per tooth at the rate of 150 cuts per minute gives a time of 7.5 seconds per tooth. The number of cuts per minute is variable by means of change gears in the gear box *O*, Fig. 1, on the front of the machine. It should be noted in addition that the master-gear and toothed track also act as change gears.

Contact between the smooth track *K* and the guide bearing *I* provides a few thousandths of an inch backlash between master-gear *H* and toothed track *J*. This contact is maintained by the parts *P* and *Q* in Figs. 5, 6 and 7. The two latter figures show a complete unit removed from the machine and compare with *J*, *K* and *M* in Fig. 5, but for a different sized gear.

In Fig. 8 may be seen the work spindle with its master-gear and guide bearing belonging with the unit shown in Figs. 6 and 7. It will be noticed that in this unit the relative positions of parts *J* and *K* (and, of necessity, parts *H* and *I*, Fig. 8) are reversed; but this arrangement is for convenience only and does not affect the principle. In order to be able to raise the frame and draw the master-gear and guide bearing out of the controlling unit the larger of each of these two members must be uppermost.

How the Work Spindle Is Guided

At the lower end of the work spindle in Fig. 8 is a small guide bearing *R* which, when the machine is assembled in working position, travels around the contour of the projection *P*, Figs. 5 and 6. The size and shape of the projection is so calculated that when the small guide bearing *R* is in contact with it, the larger guide bearing *I* is also in contact with the smooth track *K* on which it rolls.

Part *Q*, Figs. 5 and 6, is pivoted at its rear end to the under side of the unit, and has at its forward end a spring-actuated plunger which contacts with the fixed stud *S*. By this construction the bar *Q* is forced towards the central position, but is moved slightly to one side or the other by the pressure of the small guide bearing *R* just mentioned.

Fully Protected Against False Movements

To one observing the machine in action for the first time a smash-up seems inevitable. When watching the gear dodging in and out between the rapidly revolving and fragile appearing grinding wheels so fast that its movements can hardly be followed by the eye, the impression is gained that sooner or later a tooth is going to land on top of one or other of the wheels.

As a matter of fact, a smash-up is impossible. The grinding wheels have no movement other than that of rotation, and the master track has but a slight movement relative to them. The relative positions of the work are accurately determined and rigidly maintained by the steel walls of the controlling unit. It is necessary only to make certain that every piece set into the machine bears exactly the same circumferential relation to the master-gear, and that condition is determined by the setting fixture shown in Fig. 9. Two driving arbors *T* are used, so that the operator may be setting one piece while the machine, which is automatic in its movements, is grinding another.

Having set the work and driving dog on the arbor in proper relation by means of the fixture, the operator places the work on the centers, turns the machine slowly by means of the handwheel U, Fig. 1, until the work has passed both wheels once and proved that he has made no error in the setting, and then he throws on the power.

The handwheel *V* is on the shaft that turns the feed cam. The latter is a peripheral disk cam having a slow rise, a dwell and a quick drop to starting position. It is worm driven from the same motor that rotates the work, may be stopped and started by a clutch or turned back by hand at will, and when it has made one complete turn the grinding operation is finished. The dial *W* is graduated to show in thousandths of an inch the advance of the feed slide.

The device for redressing the wheels is shown in

Fig. 10. The diamond is set in the end of the small round holder that is driven transversely into part *X*, which is a hardened and ground steel parallel. It is not attached to the machine in any way. The rest is attached to the primary slide and moved with it, but its position is not affected by adjustment of the secondary slide. It is, however, capable of adjustment in the same direction as the secondary slide, but it is seldom necessary (never in operating) to use this adjustment.

When the wheel requires redressing, the secondary slide is advanced perhaps 0.001 in. by means of its handwheel *C*, Fig. 1. The amount of this advance is not material, except that it be sufficient to insure a true face after the wheel is redressed.

The operator then takes up the dresser and lays it upon the rest with the pinion of the hand lever in mesh with the rack, and passes the diamond across the face of the wheel by means of the lever. The position of the dresser on the rest is determined by two hardened steel pins, and when the diamond has ceased to cut, the operator knows that the face of the wheel is in its original position. Dressing is done while the first roughing cuts are being taken, so that no time is lost.

In any gear grinding operation it is necessary to keep a constant watch upon the accuracy of the product, and this is here done by means of the Odontometer shown in Fig. 11 and designed to measure the normal pitch of gears. With this instrument it is possible to detect a departure from true normal pitch to a limit of accuracy of 0.0001 in., by bringing each tooth successively in contact with the measuring points and noting the error upon the dial.

Qualities of the Successful Employment Manager

By W. E. Richmond

IT DOESN'T matter what your job is, there are always a number of things connected with it which give you a chance to use any native intelligence you have, in handling it well. It is not, of course, the soft job that brings out all that is in you, yet an employment manager could well dispense with some of the handicaps connected with his work, the overcoming of which take time and effort which could be expended to better advantage.

The successful employment manager must study and classify correctly not only the needs and wants of the plant as a whole, but the whims and preferences of each individual, from foreman to manager, who has anything to say about the type of employee he desires.

Theoretically, the employment manager hires, trains, promotes and discharges all employees, functioning in this capacity to fully co-operate with all department managers so as to produce as nearly perfect a personnel as the environment in which the plant is situated will permit.

Practically, the building up and maintaining of a nearly perfect personnel organization requires not only full co-operation of the employment manager with the superintendents, but the manager must have from each of them individually, and all of them collectively, all the support they are capable of rendering. Here enters the personal element. Each boss, from foreman to general manager has his whims, idiosyncrasies, preferences and ideas, all more or less fixed, which he will not or cannot change when it comes to co-operating with some one else. So, the employment manager must exercise a nimble wit when, for the bests interests of all concerned, he knows that it is desirable or necessary to get around some of these corners.

The employment manager cannot be sentimental—these other chaps as a rule have not wholly learned that they should not be sentimental. Some one's prejudices against red or bobbed hair, the excessive use of a vanity case, too high heels on her slippers, and a thousand and one such little details have often kept deserving girls from landing in good positions, but, the point is here, the girl chosen because of some superficial favorable characteristics was not, from the standpoint of efficiency, necessarily the right one.

One foreman can dig more ditch with Mexican labor, others with Italian, Greek, or white. Another will use anything but a Swede or an Irishman, while still others want all of them they can get. A chief engineer of my acquaintance frankly states that he "hates railroad engineers," yet I never have persuaded him to tell why.

Then there is the superintendent that is sure that the last man he sees is the best one. He always regrets having made a choice, as he is sure that the present applicant is a better one.

Personal likes and dislikes, within reason, must not influence a superintendent who is after results. If of the type that is so influenced, he must learn to rely on the judgment of the employment manager as superior to his own. This is a hard dose for some to swallow, but they have been known to do it. Within the limits of the policy of a firm a man must be measured by what he accomplishes, not by whether we like him or dislike him. Overlooking bad qualities because of one good quality, and the reverse, is not profitable if no effort at correction is made.

Give the Capable Assistant a Chance

Here and there may still be found a foreman who will try to prevent you from hiring an assistant for him who is so good that he may work the foreman out of his job. Such cases confirm my statement that an employment manager must remove the word "sentiment" from his vocabulary.

There is one type of man in positions of more or less authority who hates or dislikes others who may be under or over him, because they know more about some things than he does. A slight change in his point of view will cause him to realize that he knows a lot that they do not, and that he can make it his business to learn anything that they know if it is desirable to add that knowledge to his fund. Then he can learn to like instead of hate his fellow workers, because they prod him into increasing his own value.

As it is more fully realized how indulgence in personal sentimental whims and fancies on the part of superindents "gums up" the smooth working of personnel management and directly adds to the already too high general cost of labor turnover, this expensive pastime will decrease in popular favor. When all is said and done, the whole effort of the employment manager today is, always within his limits, to make the entire personnel function as smoothly as the latest and very best engineering practice keeps the plant machinery running.

Development of Machine Tools in New England

BY GUY HUBBARD

The seventh article—Early gun making by the interchangeable system—Special machinery and tools brought out by the contract method—Payments made in land

IN 1835, Nicanor Kendall, a young gunsmith, became a son-in-law of Asahel Hubbard and was taken into the National Hydraulic Co. At this point there began with this concern, the second and a most important phase of the machine industry at Windsor—the quantity manufacture of firearms. The National Hydraulic Co. continued under the original name until 1839, when Asahel Hubbard sold out his entire interests to Mr. Kendall and moved "way out west" to Iowa—as numerous other Vermonters were doing at that time.



FIG. 37—ELI WHITNEY'S ARMORY, WHITNEYVILLE, CONN. (From a steel engraving made about the time of the civil war)

It appears that during his visit to that territory in 1831, on his "St. Louis horse," the inventor had invested his share of the cash proceeds of the St. Louis pumps in a "quarter section," at Davenport—which town was very attractive to him. In 1840 he settled permanently upon this quarter section and continued to exercise his engineering tastes, as well as his undoubted love of adventure, by becoming a surveyor of government land in Iowa. In the performance of this work, this pioneer mechanic met a rather untimely end on September 18, 1845. He died of fever in his surveyor's camp in the wilds of Mahaska County, Iowa, more than a hundred and fifty miles from a human habitation. His body was carried to Davenport by his Indian guides, eventually being buried at Windsor within sound of the wheels of the industries which he set turning.

Before emigrating to the West the inventor sold the patent rights of his pump in Connecticut to Ezra Williams of Deep River, who manufactured them there in small sizes for more than twenty years. The site and water power of this Deep River pump factory is now occupied by the Pratt & Reid Ivory Co. which is the leading industry of that ancient tide-water town.

The inventor's son, Colman S. Hubbard, (1816-1877) who has been mentioned as his father's assistant and the foreman of the pump shop at Windsor, went to Deep River at the time of this sale in order to set up the pump manufactory for Mr. Williams. He later became a skilled gun maker and from 1860 to 1865 served as Secretary of the Whitney Arms Co. at Whitneyville, Conn. (Eli Whitney's Armory, see Fig 37) under Eli Whitney, Jr., who, during the civil war, was one of the most prominent manufacturers of rifles for the Government.

It may be mentioned that the revolving hydraulic engine, besides being continued by the Fales & Jenks Machine Co. in its original form, is familiar to all of us as the common rotary gear pump so universally used in the cooling and oiling systems of automobiles and for circulating the cutting compound and oil on machine tools. See Fig. 38.

For the latter purpose those modern machine tool industries at Windsor and Springfield, Vt., which are direct descendants of the National Hydraulic Co., have of late years manufactured literally thousands of the rotary pumps, so indirectly the original industry is still very much alive in the very region where it came into being but little short of a century ago.

Nicanor Kendall, whose portrait is shown in Fig. 39,

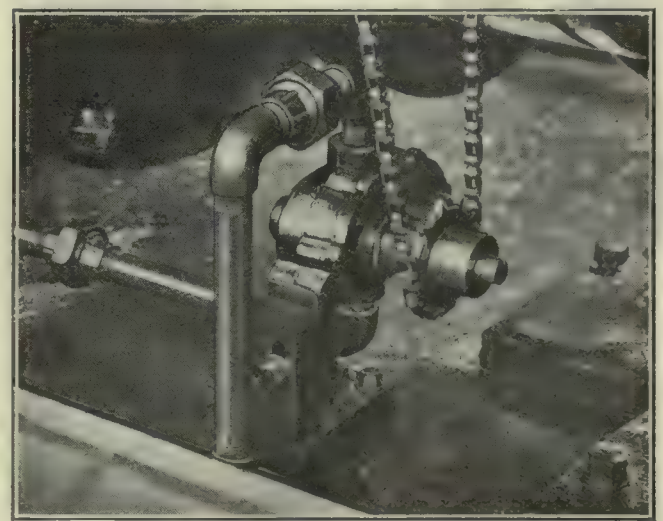


FIG. 38—THE OIL PUMP ON MACHINE TOOLS IS ESSENTIALLY THE REVOLVING HYDRAULIC ENGINE

was born in the West Parish, now called West Windsor, December 20, 1807—the son of the village blacksmith. Working in his father's shop after hours while he attended the district school, he learned the trades of blacksmith and wheelwright, which in country villages were closely allied. Being dissatisfied with this rough sort of work, "Cain" or "N." Kendall, as he was generally called, perfected his practical knowledge of the mechanic arts as an assistant in the shop of Asa Story, the gunsmith of the West Parish, who was engaged in building turkey and squirrel rifles on the Kentucky pattern to suit the needs of the farmers thereabout. He was called a custom gunsmith, just as tailors are called custom tailors today, for in those days expensive sporting rifles were "tailored to fit"—each careful marksman demanding his own special shape of stock, length and weight of barrel and twist of rifling.

During the latter part of the time when Asahel Hubbard was operating his shop between Windsor and the West Parish, Nicanor Kendall became, for certain reasons, a frequent visitor there. One day when this young gunsmith and the daughter of the house were riding in a sleigh along one of the country roads, he noticed a gray squirrel in a tree nearby and having one of Story's side hammer percussion rifles with him, he started to draw it from beneath the buffalo robe. As he did so the hammer caught, and falling, exploded the charge when the muzzle was in his hand and apparently pointed directly at the young lady's head. Believing his right hand to be blown to pieces, Kendall thrust it under the robe and, horror stricken, turned to see what the fate of his companion had been. To his intense relief he found that at the moment of the explosion she had chanced to lean out of the sleigh to look back so, aside from being badly frightened, was uninjured. Without mentioning his own crippled condition Kendall drove hurriedly to the house of the village doctor, where he was further gratified to find that his hand, instead of being shattered was only burned, the ball having passed between his fingers.



FIG. 39—NICANOR KENDALL
(From an old photograph)

This accident inspired Mr. Kendall to invent a type of gun lock in which the trigger and hammer might be protected by the same guard. The result of his efforts in this direction was one of the cheapest, simplest, and most dependable locks ever devised. The mechanism, generally called "Kendall's patent underhammer lock" was eventually adopted as the standard type by all the custom gun makers of the Windsor district, including Asa Story, and is one of the "ear marks" of the thousands of percussion sporting arms manufactured in that district between 1835 and 1880.



FIG. 40—ORDINARY MUSKET LOCK

As the name suggests, the Kendall underhammer gun had the hammer beneath the barrel. This location, in front of the trigger, was originally chosen for the reason mentioned above, but the guard over the hammer was later on eliminated. The outstanding advantages of this lock are: that it is a unit with the breech block or "breech pin," thus doing away with the lock plate and its recess in the stock, which greatly simplifies the stocking of the rifle; that the top of the barrel is left clear for sighting and there is no danger of the shooter flinching from the sight of the falling of the hammer, or from fire from the cap; that the barrel is of the simplest possible form, being a plain tube with the cone screwed directly into it, through which the fire reaches the powder charge directly. It used to be a saying of the muzzle-loading gun that it consisted of but three parts, "lock, stock, and barrel" but in the standard side hammer type the lock, Fig. 40, was made up of no less than fourteen complicated pieces in all of which high accuracy was essential. As compared to this, the Kendall lock, Fig. 41, consisted of but seven simple parts, in none of which great accuracy was essential even under the interchangeable system. This made it possible for the country gunsmiths, with their small shops and crude tools, to compete with the large manufacturers as long as the percussion system was in use.

Manufacture of Underhammer Guns

Soon after his marriage in 1835, Nicanor Kendall went to work with the National Hydraulic Co. and interested his father-in-law, Asahel Hubbard, in the manufacture of the underhammer guns. Like the earlier productions of Asa Story, these rifles were patterned after the Kentucky models, which were small bore rifles of the Arabic style, very popular among backwoodsmen. The main departure from the Kentucky type was that the Kendall rifles, on account of the new lock, were

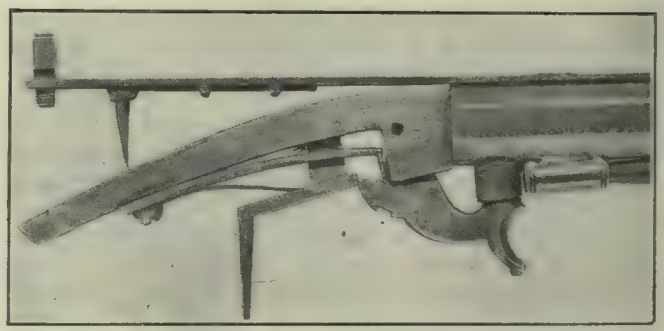


FIG. 41—KENDALL'S UNDERHAMMER LOCK
(Showing the Lawrence Peep Sight)

stocked only at the breech. The interchangeable manufacture of these arms was begun at Windsor on the "contract system," in the pump factory at the Vermont State Prison, by Kendall, Hubbard & Smith, Contractors, who made all the parts themselves with the exception of the barrels. The barrels, which were beyond the capabilities of their mechanical equipment, were forged, bored and rifled to specifications by Eliphalet Remington, whose portrait is shown in Fig. 42, a skilled gunsmith of Ilion, N. Y., from whose humble shop, Fig. 43, was destined to develop two industries which are today known the world over—The Remington Arms Co. and the Remington Typewriter Co. The Kendall rifles were sold through the already established agents of the Hydraulic Co. by which means wide distribution of the new firearm was immediately attained.

Because of the fact that both gunsmiths and the contract system are here mentioned for the first time and as both these craftsmen and this system had a profound influence upon American manufacturing, a word of explanation will not be out of place at this point.



FIG. 42—ELIPHALET REMINGTON, MAKER OF FIRST REMINGTON RIFLE

The gunsmiths developed from the ancient armorers, whose craft has been defined as a refined branch of blacksmithing. As the name suggests, the early gunsmiths were closely allied to the blacksmiths—they were in fact blacksmiths until well after the beginning of the 19th century. Old time firearms were built of high-grade hand forgings, which were dressed by filing to fit together and it was not until the development of the interchangeable system in America by Eli Whitney, that the gunsmith actually ceased to be a smith in the true sense of the word.

The interchangeable system was developed for the purpose of manufacturing army muskets, which were the first high grade mechanisms required in quantities and exactly alike. It was for the purpose of manufacturing such guns that the distinct improvement in machine tools and in machine shop systems was initiated in America. Thus it came about that instruments primarily designed for destruction brought about the great constructive movement, called by Henry Rowland in the *Engineering Magazine* of 1899, "the revolution in machine shop practice." As will be shown later on, this gun manufacture gave industrial supremacy to America and did so without the shedding of a drop of blood, for in the evolution of industry in New England, "swords were beaten into plowshares," in effect if not to the letter.

Under the interchangeable system, the gunsmith became a high grade machinist similar to our toolmakers of today and as soon as the development of this system resulted in the detailing of one step of the process to each workman, (the Subdivision of Labor it is called in Economics) the less skilled and even the unskilled were employed upon details under the direction of a gunsmith, who was thus able to enlarge his sphere of usefulness tremendously.

In the larger New England shops it soon became the custom for the experienced gunsmiths who were in charge of such organized groups of workmen, to take contracts for the production of large lots of certain parts of guns, (such as the locks, or some part thereof) the company furnishing shop room, heat, light, power, material and standard tools, while the contractor himself furnished and paid for the labor, superintended the work and devised and built his own special tools and oftentimes special machinery. Under this system it is evident that the quicker and more cheaply the contractor could do his work and still have it pass inspection, the more money he made and this was naturally a powerful incentive to the invention of improved tools, jigs, fixtures and methods, as well as to the cultivation of keen business and executive ability among the contractors. Therefore, not only did numerous improved machines come into being as a direct result of this system but also numerous industrial leaders began their careers as contractors in the old New England shops. The early introduction of the contract system at Windsor, will in some measure account for the numerous vigorous industrial offshoots therefrom.

In November, 1835, the American settlers in the territory of Texas organized as the "Lone Star Republic" and in consequence found themselves at war with the Republic of Mexico, which claimed sovereignty over them. These Texas patriots, who in common with other frontiersmen were devotees of the small bore Kentucky rifles, were in immediate need of quantities of such accurate firearms at the lowest possible price. Through its agents in New Orleans, the National Hydraulic Co. learned of this condition and being by that time organ-



Courtesy Remington Arms Co.

FIG. 43—ARMORY AT ILION—FIRST REMINGTON FACTORY

ized for the production of Kendall's underhammer guns at about half the price of the regulation army musket, the first large order, for several hundred of these new arms, came from the Texans. The old account books show that payments for these consignments of rifles were made in Texas land, no less than nineteen hundred and twenty acres being deeded to the Hydraulic Co. in 1836. As to the Kendall rifles, they were reported to have given excellent service and long remained a favorite type among the Texans. There was even a tradition, current years ago in Windsor, that David Crockett was armed with one of these rifles when the coon said, "Don't shoot, Mr. Crockett, I'll come down!"

The reference to the Texans' method of paying for

the guns brings to mind another great difficulty of widespread trade in those early days—that of exchange. Because of the slowness and uncertainty of communication, the undeveloped condition of the banking system of the country and the general lack of ready money, the question of the transfer of funds was a very puzzling one, especially where the parties to the dealings were far apart. Long accounts were run and finally there would be some transaction in the other direction or an exchange of notes which would go to balance the account. Barter and exchange were the prevailing methods of doing business and in spite of the large cash totals appearing upon the books, it was seldom that large amounts of cash actually changed hands. The dealers in the cities often exchanged such things as tools and raw material for pumps and guns, while the local trade frequently "swapped" such homely items as salt pork, turkeys, grain, homespun cloth, mittens, potatoes, maple sugar and even barrels of cider for the manufactured products. Aside from insuring the members of the company "three square meals" and the "cup that cheers," a connection was maintained with the general store in Windsor by which the surplus of such produce was eventually turned into cash.

The travelers for the Hydraulic Co. had no very "soft job," at least as compared to the salesmen of modern machine companies. Their journeys were almost as protracted as the voyages of the old whalers and, after leaving Windsor for some such point as Apalachicola, Fla., they would be separated from the home office for months. Their trips were made (in order of luxury) on steamboats, schooners, canal boats, stage coaches, Conestoga wagons, horseback and on foot and they often suffered all the hardships endured by the pioneers of those early times—hunger, thirst, fatigue and danger.

Calvin B. Cross, the last surviving traveler of the Hydraulic Co., who died not many years ago at Windsor at the age of nearly a hundred, used to tell of a time when his funds gave out in a small town in western Missouri, while on a selling trip and in order to raise money enough to continue his journey, he tended bar in a tavern for some time. It would have taken many weeks for a letter to have reached the home office at Windsor and, as the facilities for the safe transmission of funds were very meager, he would have had to have waited a long time for their receipt, if they ever reached him, so he adopted the only sensible course by which to earn the necessary money.

Nothing New Under the Sun

BY JOHN WRIGHT

Every once in a while something crops up to prove the truth of the old adage, "there is nothing new under the sun." It seems to me that wherever possible, when something turns up as "new," which was in use in fact or in principle years ago, the readers of your magazine should be fully informed, although I realize the difficulties in the way of an editor's knowing all the devices brought out for the past fifty years or so. I understand, too, that the *American Machinist*, by giving the news of developments in machines and tools, does not necessarily endorse them, and for that reason I can condone the omission, in the Shop Equipment News section, of references to tools of days gone by which were the same as, or similar to, something being described as just placed on the market.

To illustrate my point I refer to a type of cutter that was mentioned in your Shop Equipment News section not so long ago. The teeth of this cutter had the shape of a cantilever beam of uniform strength. No reference was made to previous existence of cutters with teeth of this shape, although as a matter of fact as far back as 1908 similar cutters were made by the Union Twist Drill Co., as shown by the accompanying reproduction of blueprint, Fig. 2, and shop order, Fig. 1, dated May 25, 1908. The cutters were made for R. Hoe & Co. I have no doubt that a search through the machine and tool shops of the country would reveal many such cutters far older than this one.

I have been much interested in the many historical articles appearing in the *American Machinist* from time to time, and hope that you will publish this short article as a contribution to any historical references to cutters that may be made or that have appeared.

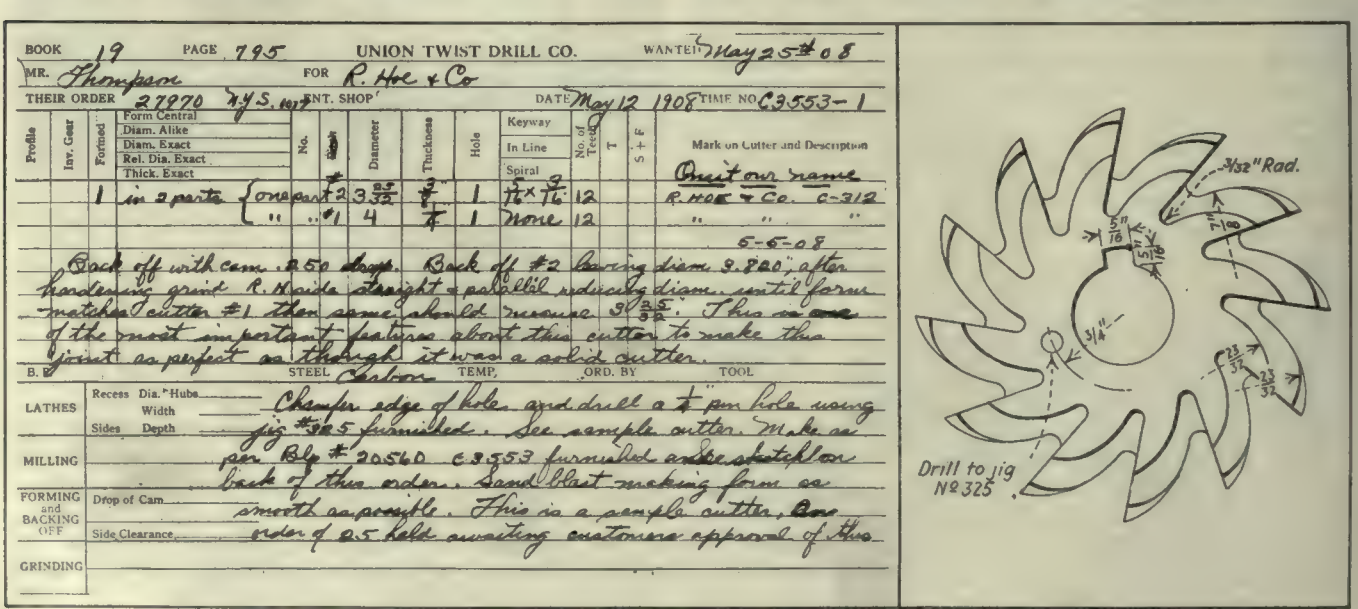


FIG. 1—SHOP ORDER FOR CUTTER. FIG. 2—SHAPE OF CUTTER

It Pays to Replace—

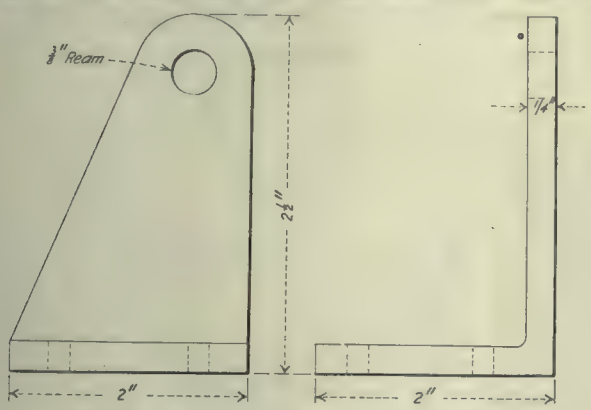
How a Shop Saved by Replacing Old Shop Equipment with New Equipment

These articles won honorable mention

By Everett L. Rudebock
Westinghouse Lamp Co., Bloomfield, N. J.

IN AN experimental department where much of the work is necessarily done by hand, and where usually only one piece or machine of a kind is made, costs often are ignored or lost sight of in order to get results. Especially does this apply to most of the men in the shop, whose chief aim, quite rightly, is to do a good job, and "make it work."

When it was decided to install a No. 1 Gardner disk grinder in our experimental department, after a number of workmen and others had expressed a wish for something of this kind, there was still some opposition and



WORK FINISHED ON A DISK GRINDER

head shaking, principally among those who knew only the old lap wheel, with its glued-on cloth disk. But when the new machine was set up, with its quarter-inch thick "G.I.A." disks, there was a general revision of opinion among the conservatives.

Many a job can now be done quickly and accurately that was formerly done much less effectively by such means as shaper, milling machine, lathe, filing machine, the side of any convenient grinding wheel, or the old reliable hand file. For instance, it is very much cheaper to face off the foot of a small bracket by holding it for a few seconds on the disk, than by setting it up in a milling machine or shaper and trying to "skin off the scale." Many small parts, whose finished surfaces are finished only for securing bearing on other finished parts, are now being disk ground instead of being faced in other machines.

One example of a kind of work frequently encountered in this department is shown in the sketch herewith. This part will eventually be a casting, but for a tryout the piece shown had to be made from angle iron. One way of doing it would be to "hog" it out of solid stock. Another would be to forge it from flat stock, and finish it in the shaper or surface grinding machine. What was done was to lay out the part on a piece of angle iron, spend a few strenuous minutes with a hacksaw, and then disk grind it all over in a few minutes more. Even if the part had been made from angle iron and finished by file and abrasive cloth, it would have taken at least three times as long to make as it took with the aid of the disk grinder, and if the mechanic had been as "fussy" as some, the job would have taken half a day instead of half an hour.

In addition to the saving of time, another important saving is effected because the machine is motor driven. This saving is in floor space, for the machine is set in a convenient but otherwise practically useless space, and no provision had to be made for putting it in reach of a line shaft.

Our disk grinder has had no medals pinned on it. The savings don't show, at least not where "he who runs may read." But they are there, nevertheless. More work is being done for a given appropriation, and faster and more accurate service is being secured in the building of experimental equipment. It is well known what a disk grinder can do on production, and this little instance is intended to give an idea what it can do on "one at a time" work. Our disk grinder has come to stay.

By Axel Halvorsen
Master Mechanic, McCormick Bros. Co., Albany, Ind.

HAVING contracted for quantities of an article which required one ring, as shown in sketch and three pieces of the smaller formation per article, and not having any special wire-forming machines in our equipment, ordinary punch presses had to be utilized. Therefore, dies were made to get production started. Afterwards we proceeded to look about for better equipment and the choice was a No. 3-24 Baird 4-slide wire-forming machine.

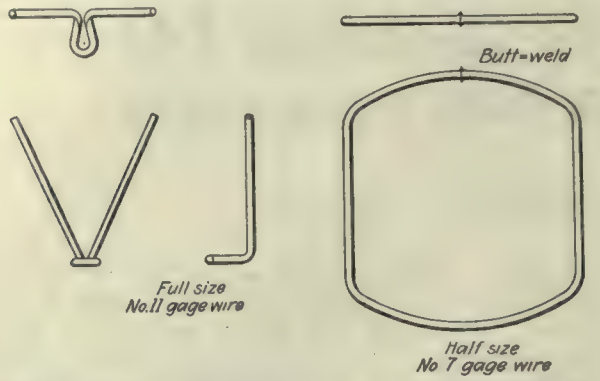
Production on the punch press required three operations for the small piece, first the wire was cut to length and followed by two forming operations and for all three operations was at the rate of approximately 5,000 or 6,000 per day. Production on the four-slide machine fitted with the proper dies and taking the wire from the coil, straightening, cutting off and forming complete, amounts to 15,000 or 16,000 pieces per day.

The large ring-shaped piece was produced on the punch press from two pieces of wire cut to proper length. Two pieces were necessary to take care of the spring of the wire and this necessitated two butt welds. The production for the press operation was about 4,000 per day. On the four-slide machine, the wire is taken from the coil, straightened, cut off and formed complete

In the contest, which closed July 5, nine prizes were given for articles telling how a shop saved by replacing old shop equipment with new equipment. The accompanying articles conclude the series.

in one operation and the production is increased to approximately 8,000 pieces per day. Moreover there is only one butt weld to make.

The difference in the production figures on the two



WORK ON WHICH PRODUCTION WAS INCREASED BY AN IMPROVED MACHINE

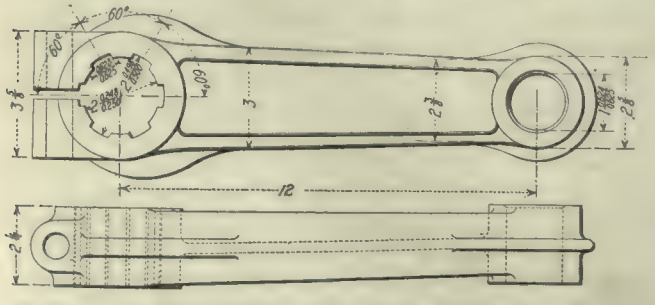
pieces of this article, made on the same machine, is accounted for by the difference in length of the wire in the formation. The smaller piece is cut 5⅞ in. while the larger is cut 24⅜ in. For the larger piece a coil of wire is required every hour and the machine must be stopped for replacement, while for the smaller piece two coils would not be used in a day.

The operator of the machine takes care of another machine of the same kind and build, but of a smaller size.

The figures for production stated above show that, by getting the proper equipment, production was more than doubled and a better article produced, and prove "it paid to replace."

By Thomas E. Warburton
General Foreman, Fitzgibbon & Crisp, Trenton, N. J.

IN THE course of our work we make quantities of crank arms having six keyways, ⅝ in. wide, ⅛ in. deep and 2¼ in. long, as shown in the accompanying drawing. We had been cutting these keyways on a well-known keyseating machine, equipped with a special indexing fixture but had trouble in getting the keyways parallel, owing to spring in the tool and guide bars. We also had considerable trouble through the breakage



A SUCCESSFUL JOB OF BROACHING

of the tools which were of special design and difficult to make, especially for a small shop that did not employ expert toolmakers.

We were at our wit's end as to how to get greater production and more accurate work, when the foreman of the department persuaded the boss to purchase a broaching machine from the Lapointe Machine Tool Co., Hudson, Mass. The boss was skeptical as to the glowing accounts the foreman had given him regarding the work that could be done upon this machine, but awaited results.

The machine, equipped with the necessary tools for our work, was installed. The men closely connected with the job were not optimistic and were looking for something to happen when we started the machine.

We put the first job in, and the signal was given to "Let her go," and she pulled the broach through in two minutes. All the keyways were parallel and within the limits as to size. The finish was excellent.

The story is not finished. On this job there were operations of boring and reaming. The material is cast steel, fairly tough, and we had trouble in keeping our reamers up to size. Now we bore the holes to within $\frac{1}{64}$ in. of size, put a cylindrical broach through them and forget the reamers. We have broached hundreds of these parts and never had the slightest trouble, every hole being to size and having a fine finish.

We have found many other uses for the broaching machine, one of which is broaching bushings after they have been pressed into place.

While the purchase of the broaching machine was a big outlay for a small shop, the end justified the means, and the moral is: It pays to equip with modern tools.

Good Service from Countershaft Clutches

By A. W. Forbes

Two articles have appeared recently in the *American Machinist* about countershaft clutches. One (page 58, Vol. 59) mentioned the importance of oiling the clutches regularly at least once a week, and the writer of the second (page 413, Vol. 59) could not make clutches work satisfactorily anyway. Not having had any trouble with our clutches since they were new, I had almost forgotten that there was any such thing in the shop. So I took the copy of the *American Machinist* out into the shop to check up the advice.

First I came to a boy using a turret lathe, and in reply to my question he said that the clutches on his countershaft were oiled about three months before. A toolmaker on another lathe said that he had oiled his about a month before. I showed him the article in the *American Machinist* which said they should be oiled every week, and he showed me the moist oil on each side of the clutches, indicating that it was still working out, and that further lubrication was not immediately necessary.

The fact that one of these machines has been in use ten years, the other having been bought second-hand six years ago, and that the bearings appear to be in good condition without any play that can be felt by hand, although they have not been taken apart or adjusted since they were installed, would indicate that the attention they are getting of an oiling every two or three months is sufficient.

In none of our machines do the clutches limit the output. It is always the belts. I do not know who made the clutches, but they were furnished by four different manufacturers of machine tools, they are of three different styles, and all give good service. The only attention they need is the occasional oiling mentioned, and the adjustment of the friction every year or two. Some of us find these clutches more satisfactory than the writers mentioned above.



Where Machine Tools Are Made

The Cincinnati Milling Machine Company

Founded 1884

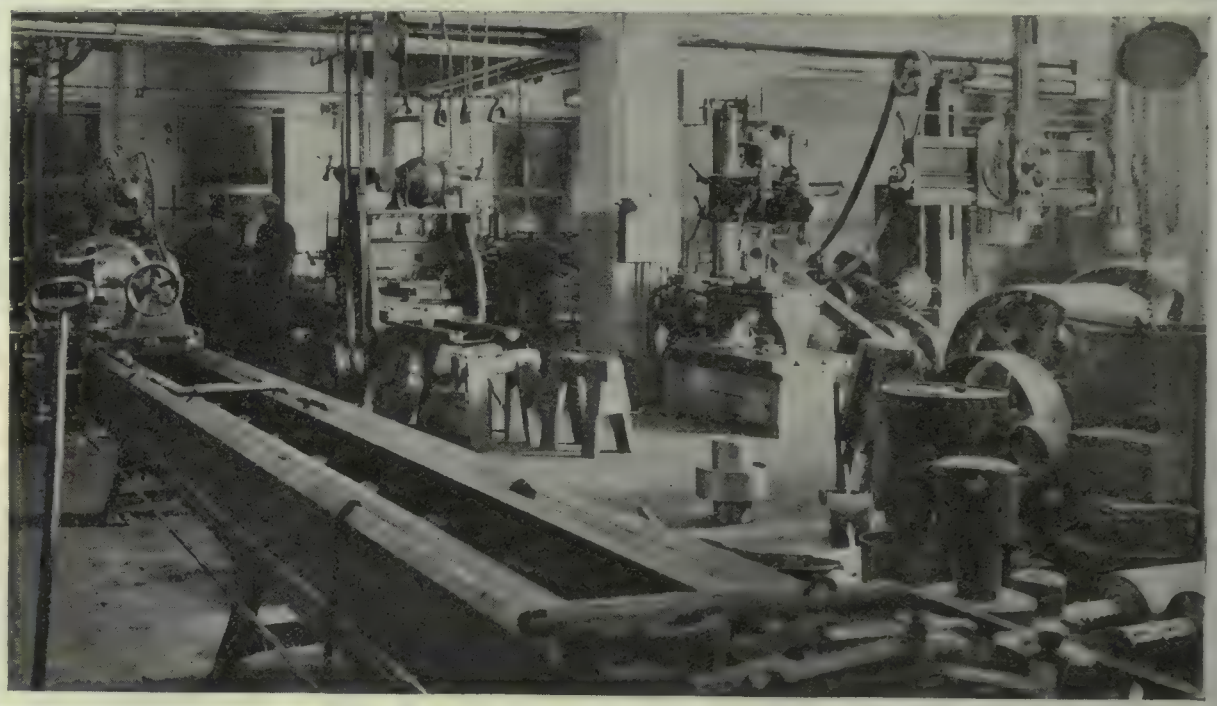






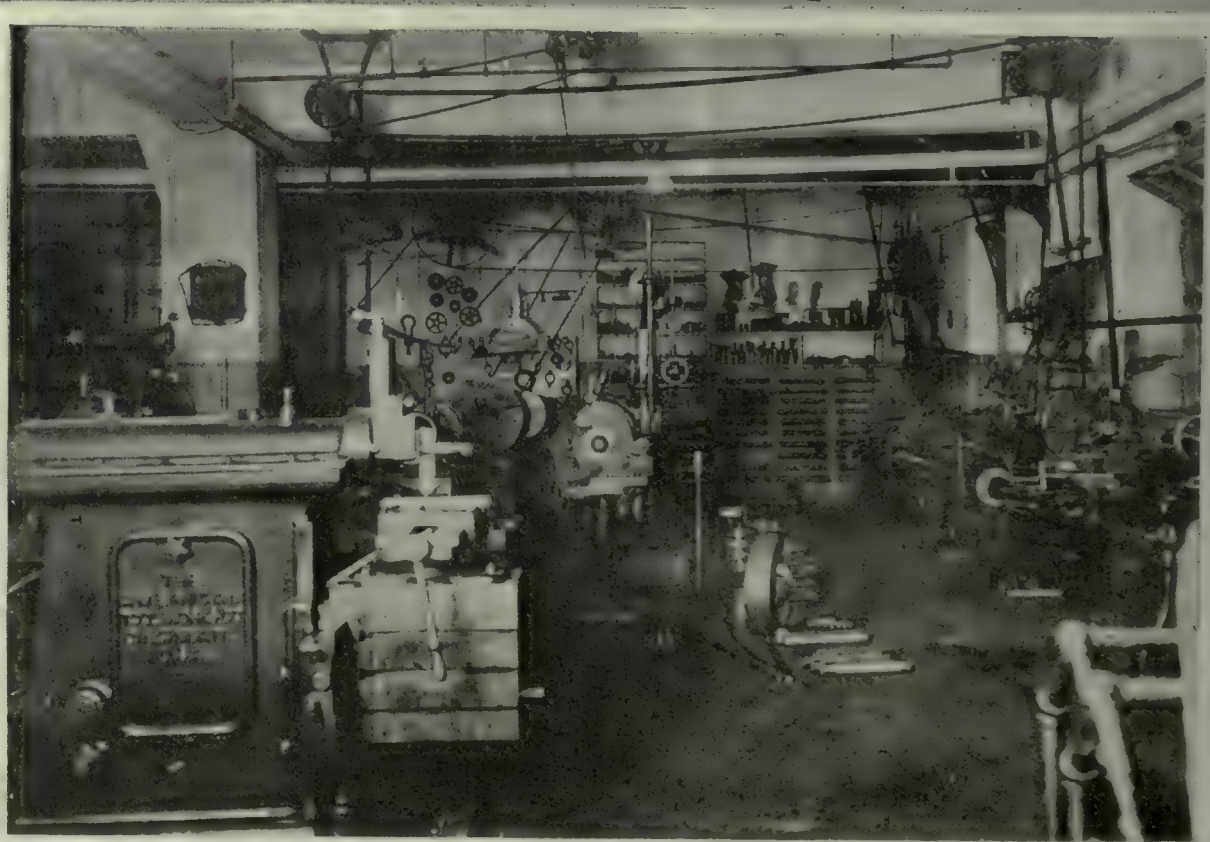
Central Tool Cribs (Above) *High Bay for Heavy Work (Below)* *Chemical Laboratory (Above)*





MACHINE TOOLS AND

Washburn-Crosby Co.

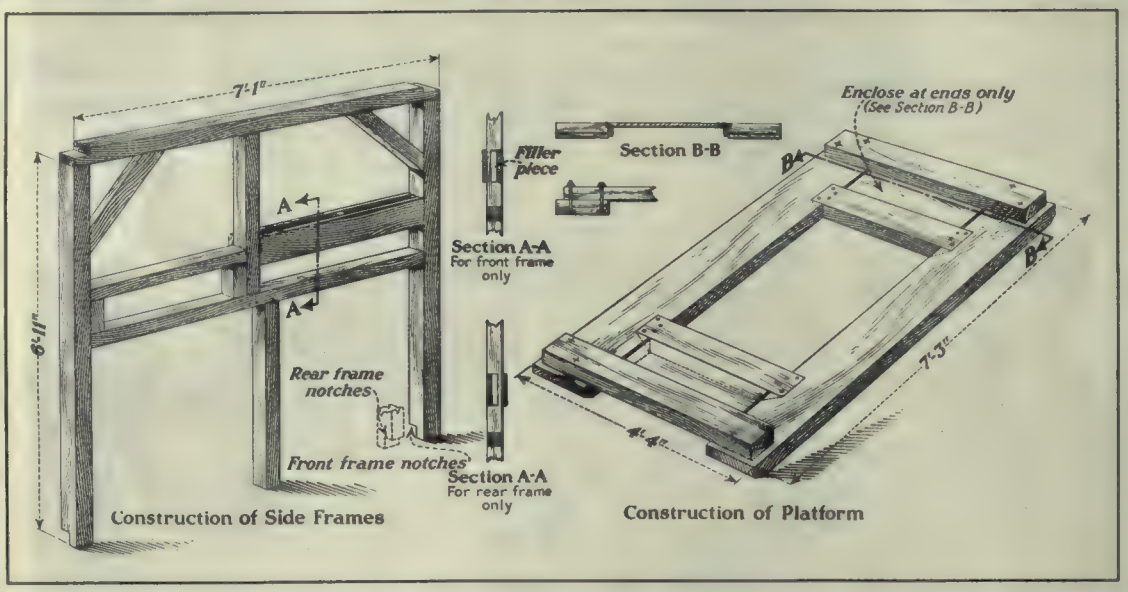




THE BREAD LINE

Pillsbury Flour Mills Co.



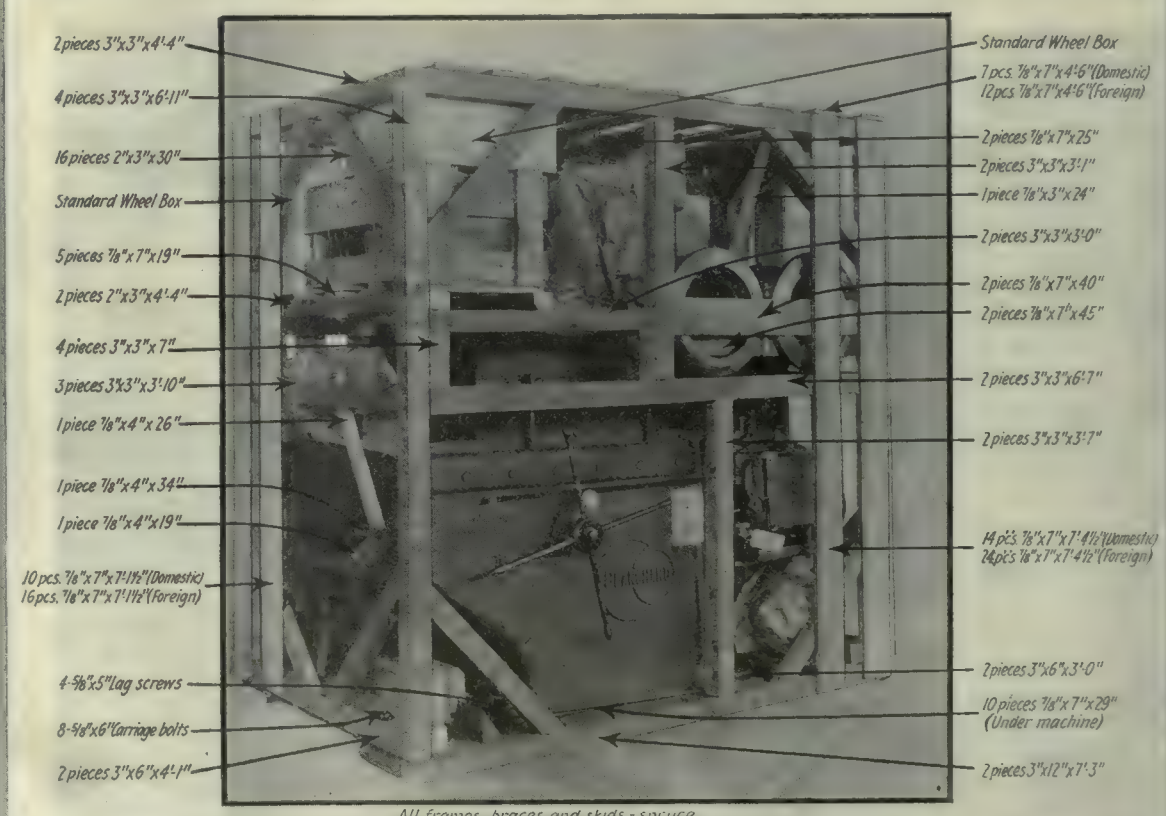


PACKING FOR SHIPMENT

THE BLANCHARD MACHINE COMPANY

Cambridge, Mass.

Crate for the №16 Vertical Surface Grinder



All frames, braces and skids - spruce
All 7/8" stock - North Carolina roofers
Note:- For foreign shipment the top and lateral boarding is continuous

Measuring Tooth Thickness of Involute Gears

By ERNEST WILDHABER

A new method which is not affected by errors in outside diameter—Ordinary vernier caliper used — Formula for standard measurement

THE tooth thickness of spur gears is measured in various ways. The most convenient methods, however, depend on the accuracy of the outside diameter of the gear blank, and errors in the outside diameter will usually spoil the measurement of the tooth thickness.

The following is a new method of measuring the tooth thickness of involute spur gears, which does not depend on the outside diameter, and is not affected by its errors. A gear tooth caliper must be set to the proper addendum, before the chordal tooth thickness can be measured, but no such setting is required by this method. All that is necessary is to measure a straight distance, which can be done with an ordinary vernier.

In the figure one-half of an eighteen-tooth gear is shown and a pressure angle of 20 deg. has been assumed. It is evident from the figure, that the distance *AB* between the outside profiles of adjacent teeth can be a measure for the tooth thickness. If the teeth of the gear are too thin, then the distance *AB* will be smaller than it should be. If, on the other hand, the teeth are too thick, then distance *AB* will turn out too large. Moreover, the straight distance between outside profiles of involute teeth is exactly the same in any direction normal to the tooth profiles. Thus, distance *DE* is the same as distance *AB* on involute teeth, and the distance taken in any other direction, within reasonable limits, would be the same as distance *AB*, provided neither point drops below the base circle. The distance between outside profiles is, therefore, a very convenient measure for the tooth thickness.

The lines *AB* and *DE* are tangent to the base circle *b*, and their length is equal to the length of the arc of the base circle between the points where the two involute outside profiles rise from the base circle. The distances *AB* and *DE* are therefore equal to the tooth thickness in the base circle, plus one circular pitch of the base circle, when referring to the case illustrated in the figure. The way of figuring distance *AB* will be worked out later on.

Distance *AB* depends primarily on the tooth number of the gear and on its pressure angle. It also depends on the number of tooth spaces left in between the measured outside profiles. In the figure the distance between the outside profiles of adjacent teeth is measured, and consequently there is only one tooth space left in between, but in gears of large tooth numbers it is frequently desirable to measure the distance between greater numbers of teeth, that is, to leave two or more spaces between the measured profiles.

In the illustrated case of 18 teeth and 20-deg. pressure angle, the points *A* and *B* are situated below the pitch circle, which is indicated by a broken line. The points *F* and *G*, however, which correspond to two spaces left between the measured outside profiles, are

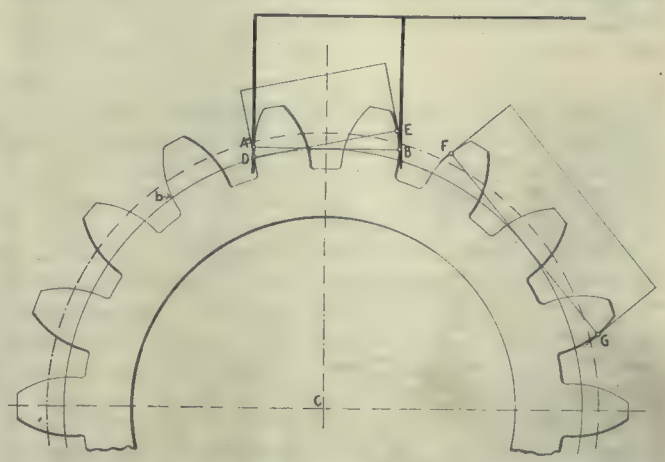


DIAGRAM SHOWING VERNIER CALIPER MEASUREMENT FOR AN 18-TOOTH, 20-DEG. PINION

situated above the pitch circle. As the tooth number increases, the distance between the pitch and base circle increases, so that *A* and *B* will drop further below the pitch circle, while *F* and *G* approach it.

It is desirable to have the measuring points close to the pitch circle, since the pitch circle area is the most important part of the tooth profile. Furthermore, it is the area which is usually free from modification of the tooth profile. The true involute shows up around the pitch circle, while frequently the tips and the roots of the teeth are somewhat modified. It is preferable, therefore, to leave between the measured tooth profiles just that number of tooth spaces which will place the contact points, between the measuring instrument and the teeth, closest to the pitch circle.

It will be assumed in the following that the tooth thickness in the pitch circle is one-half of the circular pitch, that is, that the gears are to run without play or backlash. In order to provide a slight play in the gears, the actual distance of the outside profiles should be slightly smaller than given by the figures. Under this supposition it will be found, that in the case of the usual 14½ deg. pressure angle the measuring points

A and B are very slightly above the pitch circle in an 18-tooth gear, and very slightly below the pitch circle in a 19-tooth gear. This refers to one tooth space left between the measured outside profiles.

If two tooth spaces are left between the measured outside profiles, and the measure is taken over three teeth, the symmetrical measuring points A and B are situated practically on the pitch circle in a 31-tooth gear. If three tooth spaces are left between the measured outside profiles, the measuring points A and B are slightly outside the pitch circle in a 43-tooth gear, and slightly inside the pitch circle in a 44-tooth gear. When four tooth spaces are included between the measured profiles, A and B are almost on the pitch circle in a 55-tooth gear, and the coresponding tooth numbers for 5, 6, 7 and 8 spaces are 68, 80, 93 and 105, respectively.

All this refers to a pressure angle of 14½ deg., and to a tooth thickness which is one-half of the circular pitch in the pitch circle. Such standard gears should therefore be measured as indicated by Table I, where

TABLE I—MEASUREMENT SPACING, 14½-DEG. PRESSURE ANGLE

N	12–25	26–37	38–50	51–62	63–75	76–87	88–100
S	1	2	3	4	5	6	7
$S+1$	2	3	4	5	6	7	8

S represents the number of tooth spaces to be left between the measured outside profiles, and N indicates the number of teeth in the gear in question. In the last line of the table, $(S + 1)$ represents the number of teeth included between the measured outside tooth profiles. As an example, we find that a 56-tooth, 14½-deg. standard gear should be measured over 5 teeth, or that 4 tooth spaces should be left between the measured outside profiles.

Since the number of tooth spaces to be left between the measured profiles depends on the pressure angle of the gears, the number of spaces should be increased as the pressure angle increases, in order to measure near the pitch circle. For a pressure angle of 20-deg., Table II should be used.

The number of teeth over which the distance AB is to be measured having been determined, the distance can be measured with an ordinary vernier caliper held normal to the tooth contour. This distance can then be compared with the calculated distance AB, and the tooth thickness over the measured distance determined.

A formula for distance AB which is simple in application may be written as follows, keeping in mind that distance AB is equal to the tooth thickness on the base circle plus S times the circular pitch of the base circle:

$$AB = \frac{\cos \alpha}{P}\left[(2S+1)\frac{\pi}{2} + N(\tan \alpha - \text{arc } \alpha)\right]$$

in which

S = Number of tooth spaces between measured profiles
N = Number of teeth in the gear
α = Pressure angle of the gear
P = Diametral pitch of the gear

For convenience and simplicity of application the following constants may be introduced for the trigonometrical terms:

$$C' = \cos \alpha \times \frac{\pi}{2}$$

$$C'' = \cos \alpha \ (\tan \alpha - \text{arc } \alpha)$$

We can then write the equation in a simple and usable form:

$$AB = \frac{(2S+1)C' + NC''}{P}$$

The numerical values of the constants C′ and C″ corresponding to different values of α are:

α	C'	C''
14½ deg.	1.52076	0.00537
20 deg.	1.47606	0.01400

As an example in the use of the formula, let us consider a 4-pitch, 55-tooth gear with a pressure angle of 14½ deg. From Table I we find that the value of S for this gear is 4, and the numerical values of the two terms of the formula will be as follows:

$$(2S+1)C' = 9 \times 1.52076 = 13.68684$$
$$NC'' = 55 \times 0.00537 = 0.29535$$
$$AB = \frac{13.68684 + 0.29535}{4} = 3.4955 \text{ in.}$$

This is the calculated distance over five teeth on the above gear without play or backlash, or in other words, a gear which measured as above over 5 teeth would run without backlash with a gear of the same tooth thickness. If the distance AB, when measured on the gear with a vernier caliper, is found to be less or greater than calculated, the difference between the calculated and measured distances will equal the difference between a standard tooth thickness of one-half the circular pitch and the tooth thickness of the measured gear. If the measured distance is greater, interference will be found; if smaller, backlash is indicated.

Another example may serve to further illustrate the method. Let us take, in this case, a 6-pitch, 25-tooth gear with a pressure angle of 20 deg. From Table II

TABLE I—MEASUREMENT SPACING, 14½-DEG. PRESSURE ANGLE

N	12–18	19–27	28–36	37–45	46–54	55–63	64–72
S	1	2	3	4	5	6	7
$S+1$	2	3	4	5	6	7	8

we find that the value of S is 2 and that the distance AB should be measured over three teeth. Using values of the constants for a 20-deg. pressure angle, we find the numerical values of the terms to be as follows:

$$(2S+1)C' = 5 \times 1.47606 = 7.3803$$
$$NC'' = 25 \times 0.01400 = 0.3500$$
$$AB = \frac{7.3803 + 0.3500}{6} = 1.2884 \text{ in.}$$

This value of AB compared with the distance measured over three teeth will indicate the thickness of teeth on the measured gear.

Automobile and Truck Preference in Ontario

It is estimated at the present time that 40 per cent of the automobiles in use in Ontario, Canada, are closed models, which are rapidly gaining in popularity, states a report from the Department of Commerce. In some instances dealers report that 70 per cent of their sales during the past year were closed models, and all believe that the principal market in the future will be for this type—practically no European cars are sold. As in the other provinces of Canada, price, service facilities, and gasoline consumption are determining factors in automobile sales. The nationality does not influence prospective purchasers of either truck or passenger cars. About 75 per cent of the trucks in use are light trucks up to and including one ton. Another 15 per cent are delivery wagons and the balance are heavier trucks of various types.

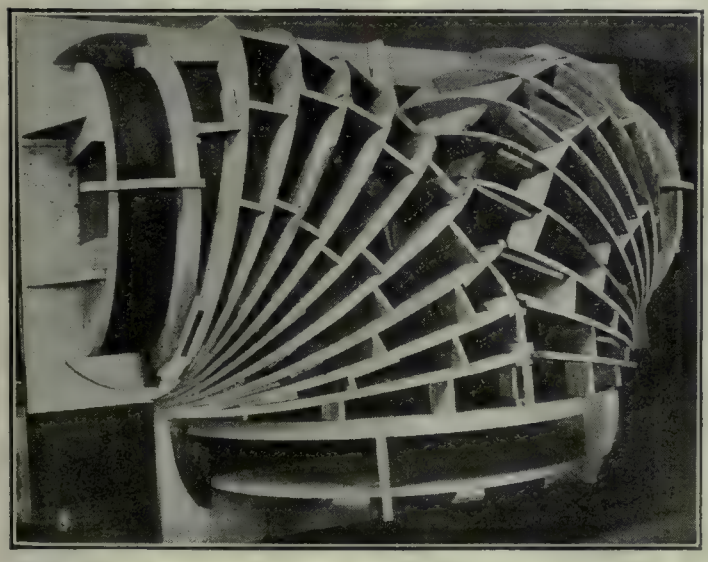
Large Pattern and Core Work on the Pacific Coast

SPECIAL CORRESPONDENCE

A method of building both patterns and cores with sand over skeleton wooden frames, to cheapen the cost, where but few castings are required

THE MAKING of large pipe connections for heavy-duty water power turbines involves many problems in pattern work, especially where costs have to be kept down, owing to the fact that but one or two castings may be required. The method used in making large pipe connections for the turbine work of the Pelton Water Wheel Company, San Francisco, Calif., gives a good example of this, as shown in the accompanying illustrations.

Instead of building up elaborate patterns and core boxes, only skeletons are made, different views of the pattern being shown in Figs. 1 to 4. Fig. 1 shows the front of the pattern in which the core prints are a continuous surface, while the pattern itself consists of numerous ribs with filling pieces fastened in between. Fig. 1 also shows the loose pieces *A*, *B*, *C* and *D* which fit on the outside of the pattern so as to form projections or bosses on the castings. Fig. 2 shows the back side of this pattern, and the arrangement of the ribs and the bracing. Pieces *A* and *B* are also



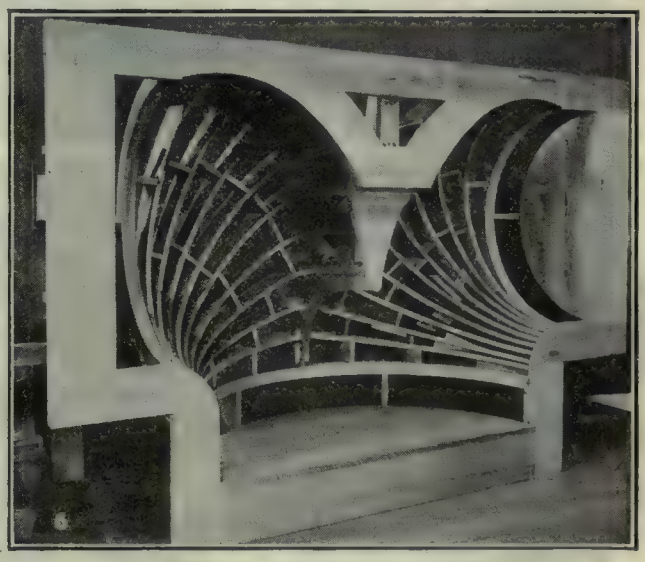


FIG. 5
FRONT OF SKELETON FOR CORE

FIG. 6
BACK SIDE OF THE SAME SKELETON CORE FRAME

FIG. 7
CORE FRAME IN PLACE FOR BUILDING UP WITH SAND



FIG. 1—FRONT OF SKELETON PATTERN. FIG. 2—BACK OF SAME PATTERN SHOWING RIBS AND BRACINGS. FIG. 3—PATTERN BEING BUILT UP, AND FLASK FOR THE MOLD. FIG. 4—PATTERN COMPLETED WITH SAND AND LOOSE PIECES IN PLACE

in place. An idea of its size can be had from the location of the wall switch at the left and the doorway at the right.

The method of using this kind of a pattern is shown in Fig. 3. Here the loose pieces *A*, *B*, *C* and *D* are in place and the left half of the pattern built up with molding sand. In the background, at the left, is the large flask which is lowered over the pattern and the sand filled in and rammed through the openings between the ribs.

In Fig. 4 the skeleton pattern has been completely covered with sand and is ready to have the flask lowered into place for filling and ramming. The loose pieces *A*, *B*, *C* and *D* are here shown in position.

The core is built up in a similar manner, the skeleton or frame being shown in Figs. 5 and 6. The core skeleton does not differ materially in general appearance from the skeleton pattern, although a few changes are noticeable. It will be seen that the boarding between the ribs is not complete, so that the whole interior of the core is composed of sand to withstand the weight of the metal as it is being poured, and while it is cooling. In the case of the pattern, only the pressure of ramming has to be taken care of by the skeleton. It will further be noted that the core prints are not boarded over at all in Fig. 5, the entire core print being composed of sand and the form secured by sweeping to conform to the two semi-circular boards on each end. When both halves of the core have been completed they are placed in position in the two halves of the mold, which have previously been made over the pattern shown in the earlier illustration.

The great variety of sizes and shapes of these fittings, together with the small quantity usually required at any one time, has made this method particularly successful in cheapening the cost.

Determining the Cutting Horsepower of a Machine Tool

By Herbert K. Keever

PERHAPS there is no more important point to be borne in mind by anyone wishing to know how to make a machine tool do its best work, than how much the machine will pull under cut. The exact statement of cutting speeds is impractical on account of the rapid progress that is being made in the art of making high-speed steels. It is practical to know, however, that with a certain type of machine a certain definite production capacity may be expected.

For purposes of analysis, let us confine ourselves to a single type of machine, for with slight modifications the following method may be applied to any type of machine tool. It may be well to state that the formulas derived are at best approximate and should serve only as a guide to the maximum theoretical cutting capacity of the machine tool. For illustration, the following formulas are figured for a geared-head, constant-speed-drive lathe. The power input will then be constant, depending upon the driving mechanism.

Assuming the radius r of the driving pulley to be 7 in., the width of the double driving belt as 4 in., a pull of 50 lb. per inch of width of belt, and a constant speed of 650 r.p.m., the constant horsepower input will be

$$Hp. = \frac{2\Pi rPN}{12 \times 33{,}000} = \frac{2 \times \Pi \times 7 \times 200 \times 650}{12 \times 33{,}000} = 14.4 \text{ hp.},$$

where P = Width of belt × pull per inch of width, and
N = R.p.m. of driving pulley.

The horsepower delivered at the spindle end of the machine to the piece of work is usually somewhat less than this, some engineers figuring a one per cent power loss for each bearing. Usually the power loss in a geared-head machine is somewhat more than this amount, and can be determined accurately by experimentation only. The manufacturers of machine tools usually furnish the effective driving power of their machines, upon request. Assuming a 50 per cent power loss in the head, the amount actually delivered at the work in this case would be 7 horsepower.

The pressure upon the cutting tool is determined by the area of cut, and a good rule to follow in this regard is

$$P = 3 \times A \times U,$$

where,

P = the pressure on the tool in pounds,
A = the area of cut, or feed × depth of cut, and
U = the ultimate tensile strength of the material.

From the horsepower formula,

$$P = 63{,}025 \frac{\text{Hp.}}{Nr}$$

Substituting $3AU$ for P and 7 for the value of the horsepower,

$$3AU = \frac{63{,}025 \times 7}{Nr} = \frac{441{,}175}{Nr}$$

$$ANr = \frac{147{,}058}{U}$$

This last formula may be called the fundamental formula for the machine, which in this case delivers 7 hp. at the spindle of the machine. In this formula the different constants may be determined from the tensile strength of the material to be machined. Marks' "Mechanical Engineers' Handbook" gives the following values for the tensile strength of different materials:

U = 18,000 lb. per sq.in. for cast iron
U = 30,000 lb. per sq.in. for malleable iron
U = 60,000 lb. per sq.in. for mild steel
U = 80,000 lb. per sq.in. for hard steel
U = 120,000 lb. per sq.in. for nickel alloy steel

Since the area of cut is the product of the feed and the depth of cut, and substituting our values for U in the fundamental machine formula, the following formula for working use is obtained:

$$D = \frac{K}{FNY},$$

where,

D = depth of cut,
F = allowable feed,
N = r.p.m. of work,
Y = diameter of work, and
K = constant for the material.

Values of the constant as determined for the 7-hp. machine are

K = 1.64 for cast iron
K = 0.98 for malleable iron
K = 0.50 for mild steel
K = 0.38 for hard steel
K = 0.25 for alloy steel.

Book Reviews

Wood Pattern Making. By Herbert J. McCaslin, Instructor in pattern-making, Dickenson High School, Jersey City, New Jersey. 285 4¾x7½-in. pages, illustrated. Published by The McGraw-Hill Book Co., 370 Seventh Ave., New York City. Price $2.25.

This book is intended to be used as an instruction or textbook in vocational schools and other places where pattern-making is taught. The experience of the author as an instructor in such schools should enable him to judge correctly as to the nature and extent of textbook training that the average student is capable of absorbing.

The opening chapters are designed to convey to the student a knowledge of the various woods used in the construction of patterns, their peculiarities and adaptabilities to specific purposes, and the methods of preparing them. A list of the machines and tools required by the pattern-maker is given in the introductory pages and the use and application of the various tools is explained in succeeding chapters as the work proceeds.

The student is started with instructions as to the necessary steps to be taken in the making of very plain and simple patterns and is carried by easy stages to the construction of those of a more complex and difficult nature. Foundry practice is taught to some extent by illustrations of the molds and descriptions of the manner of making them as applied to the specific examples given; though this feature, so essential to the finished pattern-maker, could be strengthened to advantage.

Workmen's Compensation Acts in the United States, The Medical Aspect, Research Report No. 61. Paper covers, 6x9 in., 282 pages, 21 tables. Published by the National Industrial Conference Board, 10 East 39 St., New York, N. Y.

The volume deals with the medical questions related to the action of workmen's compensation laws in the United States. The first research report, published by the Board in 1917, discussed the legal questions involved in the administration of the workmen's compensation laws. At that time the legal aspect was of primary importance, and the experience with the medical questions was so limited that no great import was attached to that phase. The medical experience is now available in the records of decisions of the courts and of industrial boards and commissions.

In order that the legal status of compensation laws may be understood, the report presents an analysis both of the provisions of the laws dealing with medical and related questions, and also of the decisions of courts upon them. Thus the principles and practices that have been developed are shown in the light of the legal provisions and of the interpretations placed upon them by commissions and courts.

No attempt is made in the report to criticise the laws or decisions. What is done is to bring together and analyze a large body of facts on the subject and make them available in convenient form, as the first comprehensive study of the subject that has been undertaken. Study of the conditions can be easily made, so that the report should bring about constructive work.

The medical side of compensation laws has greatly increased in importance in the past few years. One reason is the inclusion of diseases of occupation in the later laws, and also the granting of compensation for diseases having only a casual and sometimes remote connection with the occupation or with the original injury. The different phases are illustrated by references to a large number of actual cases, so that the precedent existing under various conditions is shown. Due to the wide scope and comprehensive treatment, the volume should serve as a handbook on the subject of workmen's compensation.

The Worker in Modern Economic Society. By Paul H. Douglas, Curtice N. Hitchcock and Willard E. Atkins. 929 pages, 6x9 inches. Published by the University of Chicago Press, Chicago, Ill.

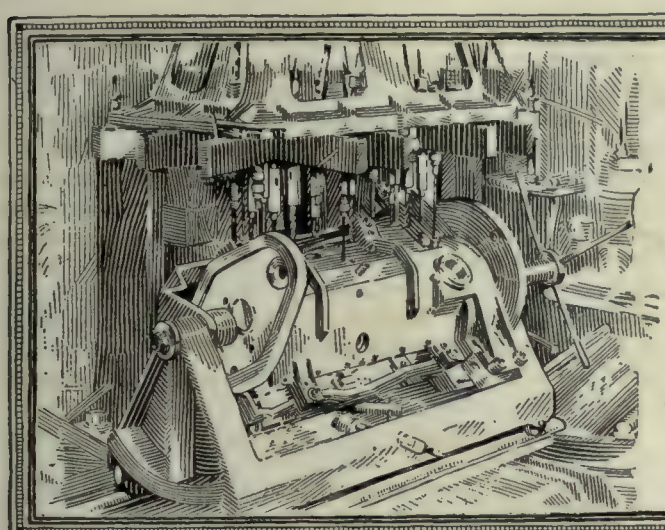
This book presents what is probably the most complete study of what we call the labor problem that has ever been gathered into a single volume. It is divided into seven distinct parts, the first dealing with human nature and industry. Then comes the development of economic organization; the worker in his relation to the market; security and risk; the workers approach to his problems; the employer's approach and, lastly, the community's approach. Each of these parts is divided into numerous chapters which deal with the various phases of the problems considered under its particular heading.

In each chapter have been gathered the opinions and studies of men and women well known in their various fields—such names as William James, John Dewey, Royal Meeker, John R. Commons, W. M. Leiserson, Crystal Eastman, Helen Marot, P. T. Sherman and others well known on both sides of the question. Statistics from many government bureaus and private organizations, both in this country and abroad, are included, so that the reader need not fear hearing only one side of the argument.

It is, of course, impossible to give an adequate idea of the contents of this volume in a review. But those who are really interested in the problems which it touches, will be interested in the manner in which this volume traces the development of economic organization, the question of wages and standards of living, the length of the working day, industrial accidents, occupational diseases, health insurance, old age pensions and unemployment.

The chapter showing the development of unionism in the United States is of particular interest and indicates very clearly that we have been unduly alarmed over the temporary growth of some of the socalled radical organizations. The open and closed shop, collective bargaining, strikes and losses occasioned by strikes and lockouts, apprenticeship and its limitation, labor's share in industrial waste, profit-sharing, minimum wages, compulsory arbitration, and apparently all the points which we too frequently discuss without full knowledge on either side, are here analyzed and presented in a valuable and readable form.

The authors are to be commended for the impartial manner in which they have handled both sides of the question without fear or favor. Those who expect to read that the particular side in which they are interested possesses all the virtues are doomed to disappointment. The book is to be highly commended to all real students of modern economic society.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Gaging screw threads—Importance of accurate methods of manufacturing and gaging—Inspection by optical projection—Automatic gaging machines—Providing for upkeep in designing gages and tools

IN A PREVIOUS article we have mentioned the important points in the gaging of screw threads, and we have illustrated a number of forms of work gages used in keeping the work within the required limits of accuracy. After work of this kind has been completely machined, the final inspection of thread form, pitch diameter, angle of thread, lead and similar points is used as a check on the accuracy before the parts are sent to the stock room. The practice for final inspection of threads varies in different factories, the controlling factor being the accuracy required in the finished product.

When screws of various kinds are made in large quantities, as in the case of a factory devoted exclusively to this class of work, the greatest care is taken to see that the parts are held closely within the specified limits during the process of manufacture. The final inspection is to a great extent used to detect imperfect work which may have been caused by poor stock, flaws in the material, threads damaged after or during manufacture, and other causes. At the same time a final inspection is absolutely necessary in order to check up the accuracy of the work and to see that the quality is fully equal to the commercial requirements.

Importance of Accurate Manufacture

In every variety of mechanical work the methods and tools used in the manufacture are of the utmost importance if an accurate product is to be made. Hence, the progressive executive aims always to perfect his manufacturing methods in order to avoid inaccuracies and reduce "scrap" to a minimum. This can only be done by painstaking effort and conscientious endeavor to make sure that all tools, jigs, fixtures, and gages are well kept and the best of their kind, and also that all machine tools used in the work are in first-class working condition.

In considering the manufacturing methods used for screw threads, either external or internal, there should be such careful supervision and such thorough tests during the process as to eliminate the likelihood of errors as far as possible. Rigid inspection of taps, dies and chasers, combined with careful selection, and exacting limits in manufacturing will aid greatly in keeping down the cost of inspection and will result in a superior product.

We have previously mentioned the types of gages used for work in the actual process of manufacture. In classifying gages, an endeavor has been made to separate those used by the workman who operates a machine, from those which are used by an inspector at the bench or elsewhere. In the inspection of screw threads there are so many points of importance to be looked after continually, that the inspector and the workman must be in very close touch with each other. Errors in lead must be caught by the inspector before too many pieces have been made, as otherwise the scrap-pile would increase too rapidly. A faulty tap or imperfect chasers can cause a great deal of trouble and expense, so the safest thing to do is to inspect them before they are issued from the tool crib.

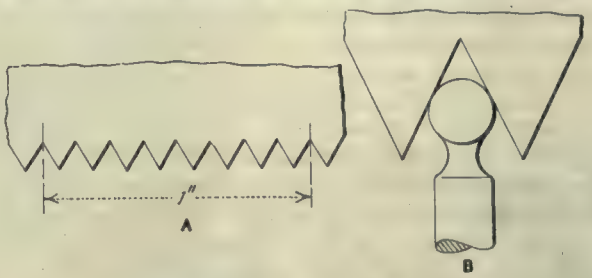


FIG. 564—TESTING LEAD OF SCREW

One of the most troublesome matters in connection with screw threads is the accuracy of the lead of the screw. Yet, how can it fail to be so when we consider the possibility of variations in taps, dies, chasers and lead screws of different machine tools. Also, there are the various kinds of steel used, the treatment in hardening and the changes caused by different methods or ignorance in handling. A realization of the importance of the lead of the screw has brought about a radical improvement in methods of manufacturing taps, dies and chasers, as well as in the quality of the steel used in the work. Careful experiment has also shown us how much tolerance in the lead of the thread is permissible for good commercial work.

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The United States Government has established standards and tolerances for work of this character, and many manufacturers have modified them to suit their own requirements. The government specifications are very exacting, and a great amount of commercial work does not require such close limits of manufacture. It is very evident that the nature of the work itself is a factor of great importance in determining the accuracy required, as screws used in farm machinery and other mechanisms of a more or less crude variety, do not need to be as accurately made as those for machine tools or automobiles.

If the lead of a screw or nut is incorrect to any great degree, long screws will bind or crowd in the thread when assembled with the nut or in any kind of a tapped hole. Also, the wear on the thread is not uniform and trouble results on this account, particularly when the nature of the work requires the screw to be removed and replaced frequently. In testing the lead of screws or taps several methods are in use, but in the majority of cases the lead is tested at points 1 in. apart. In the case of short threads, a measurement of ½ in. is sometimes necessary. In very long threads, such as lead screws for machine tools and other work of similar kind, greater distances are used as a basis of measurement in order to detect any accumulation of errors.

The diagram in Fig. 564 gives an idea of the method used in testing the lead of a screw. The example *A* shows a screw having 8 threads per inch according to theory, yet a practical test may show variations of several thousandths of an inch from the exact lead. By using ball points which come in contact with the thread at the pitch line, as shown at *B*, any variations can be easily detected if a suitable indicator is used. Several instruments for testing the lead of screw threads are on the market, but as they are commercial products it is unnecessary to describe them in detail. We are dealing with the design of gages and not those which are already manufactured. The principle employed, however, may be mentioned briefly in order to familiarize the designer with the general features of the instrument.

Device for Testing Lead

Roughly speaking, a lead tester consists of a holder of simple form in which two ball points are inserted. One of these points is adjustable so that it can be readily set at a fixed distance from the other, and a suitable connection is made to an indicator point by means of which variations in the lead can be readily seen when the ball points are in contact with the threads. The holder can be mounted on a stand provided with adjustable centers for holding the work to be tested, or the work can be placed against a parallel or straight edge placed in a suitable position. For special threads on castings or irregular parts of various kinds it may be found necessary to design a special stand to suit the conditions, but the designer has had sufficient training to enable him to do this without great difficulty. It is always a good idea for the progressive man to keep in touch with new developments in gaging by following the advertisements and notes of new tools in the trade papers, and to obtain detailed information wherever possible.

Probably the most satisfactory method of testing screw threads for shape of thread, angle, and lead is by means of projected shadows of the thread, greatly magnified and thrown upon a screen on which accurate thread forms of the same magnification are suitably held. A comparison of the projected shadow with the accurate thread form clearly shows variations in pitch, angle and form of thread. Machines for this purpose can be purchased of the manufacturers at prices consistent with the value of the device. It is usually more satisfactory to purchase machines of this kind than to attempt the design of a similar mechanism, particularly if only one or two are needed. For those who are especially interested we refer to the trade papers, in which are listed the manufacturers and their addresses. The manufacturers are always glad to furnish information to those requesting it and writing for catalogs.

Quantity Inspection of Threads

When screws, bolts and nuts are manufactured in quantity, the methods used in the inspection department must be devised in accordance with the requirements. Usually the inspector selects a few pieces at random from a quantity of work, tests them for pitch diameter, lead and quality of workmanship, as well as general finish and appearance. He then passes or rejects the entire lot according to the result of the tests made. If the work is very exacting, each and every part is carefully inspected by means of limit gages of standard form, and those which have not been machined within the required limits are rejected.

Designers are occasionally required to design gages of a type particularly suited to rapid inspection, but as a general thing such work requires only mechanical solutions of problems that are ordinarily solved by the use of several successive gages in the hands of a competent inspector. We believe that sufficient information has been given in these articles to enable a designer to understand thoroughly the principles of gaging, so that by a judicious application of the principles he can adapt them to suit a variety of conditions.

We do not feel that we should close the subject of gaging without mentioning some of the recent developments in automatic inspection of certain standard products, and while we are not free to illustrate these methods in detail we can give our readers a general idea which may be of interest. Naturally, the gaging of parts in an automatic manner, should be attempted only when very large quantities of the product are being manufactured. Furthermore, it is not usually possible to gage more than one dimension at a time, although a semi-automatic machine requiring the constant attendance of one inspector might permit two dimensions to be gaged simultaneously. To the best of our knowledge, however, this has not as yet been done successfully.

Some years ago steel balls such as those used in ball bearings were rapidly gaged by passing them over a hardened anvil and at the same time under an indicator point, the dial of which registered very accurately variations in the diameter of the balls. This method was naturally somewhat slow and the accuracy obtained was dependent entirely upon the inspector. Other devices were experimented with in order to eliminate the human factor as far as possible. One of them was designed so that oversize and undersize balls made an electrical contact which rang a warning bell. An attendant was required to remove the defective balls and place them in a separate box, from which they were afterward taken and graded according to their sizes. All of these methods required considerable time and were not abso-

lutely infallible, because occasionally balls would pass through that should have been rejected.

There are several designs of automatic ball gaging machines in use at the present time, and although they are somewhat different in general details of construction, the principles employed in gaging are practically the same. The balls are dumped into a hopper which is oscillated automatically in order to keep the balls moving freely. At the bottom of the hopper there is a revolving disk with one or more slots in it of sufficient size to admit one ball at a time. The ball passes through the disk and rolls down an inclined plane until it reaches an accurately graduated slot, at which point it drops through if of the correct size.

If oversize, the ball remains in the slot until a plunger (mechanically operated at the proper time) pushes it up above the slot, so that it rolls along down the inclined plane until it reaches the next slot, which is a trifle larger than the first. The same process is repeated here as at the first slot, if it is still too large to pass through, and so on according to the number of slots provided. Underneath each slot is a chute through which the balls roll to their respective boxes. The only attention needed is to keep the hopper supplied with balls and to carry away those which have been sorted. All parts of the machine subject to wear are readily replaceable, and the gage plates are detachable so that they can be quickly changed when necessary.

Automatic gaging is much more adapted to spherical or cylindrical work than to that of a rectangular shape. Taper and cylindrical pins of small size can be gaged semi-automatically by using slots and angular plates, but there are more chances for errors on this class of work than in the gaging of balls. Pins which are intended to be cylindrical may be "out of round" or otherwise mis-shapen, so that they will not pass the gage points properly.

Automatic Gaging for Taper Pins

Tapered pins, however, can be gaged by an application of the tapered plate principle, the pins dropping through the plate as they pass along down the incline. In designing any gages of this nature the greatest care must be taken to find out by actual experiment the correct angle of inclination for the tapered plates. Too steep an incline will allow the pins to pass by the gage points, and too gradual an angle will not permit the pins to slide freely. There are problems connected with automatic gaging which the designer must study and solve for himself, being satisfied to proceed slowly and to experiment wherever necessary in order to settle any doubtful points.

It is not often that this class of work is called for in gage design, yet when opportunity offers it is well to take advantage of any chance to see how progressive manufacturers have solved such problems, in order that new ideas may be absorbed and new principles in gaging appreciated and thoroughly understood. It is always the part of wisdom to take advantage of any ideas which have been proven successful and apply them whenever the opportunity presents itself. If certain things have been done in a satisfactory manner by using a certain principle, it is much better to work along the same lines, unless you are fairly certain that another idea will be more successful.

In closing our discussion of gages it seems necessary to point out briefly a few of the important matters in tool and gage design, which are likely to be overlooked or forgotten by the designer who is comparatively new to this kind of work. Some of these points have been mentioned in a general way in previous articles, but we believe it advisable to mention them more specifically here in order to emphasize their importance to the entire subject of tool engineering.

(1) Economical upkeep of tools and gages is dependent to a great extent upon the skill and forethought of the designer. All locating pads, V-blocks, leaf locaters, set blocks and other parts subject to wear and which vitally affect the accuracy of the work, must be made and located in such a way that they can be readily replaced when worn or broken. Dowels must be placed in all pieces which are likely to require removal or replacement in order to ensure correct location. Jigs and fixtures should be designed to stand not only use but considerable abuse, and yet they should be as light as consistent in order to facilitate handling. It is often advisable to make very large jigs and fixtures in sections in order to assist the toolmaker in machining them. There is an additional advantage to this method in the event of breakage or injury to an expensive jig. Each of these points is important and has an effect on economical upkeep.

Tools for Turret Lathes and Boring Mills

(2) Upkeep of cutting tools for turret lathes and boring mills can be very easily provided for by care in the design. Such tools as those used for turning and boring should invariably be made so that they can be quickly replaced after grinding or when broken. Tools like reamers when of large size should be made with inserted blades, located in such a way that they are locked firmly in place, and yet can quickly be removed and others inserted in their places when necessary.

Cutter heads or boring heads should also be made with inserted blades whenever possible. The method of locking the blades is dependent entirely on the construction of the heads, but this matter has been thoroughly discussed in our previous articles. Cross-slide tools should be made so that standard sizes of stock can be used whenever possible, in order to avoid the expense of machining the stock before using it. Form tools should be so designed that they can be ground on one face only without changing their form. All tool blocks should be provided with such adjusting screws or hardened studs that tools can after grinding be replaced in the exact positions from which they were originally taken.

(3) Upkeep of milling cutters is dependent to a great extent upon the size and shape of the cutters. For small diameters the inserted-tooth variety cannot always be used, and for this reason the upkeep is not so good as it otherwise would be. For slotting cutters the interlocking type which has been previously mentioned should always be used if the width of the slot to be machined is important. Formed cutters should always be made so that they can be ground on the face without changing the form.

(4) The upkeep of punches and dies is more difficult to provide for than some of the other varieties of tools. Provision should always be made for grinding the face of the die as well as the punch, and sufficient "land" should be allowed to give as great a number of regrinds as possible. In the case of dies of very irregular form and those with sharp corners, a built-up die is often more economical than a solid die, and it is much easier to make replacements in case of breakage. Other points pertaining to the upkeep of punches and dies have been

mentioned in previous articles, and it would be a good idea for the designer to review these matters carefully before starting work of this kind.

(5) The upkeep of gages requires careful study from more than one angle. It is evident that any gage is likely to be dropped on the floor and possibly distorted by the shock. Cast iron is much more rigid than steel, and while it may break it will seldom spring out of position. For this reason many manufacturers prefer to use cast iron frames for gage work, because they think it much better to have a gage broken completely than to take the chance of using one which may have been "sprung" so that it is no longer accurate. Gage points and wearing surfaces should always be made replaceable, and the construction should be such that there will be no possibility of errors in the relocation of the parts. Indicator points and any fragile mechanisms should be protected from injury by guards of suitable form and shape. An exposed indicator pointer can very easily be sprung out of shape and rendered inaccurate. Test blocks or some other provision for the accurate setting of indicator gages should always be provided, so that the accuracy can be continually checked to make sure that it is always correct. Otherwise, an inaccurate gage might be kept in use.

With the growing tendency toward the use of indicator gages it becomes more and more important to provide against inaccurate settings of these instruments, and for this reason we wish to call the designer's attention particularly to this matter. Let him consider that it is fully as important to design setting gages for the instruments as it is to design the indicators themselves. There are many manufacturers who dislike indicator gages for the reason that there is a possibility of inaccurate settings, which may cause a great deal of trouble in the finished product.

Speed Versus Good Welding

By R. G. Mason

THE average man engaged in manufacture or repair shop work actually knows very little about practical welding. He has learned considerable of the remarkable results that may be obtained from oxy-acetylene welding, from gossip and very little reading. Unconsciously he acquires the notion that all such welding must be like that he has heard of, so when an emergency arises he at once determines to have his broken machine welded, forgetting that there are good welds and welds that are not good. Broken machinery welded under his emergency directions breaks again, and it is not unusual for him after such minor experience to thereafter condemn the principle of fusion welding.

The science of gas welding is in its early infancy, and although progress has been made, the unknown fields for the application of welding are probably much greater than those already discovered. The old time method of welding iron and steel in the forge was a part of the blacksmith's trade, but today welding is a science—laws of chemistry, physics and metallurgy must be reckoned with if we are to progress. Of the other trades one stands out where science must be taken into consideration—that of the electrician, and in this case as also that of the art of welding, the workers must know why certain things happen when this or that is done.

Speed May Bring Hidden Defects

You would not consider for an instant the use of a sledge hammer to drive nails in a shingle roof, just to gain time by driving the nail with one blow of the hammer, yet very frequently just such a foolish thing is tried in the electrician's work and in welding. In a like manner the finished article may have a beautiful appearance, yet laminations, "cold shuts," impurities, oxidized metal, poor penetration and other defects which are the causes of many failures may be covered up. Sometimes these things are done in ignorance on the part of the welder or it may be wilful negligence, and sometimes these conditions are forced upon the operator by those who are having the article welded, for it is generally accepted by the customers who are having some repairs made that the only thing to be kept in mind is "get the job finished," the sooner the better.

In certain emergencies it may be cheaper in the long run to make emergency repairs in order to keep up production or to maintain service. However, only in cases of the rarest emergency should excess speed be used when the job or repair is to be made by the welding process.

Wastes Due to Excess Speed

There are, of course, several plausible reasons why a weld fails, such as, what caused the break in the first place, ignorance on the part of the welder, impure material, improper preparation or too much speed or heat. This article deals with the last named cause, and many hours of grief as well as dollars can be saved if one will accept the experience of others.

Let us assume that in the manufacture of a certain article by welding the operator is urged to hurry up, as is generally the case. Naturally it requires more heat to melt and fuse the material in a shorter space of time. The welder must put a larger nozzle on his torch, which gives a larger volume of heat, but incidentally also the blast or force is greater, another wrong condition. Too much heat causes failure, just as not enough heat will make a poor job. Too much heat is a waste of both oxygen and acetylene. It also causes the operator unnecessary discomfort and may slow up his work.

Second, excess heat will vaporize the molten metal, causing a waste of filler rods—more money thrown away.

Third, some of the elements are burned out, leaving weak oxidized metal, and failure is bound to occur.

Fourth, the molten metal will become more fluid and will splash over on a cold surface, causing adhesion instead of the proper cohesion.

Fifth, it breaks down the "Vee" in such a way that good penetration cannot be obtained.

These are only a few of the troubles resulting from trying to push a job beyond its limits and using an excess of heat to do it. The faults can be seen plainly by the customer if he will have a few test pieces made for his benefit.

It is a known fact that a better weld can be made in less time and with less filler rod with the proper amount of heat, than when we look only for speed in finishing the article. Moreover, when the correct heat and size of filler rod are used, there is no question of success.

From the *Journal of the American Welding Society*

A New Herringbone Gear Planer

By N. LEERBERG

Features of design proposed to overcome difficulties usually encountered—Two tools cut simultaneously and move in helical path—Work held stationary during cutting to give stability

THE LAST few years have shown an enormous advance in the use of herringbone gears. Machines for cutting the finer pitches, up to 1 D.P., have been well developed, hobbing being the principal process by which such gears are cut. Other methods are end milling and shaping by rack- or pinion-shaped cutters. When pitches become greater than 1 D.P. these methods have several drawbacks. The cutting surface of the tools becomes so great that it is difficult to obtain sufficient rigidity for efficient operation. It is necessary to machine the teeth from the solid blank, requiring the removal of great quantities of metal, and also giving a metal not as close grained as when the teeth are blocked out in casting. It is for such work on coarse pitches that the planing process is best adapted.

When planing spur gears the gear is clamped rigidly, and the tool works very efficiently. Herringbone gear planers were made along the same lines, except that the gear blank was made to rotate as the tool advanced along the face of the gear. The spring in the gear blank when the latter was much over 6 ft. in diameter made it impossible to make good time on such a machine.

About seven years ago a machine was developed in which the gear blank was clamped rigidly while the tool passed along an approximate helical path, a decided improvement over earlier machines. Based upon this experience, the writer designed a machine that would have all the good points of the spur-gear planer, a rigidly clamped gear blank and a well-supported planing tool.

Action of the Machine

The principle of the machine is as indicated diagrammatically in Fig. 1, and the motion is the resultant of the longitudinal motion *AG*, vertical motion *AB*, transverse motion *BF*, radial motion *FC*, and angular motion α. The primary motion is therefore the development of a helix in a vertical plane tangent to the pitch cylinder. But this development is constantly being folded unto the cylindrical pitch blank as follows: The pivot point is moved transversely the distance *BF* until it falls on the proper radial line. The tool is then swung radially around a pivot following the line *AF*, and thereafter moved along the radial line until the cutting point falls at the pitch line. All these motions are simultaneous.

Mechanically these motions are produced as shown on the drawings reproduced in Fig. 2. The front elevation shows the machine to consist mainly of two sole plates *1a* and *1b* carrying the base plate *2* on which are mounted two columns *3a* and *3b*. These columns carry two vertical slides *4a* and *4b* having pivots *5a* and *5b*. The planer rail *6* is supported by these pivots as well as by the worm drives *7a* and *7b*.

The tool-head carriers *8a* and *8b* slide simultaneously toward the center of the gear face during the cutting stroke. The drive to the tool heads is through motor gear *9*, bevel gears *10*, *11*, *12* and *13*, worm drives *14*, and rack and pinion drives *15*. This mechanism provides the main planing stroke *AG*, Fig. 1, and is in fact the only motion when the machine is used for planing spur gears. For such work the tools

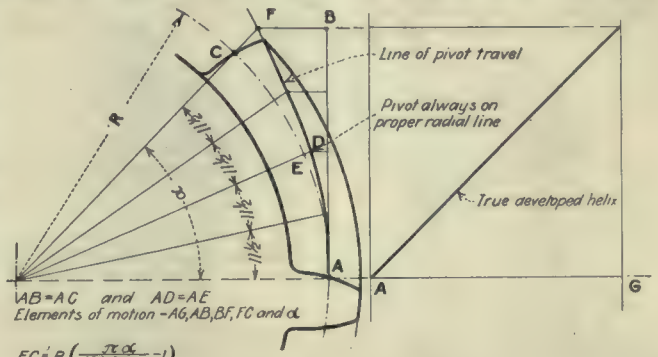


FIG. 1—DIAGRAM SHOWING HOW HELICAL MOTION OF CUTTING TOOL IS OBTAINED

are set to the proper height by running the vertical slides down against stops not shown on the drawings.

For herringbone gears the vertical motion *AB* is obtained by placing change gears having a ratio equal to the tangent of the helix angle, between drive shaft *16* and shaft *17*, referring again to Fig. 2. This shaft drives vertical shafts *18a* and *18b* through worm gearing *19*, and transverse shaft *20* through bevel gears *21*. A pinion *22* on this same shaft meshes with a rack on the vertical slide *4*, and thus gives the vertical motion.

The lower ends of shafts *18a* and *18b* drive shafts *23*, which carry the cams *24* working between rollers *25* and *26* and giving the transverse motion *BF*. This motion is very slight, and may in fact be eliminated for large gears, in which case the base *2* is bolted rigidly to the sole plates.

As the vertical slides move upward they impart motion to shaft *27* through a rack, and to worm shaft *7* through change gears, giving the angular motion α and keeping the tools radial with relation to the center of the work.

The tool heads, shown in detail in Fig. 3, are of the usual type, except that the slides are arranged so as to be in the line of the tool thrust and thus eliminate practically all spring. They are carried on compensat-

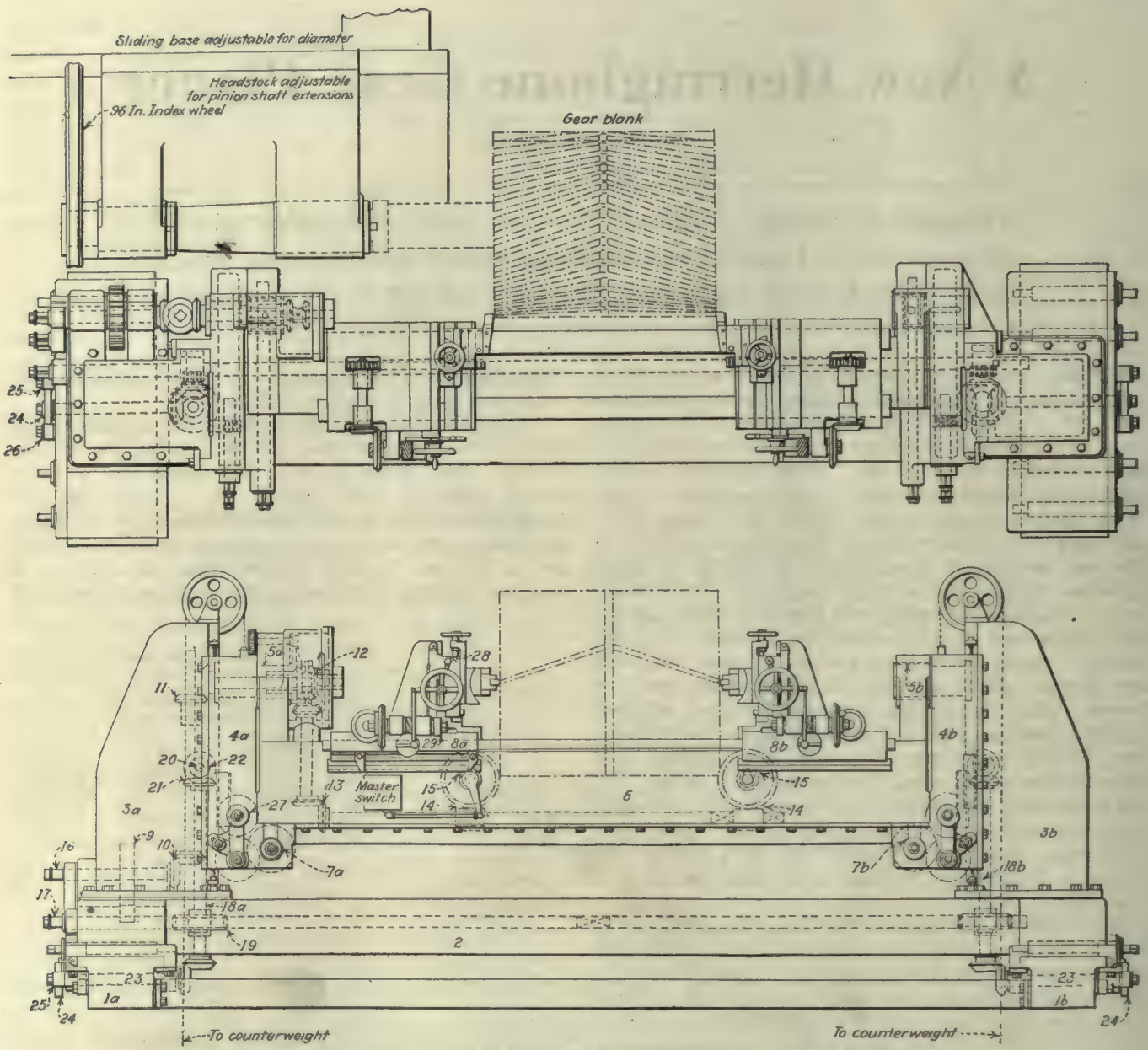


FIG. 2—PLAN AND FRONT ELEVATION OF HERRINGBONE GEAR PLANER

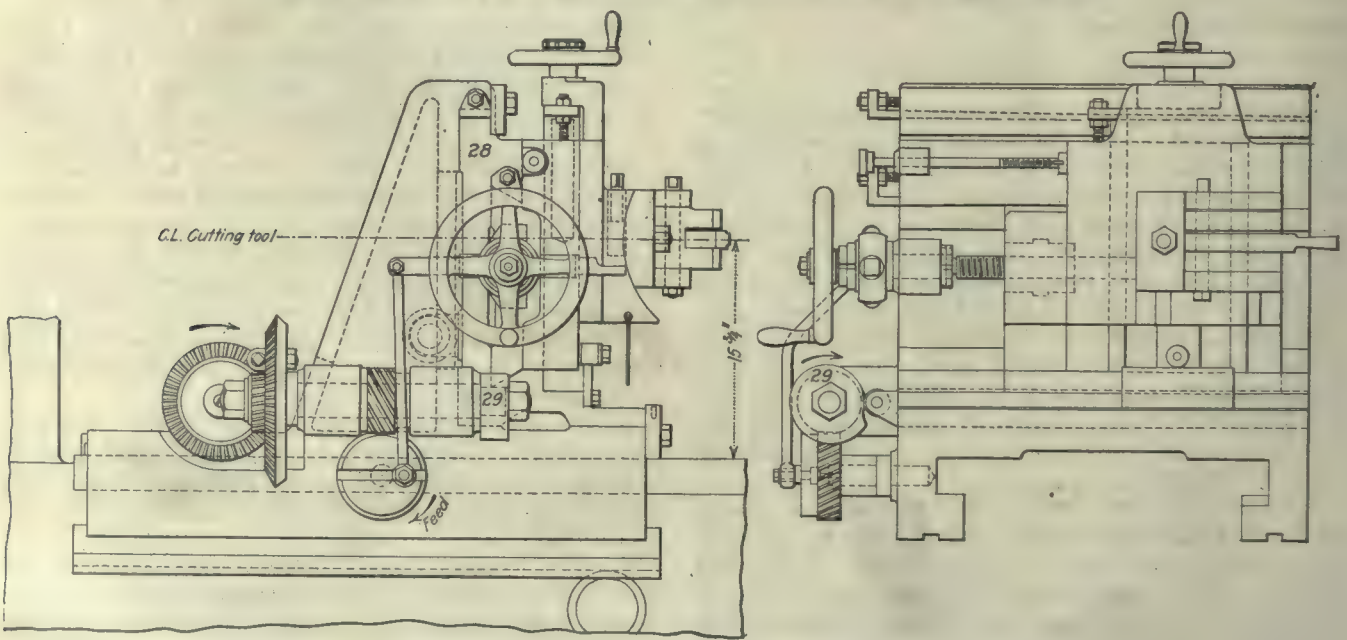


FIG. 3—FRONT AND SIDE VIEWS OF TOOL HEAD

ing slides *28* operated by cams *29* and giving the radial movement *FC*. The drive for this cam can be seen in the drawing. Since the cam must be on the zero line when the tool comes up to the face of the gear, an adjustment is provided. These cams are made in a series based upon diameters only.

The principal advantages of this machine, aside from the theoretical accuracy, are the rigid tool support close to the planer rail, the carrier drive on each side of the rail, which does away with binding and places the main driving force on the side directly under the tool, and a one-piece planer rail, which takes up the opposing tool thrusts. The planer rail constitutes a heavy balanced mass; but since its vertical motion is only about one-third of the longitudinal motion, or about 8 ft. per min., it follows that the inertia of this part has no serious effect. In this type of machine all adjustments for size of diameter and gear face are made by having the dividing head holding the work mounted on sliding bases.

It is confidently believed by the author that this machine will cut herringbone gears as readily as spur gears may now be cut with the best type of existing spur gear planer.

Bushed Versus Babbitted Bearings

By John S. Watts

SOLID bearings of all kinds may be divided into two types, one being the babbitted type, that is, bearings in which the babbitt is applied by being melted and poured into the bearing shell, and the other type being those which are bored out to receive a bushing of some anti-friction metal such as white metal or bronze, this bushing being machined both inside and out. For the purposes of this article, I will call the first type babbitted bearings, and the second type bushed bearings.

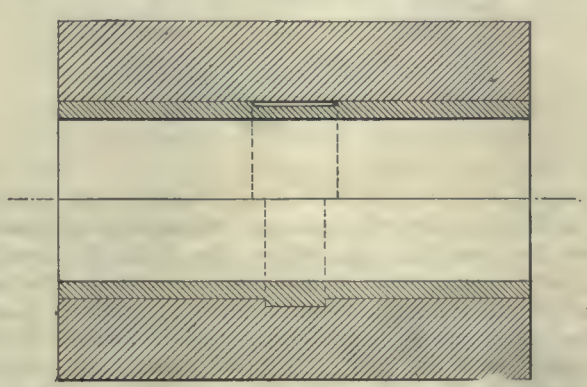
Both of these types have their virtues, and no one would advocate discarding either of them. But, we frequently find one type used where the other would have been more efficient, and I believe that there is room for a more general study of their respective merits. In a general way it seems that those who are most familiar with one type are very apt to use that type exclusively, without much if any consideration as to the merits of the other type for the particular purpose under consideration.

In order to make an intelligent choice of the best type of bearing for a given purpose, it is first essential to have an understanding of the merits and demerits of each type, which I shall now give in sufficient detail for that purpose. The babbitted bearing is much the cheaper in first cost, but that is the only point in which it is superior to the bushed type. When the babbitt is worn out, it is necessary to remove the bearing to chip out the old babbitt, and to re-babbitt it requires the services of a skilled mechanic.

A babbitted bearing should never be used where it will be necessary to dismantle the machine in order to line up the shafting when the bearings need to be re-babbitted, as the cost of this work will be far more than would have paid for bushed bearings, to say nothing of the risk of having the machine impaired by imperfect aligning. Where the bearing can be easily removed and replaced, and exact adjustment is not important, or if important is not difficult to attain, the babbitted bearing may well be the best one to use. But in such places as the main bearings of an engine, where re-babbitting will involve lifting out the crankshaft and dismantling almost the whole engine to get lines through the cylinder for lining up the bearings, the babbitted bearing is by far the most costly in the end.

The bushed bearing is quite a little more expensive than the babbitted, as it calls for more machine work. However, the first alignment of the machine is likely to be more perfect, as it depends only upon the accuracy of the machine work, and not so much upon the skill of a mechanic lining it up by hand. But what is, I think, more important, the machine can be kept in perfect alignment indefinitely by replacing the worn bushings with new ones. With proper care in the design, the work of fitting new bushings can be made much cheaper than it would be possible to re-babbitt the bearings, and the assurance of perfect alignment during the life of the machine is valuable to both manufacturer and user.

To attain the full economy possible from the use of bushings, the design should be such that the bushing can be removed and replaced easily. Especially in the case of heavy shafting the bushing should be removable without having to lift the shaft. There are many schemes used to prevent the bushing turning with the shaft, some of which call for more machine work than others, and, worse still, some compel the lifting of the shaft to get the bushing out.



SIMPLE CONSTRUCTION FOR A SPLIT BUSHING

The method I use for split bearings is shown in the accompanying sketch. The lower half of the bushing has a projecting flange at about the center of its length, which fits into a recess machined in the lower half of the shell. The cap, not having this recess, prevents the bushing from revolving, and the flange holds the bush from endwise movement. By lifting the bearing cap off and taking up the weight of the shaft on wedges or a jackscrew, the lower bushing can be revolved around the shaft one-half turn and then lifted out.

The recess shown cast in the upper half of the bushing makes it possible to machine the bushing as easily as if the two halves were alike; and it gives as cheap a construction to make as it is possible to obtain, and yet be effective for the purpose. The bearing shell is first bored out with the cap in place; then the cap is removed and the recess machined in the lower half, the whole making a very simple proposition for the machine shop.

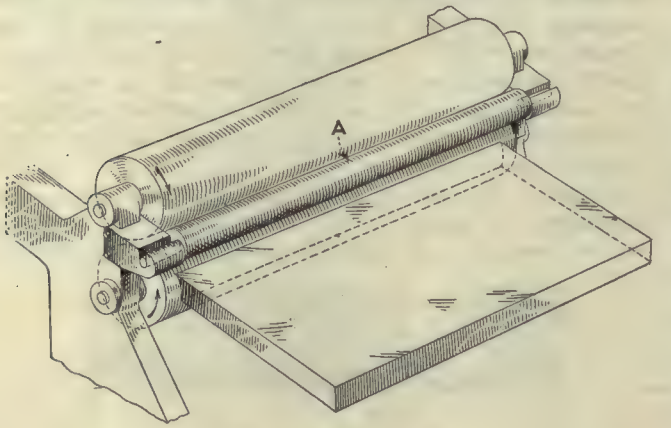
Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

An Efficient Guard for Rolling Machines

BY DONALD A. HAMPSON

Machine shop men are called upon to devise protecting devices for a wide variety of machines and machine tools. The requisites of an efficient guard are: first, protection; second, convenience for the operator. The highest type of guard combines these two features



GUARD FOR ROLLS

in such a manner that greater production is obtained from the machine than before the device is installed.

There is one class of machinery on which the most distressing accidents have occurred, on which guards have been used as sparingly as the law would permit, because most of them interfered with hand feeding operations. That class either has a pair of rolls geared together, or a single roll that runs inwardly in close proximity to a flat table. Such machines are found in large numbers in rolling mills, printing plants, and hundreds of process industries.

In all of this machinery, the workman is required to feed the material toward the line of tangency, very often having to guide the work well up to the rolls. It is here that a moment's carelessness results in his getting caught and maimed before help can arrive.

The drawing shows a type of guard that has been applied with signal success. The table is stationary in front of the rolls and upon it the work is laid and pushed up until gripped by the rolls. Fastened to the frame of the machine on each side are brackets, slotted to receive the journals of the drop-in roller *A*. This roller is free to revolve with the work, if it touches it as it is fed through. It does not retard production in any way.

But if the operator unconsciously runs his hands up too close, he finds them pressed by the weight of the roller. He has ample time to recover his senses before getting injured; at most he can only receive a passing scare, and the guard immediately drops into place again.

The simplicity and low cost of this guard commend it. In some cases the roller has been made of wood, five or six inches in diameter and weighing as high as fifty pounds; in others, where space and visability were demanded, a metal roller of lesser diameter has been used.

Spring Testing Machine

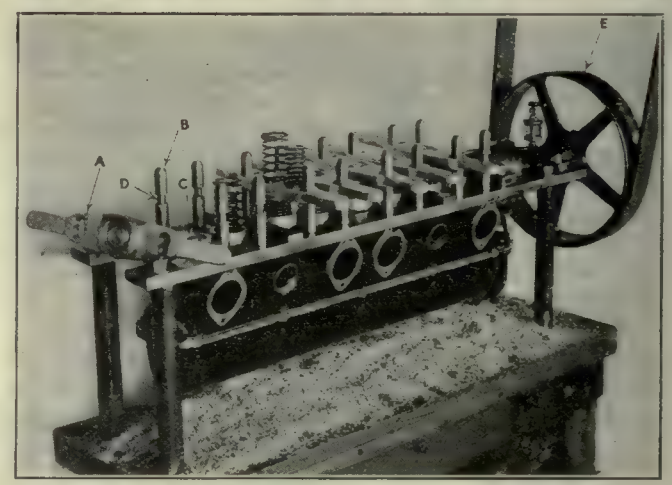
BY C. L. BURNS

The accompanying photograph shows a machine designed for subjecting helical springs to a service test before using them. It has a camshaft to operate moving spring-seats and a number of locking arms that impose upon the springs a pressure equivalent to that to which they will be subjected when actually in service.

The springs to be tested are placed on the seats as at *C* and the locking arms put over them and pressed into position on the locking posts *B*. The locking arms are provided with slotted holes which permit them to be slipped over the tops of the posts and locked in position on the shoulder *D*, by a slight twisting motion.

The machine can be made to test any number of springs required. In this case the springs were for an 8-cylinder gasoline engine and the machine accommodated eight sets of springs.

The driving pulley is attached to the camshaft which operates the spring seats *C*, through stems which are integral with the seats. The locking arms are provided with circular recesses on both sides. These



MACHINE FOR TESTING SPRINGS

recesses are made of such depths as to provide for two different lengths of springs.

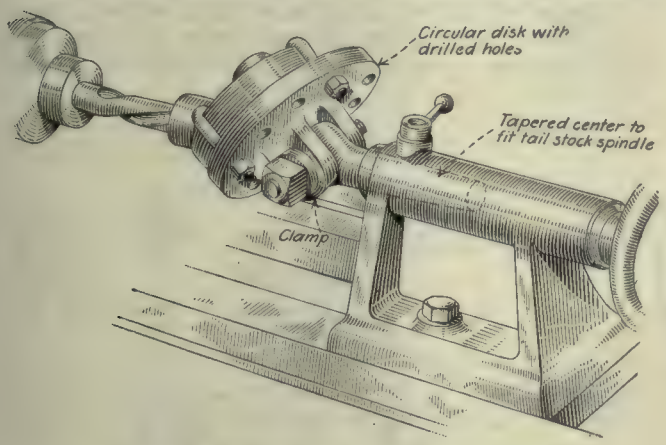
The important points to watch in the design of such machine are, the cam lifts and the distance between the bottoms of the recesses in the seats *C* and the tops of the recesses in the locking arms *A*, when the arms are pressed in position on the locking posts. These are factors which govern the pressure to be applied to the springs or the amount of compression that the springs are to receive. The speed of operation will depend upon service conditions.

A Useful Lathe Accessory

By G. A. Luers

A useful accessory for the small shop that is not too well provided with equipment, was devised by a local mechanic to take care of the drilling of some pieces that would ordinarily require a drilling machine (which he did not have) and a fixture for holding the work.

The piece is a tilting table to go in the tail spindle of



TILTING WORK SUPPORT FOR THE LATHE

the lathe, as shown in the sketch. A taper shank fitting the bore of the spindle is flatted off at the outer end to go between the lugs on the underside of the round piece that forms the table, and a cross hole through the two parts provides for a clamping bolt to fasten them in any required angular position.

Holes may be drilled and tapped in the disk for the purpose of clamping the work.

A Simple Tempering Kink for Small Parts

By William J. Thirkettle

We use at our factory steel rollers for guiding flat wire through cutters. These rollers revolve freely on centers as shown in Fig. 1, and are about 1½ in. long between the flanges. They are running continuously, in the operation of slitting with great accuracy thousands of yards of flat stock into narrow strips. Because of the nature of the work, the original wire must be of accurate and uniform width, and the measurement between the flanges of the roller also accurate, with as little chance for wear as possible.

Consequently, the rollers are hardened, and the small center pins also. We found that drill rod heated cherry red and quenched in cold water gave the desired hardness, but a difficulty arose owing to both the pins and the rollers breaking in the middle.

Different methods were tried, so as to temper only the extreme ends, but difficulty was met with the small pins, which were only ¼-in. stock and ½ in. in length. I thereby conceived the following kink that proved very satisfactory.

I obtained a piece of scrap cast iron about 2x3 in. in breadth and length and ½ in. thick, drilled and tapped six holes in the cast iron and screwed six of the small pins in these tapped holes, as shown in Fig. 2. I then heated the whole until cherry red and quenched quickly in cold water. The iron retained enough heat so as to leave the bodies of the pins comparatively soft, although the extreme ends were, of course, very hard. Up to the time of writing there has not been one case of a broken pin.

In the case of the rollers I used the same idea, with

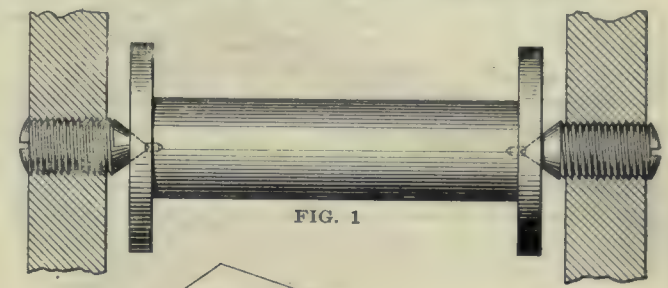


FIG. 1

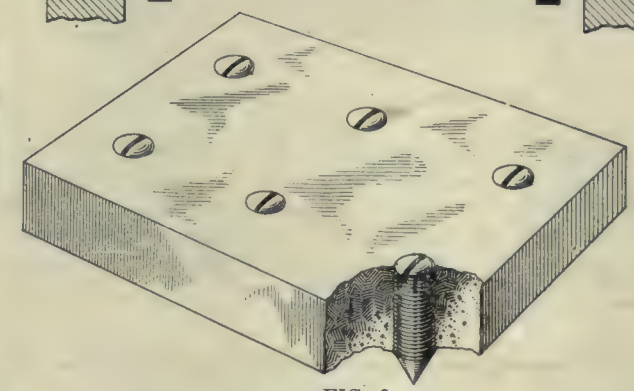


FIG. 2

FIG. 1—ROLLERS AND PINS REQUIRING HARDENING.
FIG. 2—MOUNTING PINS FOR HARDENING ENDS

a split cast-iron sleeve over the body of the roller. I am also using this method with tools that require hardening just in certain places. Cast iron proved the most economical and best metal to use for this purpose, owing to its peculiar properties when heated and quenched.

A Simple Expanding Mandrel

By C. H. Hays

Through an error, 2,000 die castings were delivered at our shop having square corners as at *A*, Fig. 1, instead of rounded corners as shown at *B*.

As the error had to be corrected by machining the castings, I made the expansion mandrel shown at *A*,

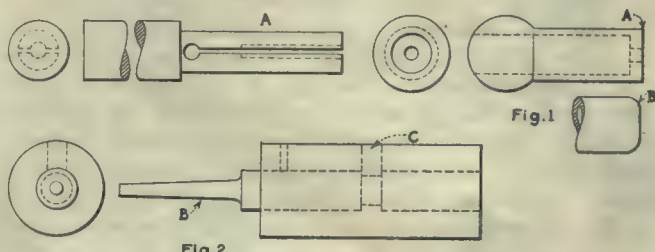


FIG. 1—THE WORK TO BE MACHINED. FIG. 2—THE EXPANDING MANDREL

Fig. 2, to hold them in the screw machine. The pin, *B*, for expanding the mandrel was held in a bushing in the turret and, while free to rotate with the mandrel, was held from moving endwise by a pin at *C*.

With this type of expanding mandrel, the castings could be put on and taken off without stopping the machine.

The pin for expanding the mandrel should be made of steel and hardened while the bushing should be made of bronze and provided with oil grooves.

Snapper Jigs vs. Swing-Top Jigs

By George Laidler

In the article headed Reducing Costs and Increasing Production on page 418, Vol. 58, of the *American Machinist*, there appears the statement that a firm replaced a number of snapper jigs by swing-top jigs, on the ground that the former were too slow. As my firm is very familiar with this sort of work, I feel that this statement is rather misleading. Comparative time studies on similar pieces treated in both types of jigs have repeatedly shown that the swing-top jig is about 25 per cent slower, in manipulation alone, than the snapper jig. In one case the operator has but to raise the snapper bridge by the hand lever, remove or insert the work, while the drill or reamer need not leave its bushing. In the other case the operator must raise the drill clear of the bridge, undo the quick-acting latch, swing the bridge clear of the work, slacken the jaws of the chuck to release the work, then remove or insert the piece.

The snapper jig is most convenient for work not requiring the greatest accuracy, such as can be centered readily under a bell-mouthed bushing or held between flat surfaces. The swing-top jig, while undoubtedly slower, is extremely accurate; moreover, one such jig when fitted with suitable removable bushings will accommodate quite a number of similar pieces of work of different bores, outside diameters and heights. On changing work from snapper jigs to swing-top jigs, our experience has been that scrap due to faulty drilling or reaming has been almost eliminated.

An assembled snapper or spring pressure jig applicable to the hardening of the bore of dies for the cold-drawing of shafts is shown in Fig. 1. Here the red-hot die is held under spring pressure between asbestos pads while a stream of water passes through the central hole. In Fig. 2 is shown a swing-top jig which embodies a standard three-jaw chuck. In disengaging the latch *A*, the first turn or so on the star wheel *B*, releases the pressure on the latch. On further turning, the star wheel jams on the washer *C*, held by the inserted screw, and turns the latch into the free position.

On page 419 of the same issue, Fig. 5 shows a multiple fixture for milling several shafts at once. An improved form of clamping arrangement for such work

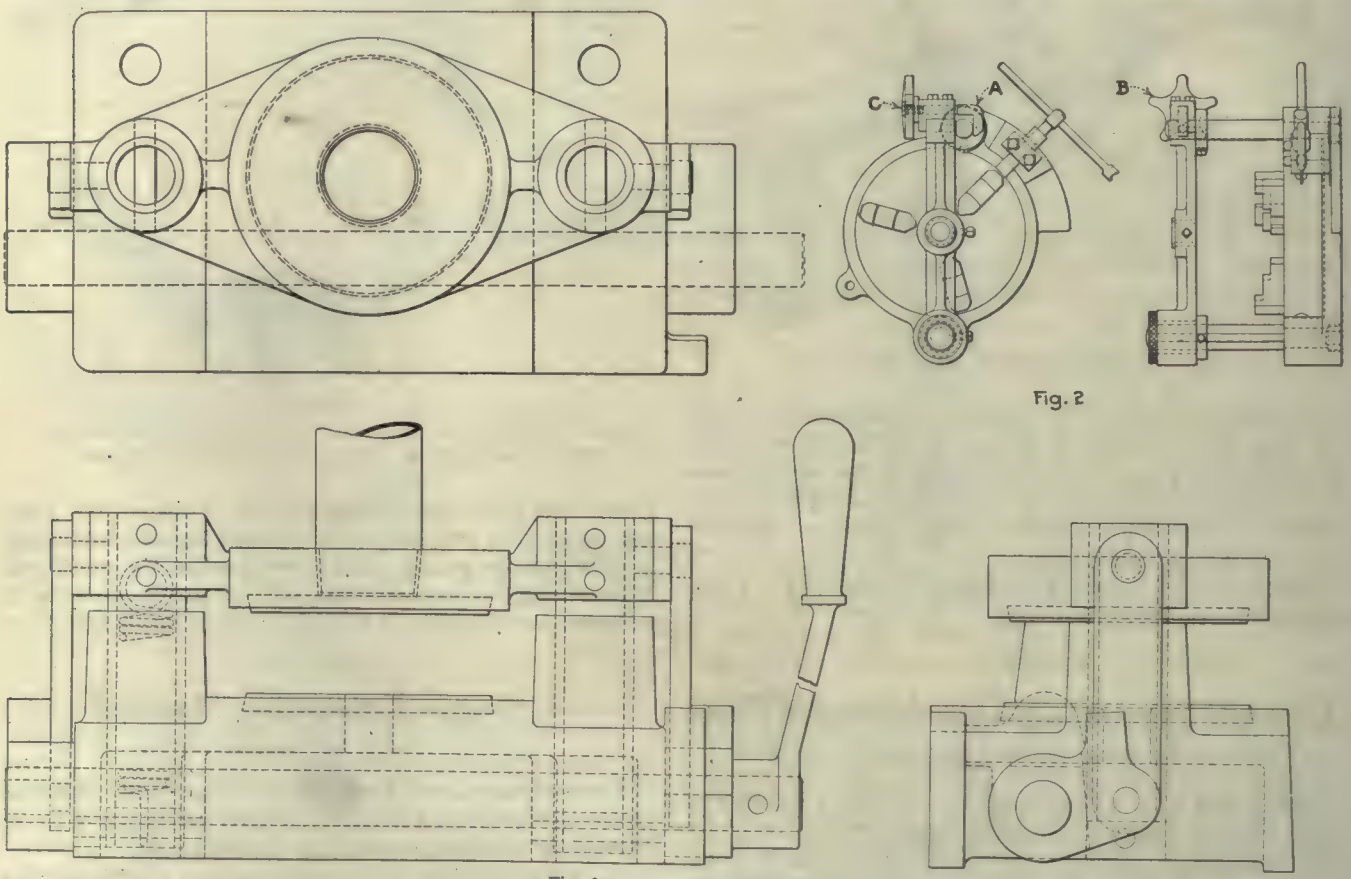


FIG. 1—SNAPPER OR SPRING-PRESSURE JIG. FIG. 2—SWING-TOP JIG.

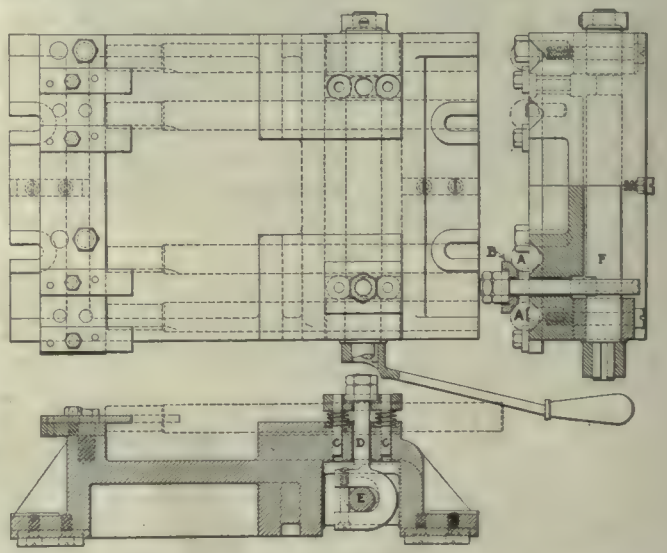


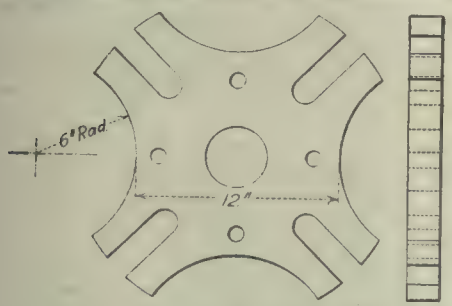
FIG. 3—FIXTURE FOR HOLDING WORK IN MULTIPLE

is illustrated herewith in Fig. 3. Here each pair of shafts is held by a clamp *B*, normally held up by springs around two guide pins *C*. The inclined edges of the clamp are cut at 40 deg. to the horizontal, the sides of the V being at 45 deg. By this device a very slight lift of the clamp allows the shafts to be removed sidewise and upwards. The clamping pressure is obtained by means of a bolt *D*, shaped as shown, which engages the eccentric portion *E* of the stiff cross shaft *F*. This shaft is 1⅜ in. in diameter in the main, reduced to 1 in. at the eccentric portion, and has a hand lever at one end. Adjustment for various diameters of shafts is made by the locknuts on the clamping bolt, so that the work is located when the eccentric is on the dead center. This arrangement has been applied to the simultaneous clamping of as many as six shafts.

An Improvised Milling Cutter—Discussion

By F. Jaeger

Under the above title on page 808, Vol. 58, of the *American Machinist*, Henry M. Clary describes how a lathe tool was used as a substitute for a milling cutter to do a facing job in the milling machine. A somewhat similar application has been made in the shop where I am employed. The work is shown in the accompanying sketch, the operation being the machining of four concaved surfaces to a radius of 6 inches. The piece was held on the dividing head of a Cincinnati milling machine by passing four bolts through the holes shown, the holes being necessary to the design of the machine and not made specially for the purpose of holding the piece.



PIECE MILLED WITH ARMSTRONG TOOL

An Armstrong tool holder was gripped in the regular three-jawed chuck supplied with the milling machine and adjusted to the required radius. The dividing head was set to face the column of the machine and the regular cross-feed applied to advance the work to the cut.

Careless Assembly and Lack of Balance

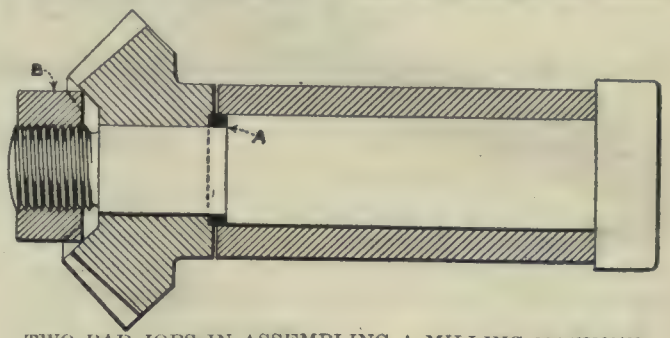
By Henry C. Francis

We bought a new milling machine the other day and it had the worst "hump" in the elevating works that I've ever seen. Once every revolution the handle bound so we could hardly get it past the tight spot. So we took it apart and found about as bad a job as I've seen for some time.

The back of the bevel gear bore on the housing before the nut could be tightened, as shown at *A* in the sketch. We fixed this by puting in a washer back of the gear and bearing on the shoulder, so as to give a clearance of about 0.005 inch.

Then we found that the nut would not tighten the gear down square because the corners of the nut bore on the bevel inside the teeth as shown at *B*. By putting a large chamfer on the corners of the nut, as shown by the dotted lines, so it would bear on its face, the job was finished.

On this same machine we had to balance the cone,



TWO BAD JOBS IN ASSEMBLING A MILLING MACHINE

by adding about 1½ lb. of weight on one side, before we could run it at the higher speeds. This is a very common fault with many of the machines we get. It is surely a poor way to let a machine go out, and we would certainly hesitate before buying the same kind next time.

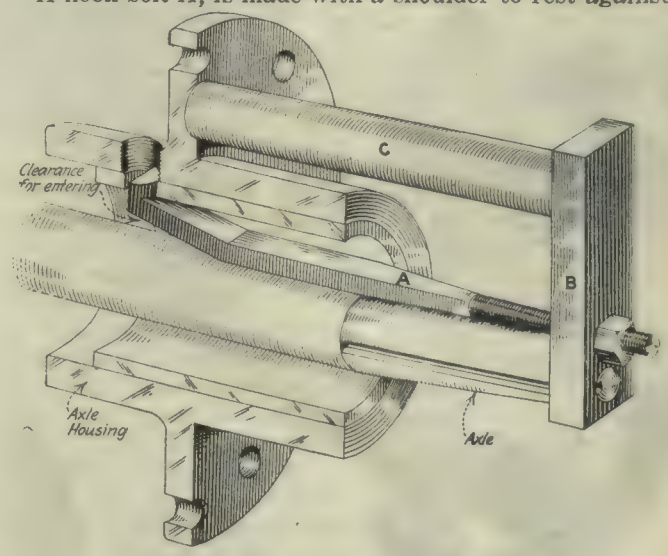
A Bushing Puller for Axle Bearings

By G. A. Luers

Where the roller type of bearing is to be replaced, it is advisable to renew the sleeve bushing at the same time, as this constitutes part of the bearing.

To remove the bushing without disassembly of the axle parts, a local mechanic devised the special puller shown. The use of this puller avoids the interference of the axle and in fact makes use of the axle as one point of support for the puller.

A hook bolt *A*, is made with a shoulder to rest against



PULLER FOR AXLE-BEARING BUSHING

the axle. To use the hook bolt it is tipped up and the end enters the recess in the bushing which is provided for the retaining screw. A cross bar *B* is provided with two holes, one of which is threaded to screw over the end of the axle, while the other is plain, for the hook bolt. A short bar *C*, is used to support the outside end of the cross bar. A nut on the threaded end of the hook bolt makes a screw jack for pulling out the bushing.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors

October 11, 1923

The Use of Metal In Airplanes

IN almost every change in transportation methods we have seen in initial developments the use of wood in structure whenever possible, and then noted its abandonment for metals—in shipping, railways, bicycles, automobiles and now the airplane. The dirigible is perhaps the only exception.

Those of us who have followed aircraft closely look back and shudder at the early contraptions in which men risked their lives in their enthusiasm for the development of the new science. No pioneers ever dared more for science than the early fliers who courageously explored the unknown air currents in machines built of wood or bamboo, fastened in the crudest manner, and braced together with wire of unknown strength. How these machines ever held together will always be one of the unsolved mysteries, and it is little wonder that very few of the original fliers are still with us.

Slowly but steadily, however, the use of metal has forced its way to the front. First in the shape of fittings by which the wooden struts and beams were held together, but gradually extending to other parts of the structure. Several of the pioneers, such as Sturtevant, attempted metal construction early in the game. And though they did not entirely succeed they aided in the development of aircraft. Others have followed and by degrees the use of metal is growing, although less rapidly than would be the case were airplane manufacture an established industry, for wood lends itself to small quantity production better than metal.

Many have contributed to the use of metal in airplanes, both in this country and abroad. The German Junker, the Fiat and others are doing their share in its development. And it is with no spirit of discrimination that we single out the recent work of the Aeromarine Plane and Motor Co. as an example. Its latest development is the all-metal hull for flying boats, which has many advantages over the wooden construction. The hull is lighter, does not add weight by absorbing water, and while it may be dented, it does not splinter or leak as easily as the wooden hull. The useful carrying capacity is increased and the cost of maintenance is less. The lighter weight enables a ship weighing 6,000 lb. to carry a useful load of 2,445 lb. and to "take off" or rise from the water in much less distance than the wooden hull. The same company has also developed a metal mail-plane.

The increasing use of metal in aeronautical construction brings the industry more and more into line as a user of machine tools and other metal-working machinery. And from a purely business point of view, cities in which such machinery is built should be progressive in providing landing fields, beacons and other necessary adjuncts for aerial transport. Some can make provisions for land machines and others for sea planes but all can encourage the industry in one way or another. It is the next step in transportation and those who are wise will aid its development in every way possible.

Sending Out Unbalanced Machines

THE letter on page 567 regarding defects in newly purchased machine tools, has one very significant statement which shows that not all tool builders are alive to the needs of fast-moving spindles and other parts. We refer to the statement regarding the lack of balance in spindles of high-speed machines.

We have talked much of balancing revolving parts to eliminate vibration. But there is still much to be done in the balancing of high-speed spindles and shafts for steady running and for the production of accurate work.

It is decidedly discouraging to buy a machine which is supposed to aid in economical production by running drills or milling cutters at high speed, only to find that, through faulty workmanship and lack of knowledge as to proper balancing, the spindle cannot be run at over half its maximum speed. Such an experience is very apt to result in placing the next order elsewhere.

With the knowledge of balancing which we have acquired during the past few years, and the machines which are now available for this work, there is little excuse for sending out high-speed machines out of balance. Machine builders who desire to maintain a reputation and to continue selling to users whose work demands high speed and who appreciate a first-class job, must consider running balance. Proper balancing is as essential as good fits in bearings and good materials in all the parts of the machine.

The Eight-Hour Day Attracts Workers

IT USUALLY happens that when we are contemplating a change in business policy or shop management, we overlook at least one important factor. And this in spite of the fact that we fondly imagine that we have carefully canvassed every factor which has a bearing on the case.

A good recent example of this is the reluctant establishment of the eight-hour day, instead of the twelve, in the steel industry. After making elaborate plans to secure such additional men as might be needed, it soon became apparent that there was no need whatever for worry on that score. The eight-hour day itself made the steel mill sufficiently attractive to men in other lines, to secure their applications for work almost immediately.

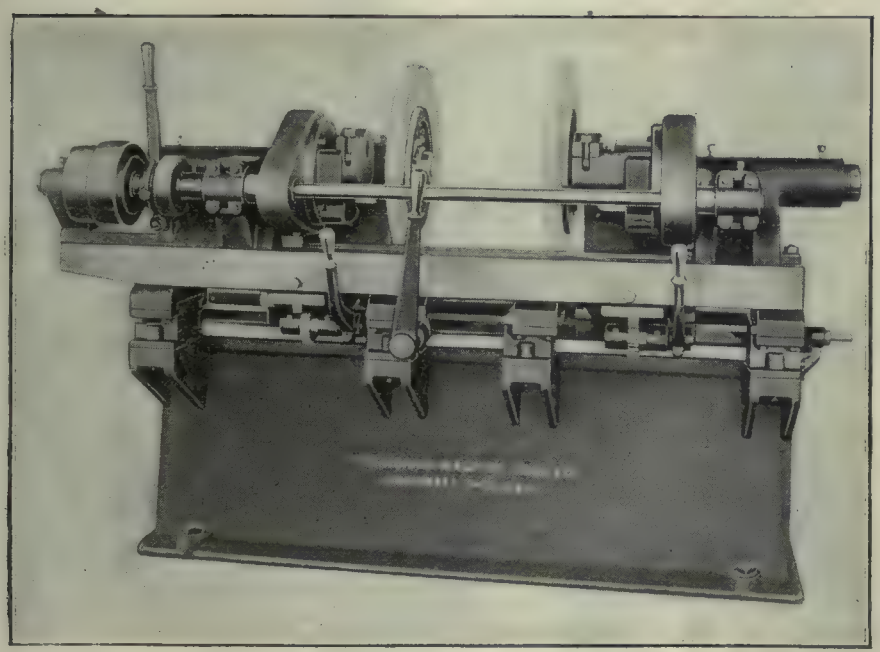
Evidently we have not quite reached the point where we fully realize that the shop worker is not a part of the machinery but that he has the same desires, likes and dislikes as the rest of us who work in other lines. When we fully realize this we shall get on faster and many of our present shop problems will disappear.

Shop Equipment News

Morris Crankshaft Buffing Machine

For the purpose of polishing crankshaft bearing surfaces after grinding, the Morris Machine Tool Co., Court and Harriet Sts., Cincinnati, Ohio, has recently placed on the market the crankshaft buffing machine shown in the illustration.

For continuous production three machines are required to buff a four-throw crankshaft complete. Two machines of the type shown in the illustration buff the crank pins, each buffing the two pins on the same center. Another machine, similar to the one illustrated but furnished with three wheels, holds the shaft between centers and buffs the main bearings. A six-throw crankshaft requires four set-ups.



MORRIS CRANKSHAFT BUFFING MACHINE

In the crank-pin buffing machine illustrated the shaft is mounted on an offset chuck and driven from both ends, in a manner similar to a crankshaft turning lathe. For buffing the main bearings the shaft is driven from one end.

The buffing wheels are made of hard felt about 24 in. in diameter and pulverized glass, dressed with a crocus block from time to time, is used for a polishing material. It is stated that the polishing operation does not change the diameter more than 0.001 in. The wheels are mounted on ball bearings in slides which are arranged to be moved transversely through the manipulation of the two short levers, shown at the front of the machine.

The table which carries the shaft driving heads can be moved longitudinally by means of the long lever. The wheel slides are adjustable on the bed to suit crankshafts of different sizes.

The driving heads are driven from the two-step cone pulley at the left of the machine, and a lever located nearby controls a friction clutch and brake. The wheels are enclosed in dust hoods which can be connected to a dust collecting system. The weight of the machine is approximately 6,000 pounds.

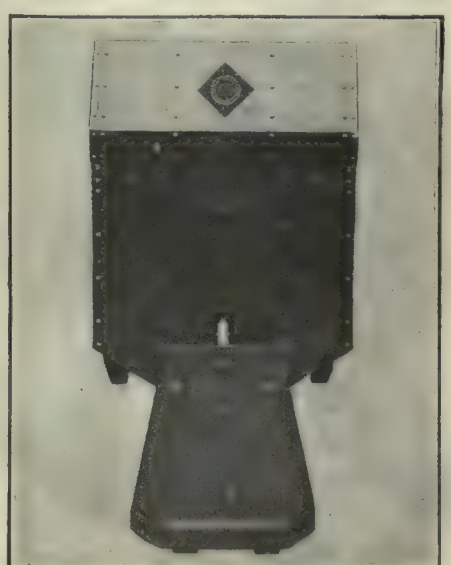
It is claimed that these machines will polish bearings faster than can be done by the hand method and with much better results. Crankshafts buffed in this machine are said to show superior wearing qualities and obviate running in the bearings in the finished motor.

Elwell-Parker Electric Low Lift Truck

For the purpose of handling material with greater ease and rapidity on load platforms, such as used with a hand lift truck, the Elwell-Parker Electric Co., Cleveland, Ohio, is now marketing a low type electric lift truck.

This truck has a riveted steel frame and the standard electric motor and drive. The drive wheels are 22x3½ in. and are rubber tired. The frame is supported over the drive axle by springs, and the storage battery is located in a compartment directly over the axle. It is claimed that the motor is of sufficient capacity to drive the truck with its load up a 10 per cent incline.

The wheels beneath the platform are 5¾ in. in diameter and 4 in. wide. The top of the platform is made from ¼-in. steel plate. The platform is 18 in. wide by 46 in. long,



ELWELL-PARKER ELECTRIC LOW LIFT TRUCK

is 6¼ in. above the floor in its lowered position, and has a lift of 3½ inches.

The platform is supported on three links which are pivoted on the frame. The lifting is done by means of a combined rocking and elevating motion of the platform, actuated by a screw ram attached to the rear of the platform between the links. The

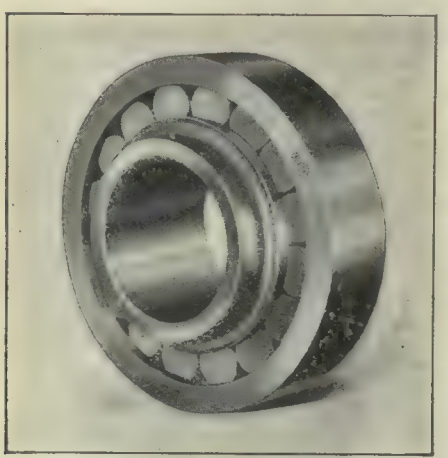
screw is threaded into the hub of a worm wheel which is driven through a steel worm by an independent motor.

When the lifting switch is closed, the mechanism lifts the load 3½ in. in 10 sec. and stops automatically. All four wheels steer, thus giving the truck sufficient flexibility for operation in restricted spaces. It is claimed that a 4,000-lb. load can be transported at from 300 to 400 ft. per minute.

Rollway MDW Type Roller Bearing

A recent addition to the line of roller bearings manufactured by the Rollway Bearing Co., Syracuse, N. Y., consists of the MDW type which has been developed for heavy service such as heavy gear or chain drives, railway service, and work of similar character.

The inner race of this bearing is



ROLLWAY MDW TYPE ROLLER BEARING

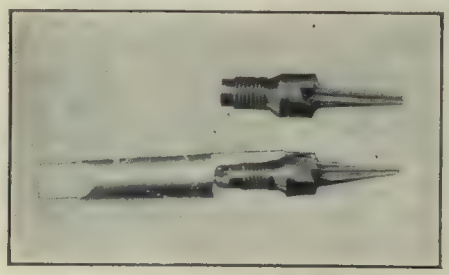
wider than the standard bearing, the extra width being intended to obviate the tendency of narrower types to cut into the shaft, and to make unnecessary the extremely heavy fits usually recommended for such heavy service equipment. The lighter fit makes removal of the bearing easier.

The inner and outer races are of a heavy channel section as shown in the illustration and no separator is used between the rollers. The use of the maximum number of rollers is therefore possible. The rollers are held from slipping end-wise by the sides of the races.

Both races and rollers are made from high-carbon, high-chrome steel. The bore diameters for the various sizes range from 0.7874 to 10.2363 inches.

Circular Tool Co. Profile Cutter

The Circular Tool Co., 71 Willard Ave., Providence, R. I., has just placed on the market a line of profiling cutters, commonly known as "cutter plate mills." The threaded shank of the mill is purposely made



CIRCULAR TOOL CO. PROFILE CUTTER

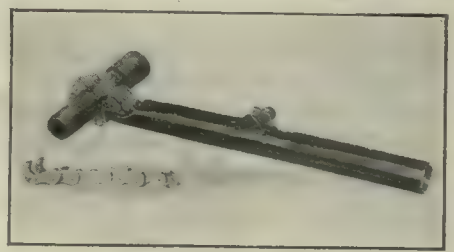
a loose fit in the collet and the tool, therefore, takes its bearing against the conical under surface of the shoulder. By this means, which is equivalent to the hold of a draw-in chuck, it is claimed that the tools are accurately centered and much more firmly held.

The tapered tools, one of which is shown in the illustration both in and out of the standard collet, are furnished in standard sizes ranging from $\frac{1}{8}$ to $\frac{1}{4}$ in. in point diameter, and from $\frac{3}{4}$ to $1\frac{1}{4}$ in. in length of flute. Parallel cutters are supplied in diameters ranging from $\frac{3}{16}$ to $\frac{1}{2}$ inch.

"Python" Ratchet-Action Wrench

The Python Tools Co., 95 Liberty St., New York, N. Y., is now marketing a ratchet-action general purpose wrench.

As shown in the accompanying illustration, the tool consists of a hollow handle from which projects a length of chain. At the end of the chain a suitable hook-shaped link is



"PYTHON" RATCHET-ACTION WRENCH

provided which fits over projections at the end of the handle after the chain has been wrapped around the part to be turned. When adjusted in this manner the end of the chain is locked in the handle by the manipulation of the thumb lever shown.

The adjustment is rapid and easily accomplished. For handling unions and similar parts where the force required is not too great, the capacity may be doubled by hooking on the extra chain shown in the illustration.

The wrench will grip nuts, rods, pipe or fittings of hard or soft material or with rough or smooth surfaces. The ratchet action makes it convenient in close quarters, and it is claimed that the chain grip will not mar the surface to which the wrench is attached.

Decrease in Iron and Steel Exports

August exports of iron and steel products from the United States were 163,010 long tons, compared with 170,259 tons in July and the monthly average of 164,535 tons for the first seven months of 1923. A comparison of the detailed figures by the Iron and Steel Division of the Department of Commerce for August shows exports of pig iron and structural, fabricated and unfabricated, to be respectively about 20 per cent and 25 per cent greater than the average for the eight months ending Aug. 31, and wire rods 37 per cent; wire and wire products, 25 per cent; plates and sheets 25 per cent; and bars, 12 per cent less than the monthly average for the period.

The United States imported 45,612 tons of iron and steel products during August, compared with 53,448 tons in July and the monthly average of 81,323 tons for the first seven months of 1923.

Pig iron, ferro alloys and scrap showed the greatest falling off, compared with the previous month's receipts as well as with the monthly average for the eight-month period. Imports of semi-finished steel, rails, and plates showed most marked increases.

Chinese Markets Get Japan's Orders

The effect of the Japanese disaster on Chinese markets was immediate, says Commercial Attaché Julean Arnold in a cable from Shanghai to the Department of Commerce. Japan's emergency purchases have stimulated the market, after some months of dullness, into marked activity and Japan's temporary cessation of exports has materially increased China's foreign trade.

Steel stocks in Shanghai are reported depleted and there is a good demand for stocks needed to replace the amounts sent to Japan. Shanghai is reported buying from several sources. Orders are being placed in America for tubing and galvanized sheets; in Belgium for plates, shapes, and angles; in England for galvanized sheets and nails; and in Australia for nails. Japan's temporary cessation of exports to China, it is expected, will increase the demand for American cotton, piece goods, steel and machinery

News Section

Fall Meeting of Machine Tool Builders Association Is Held at Lenox, Mass.

THE general approval of everything connected with the second Autumn meeting of the National Machine Tool Builders' Association at Lenox, Mass., seems to indicate that this affair is an annual fixture. The time of this year's meeting, Oct. 2 to 4, found the Berkshire Hills and golf courses at their best. Sixty-five member companies were represented by more than 140 executives and their wives.

In setting aside the mornings of the first days of the meeting for official golf and tennis, the program committee showed excellent judgment as attendance at afternoon sessions was but little reduced by unofficial indulgence in these pastimes. Another move that was productive of good results was the placing of three rows of rocking chairs in front of the meeting room. As a result it was unnecessary for President Kearney to ask those in the back to move forward.

At the Tuesday afternoon session the outstanding feature was the presidential address of E. J. Kearney. We expect to publish the complete text in an early issue. There was also a report by Wallace Carrel for the joint conference committee of the builders' and dealers' associations. After relating the facts regarding machine tool distribution as brought out in its investigations, the committee made the following recommendations:

"It is the hope of the Committee that a comprehensive statistical service may be conducted on some plan that will give the market the best sort of information. By the market, the Committee wishes to be understood as including users as well as dealers, agents and manufacturers. In the past all elements have suffered serious losses from the lack of good statistical information. Buyers have not learned to forecast their need for equipment, and too many place their orders just when costs and, of course, prices are the very highest.

The Value of Statistics

"Good statistics would enable the sellers of machine tools to demonstrate that this policy is wasteful and economically unsound. With such statistics some buyers could be influenced to place more orders than they now do in times of depression, just when the sellers need orders the most.

"The present buying policy of large users throws a peak load on machine tool builders at most inopportune times, and it is greatly to the industry's interest to take every step that will get more orders into the valleys and less on the peaks. Costs, direct and indirect would thereby be greatly reduced, and the buyer would not have to invest so much capital at high prices as he does under his present methods of buying. Complete stabilization of demand will of course never be possible. but every step in that direction will benefit the whole market.

"Without statistical facts available the industry will continue to suffer the most violent fluctuations of any industry. With investment of over 200 millions of dollars at stake, of machine tool builders' capital, and the additional millions invested by distributors, it is certainly worth while to spend considerable sums of money on the betterment of buying practice."

In his report, General Manager E. F. DuBrul called attention to the fact that there had been a slight recession in orders since the last meeting. Mr. DuBrul also told of recent developments in the field of technical research both in the machinery industry and in other fields. After some discussion of this phase of association activity the president was authorized to appoint a committee to look into it and report back at the next meeting.

At the evening meeting, H. M. Lucas, chairman of the Ethics Committee, presented an important progress report for discussion. It was referred back for further consideration by the committee.

By far the most important event of the whole meeting was Fred A. Geier's 100-yard putt with a mashie for a birdie three during the course of a match at the Pittsfield Country Club. Had Mr. Geier joined the Hole-in-one Club the excitement could not have been more intense. This famous stroke will live long in the annals of the association, and deservedly so.

The championship golf cup was won by Major MacLeod of the Abrasive Machine Tool Co. of Providence, R. I., who defeated Mr. Neilson of the Norton Co. by 3 and 2. A cup presented by the Hotel Aspinwall was won by Mr. Swift of the Ohio Machine Tool Co. who beat Mr. Whipp of the Monarch Machine Tool Co.

O. H. Broxterman of the John Steptoe Co. proved to be the master tennis expert when he defeated H. K. Spencer of the Blanchard Machine Co. in the finals after a hard fought match.

The following new directors were elected: R. E. Flanders, Jones & Lamson Machine Co.; J. G. Benedict, Landis Machine Co.; H. P. Dix, Wilmarth & Morman Co. and H. M. Lucas, Lucas Machine Tool Co.

Upon organization of the new board of directors these officers were elected: President, R. E. Flanders; first vice-president, O. B. Iles, International Machine Tool Co.; second vice-president, Frank N. MacLeod, Abrasive Machine Tool Co.; treasurer, H. M. Lucas.



UPPER LEFT, R. E. FLANDERS, PRESIDENT; UPPER RIGHT, O. B. ILES, FIRST VICE-PRESIDENT; LOWER LEFT, FRANK N. MAC LEOD, SECOND VICE-PRESIDENT; AND H. M. LUCAS, TREASURER

Many Sales to Small Consumers in Pittsburgh Market

For several weeks past the big companies have been rather slow in buying machinery and machine tools in the western Pennsylvania district, and many of them are absent from the market altogether. Disappointment is felt that the railroads are not buying more prolifically, but surprise was also expressed when it was seen how well the roads were meeting the heavy shipments of the steel mills and yet having many surplus cars left. This indicates that they are in better shape than was thought, and the car repair shops are not operating as heavily as in previous months. This has caused a let-up in demand for machine tools in that particular line.

However, the trade is heartened by the individual tool inquiries from small consumers, a distinct increase along this line being noticed in the past ten days. Sellers are encouraged, and expect to close up a number of deals shortly that will put a different aspect on their business conditions. A few of the steel companies have sent out inquiries in the last few days for machinery, the Pittsburgh Crucible Steel Co. being among this number.

A sale of cranes was noted a few days ago, and attention was called to the number of inquiries coming from different parts of the state for cranes. The Carnegie Steel Co. closed on fourteen jib cranes with the Whiting Corp. The Northern Engineering Works, Detroit, took an order for a three-ton electric overhead traveling crane from the Lorain Steel Co., Johnstown, Pa.

The inquiries coming are for practically all kinds of tools, but chiefly lathes, drill presses, wheel presses, etc. A dealer reported the sale of a motor-driven pipe machine, a saw, three motor-driven drills to one buyer, and four drills to another buyer. The Pennsylvania R.R. is expected to ask for revised bids on inquiries that have been current for some time for work east of Altoona, Pa., as well as for equipment at the repairs in the Sharpsburg shops.

Intermittent buying of good used machinery continues, among the sales lately being that of a 42-in. vertical boring mill and a 30x16-in. lathe. A local manufacturer bought a milling machine, and the same seller reported the sale of two small drills and other small equipment.

Business Improves in Canada

The machine tool business is enjoying a satisfactory share of the general improvement of trade in Canada. The expansion of the automobile industry and a considerable increase in the volume of car and other rolling stock construction has provided a broadening market for tools, forgings, etc. Western Canada particularly is opening up well from the standpoint of the machine tool trade. British Columbia is reported to be in good shape, due to the revival of the lumbering and mining industries; and the likelihood of the continued need of lumber in the Far East is thought to be a factor in guaranteeing a continuance of this condition. Such activity is making a broad market for tools.

The production of pig iron in Canada during August showed an increase of 13 per cent over the previous month, while the tonnage of steel ingots and castings produced during August was the highest for any month during the present calendar year. The revival in the demand for steel products has grown out of the renewed activities of general commerce in this country and with the increasing needs for transportation, consequent upon expanding industrial development, continuance of the favorable progress in the steel industry may be expected.

Money Plentiful in Canada

Development in regard to new purchasing power from agriculture and other primary industries continues to be most satisfactory, while the response to the recently floated Dominion refunding loan of $172,000,000 is an encouraging indication of the financial stability of the country. The Western crop is already on the move. Eastern trade centers report a better movement of goods. The distribution of about $25,000,000 in October dividends should add impetus to the demand for merchandise as well as proving an important factor in the investment situation.

A substantial increase in Canada's trade is shown in the figures for the twelve months ended with August. The total trade for that period was $1,892,928,000, an increase of $381,000,000 over the preceding twelve months.

There is also much to be thankful for in the recent statement of the Canadian National Railways for the month of August, which shows a considerable increase in net earnings of the system. Gross earnings are shown to have increased $1,566,123 or 7.7 per cent, as compared with August, 1922. After deducting operating expenses, which amounted to $19,940,909, a net operating revenue is shown for the month amounting to $2,027,000 as compared with a net operating revenue of $1,036,894 for the corresponding month of 1922.

Milwaukee Expects Good Month

While the progress made by the demand for foundry and machine shop equipment since midsummer has not been equal to expectations, manufacturers and dealers find encouragement in the improvement in business that has taken place in the early part of October. There is a hesitancy about purchases and an irregularity with respect to buying sources which still prevails and makes the state of trade not as satisfactory as general opinion expected it would be by this time. Business lacks zest and it requires strong selling pressure to get buyers to take hold.

The automobile industry, which was the backbone of trade in machinery during the past twelve to sixteen months, has not resumed purchases on the same liberal scale noted during last Spring, and it is questionable if large lots will go into this channel for the present, save for a comparatively few large and outstanding interests which have been the mainstay of trade since the gradual decline in sales began late in the Spring. The call for equipment for railroad shops remains disappointing, but this is now an old story and no further predictions of a highly optimistic character are being issued in any quarter.

Production Good

Judging by the manner in which manufacturers of metalworking machinery are sustaining their shop operations on at least the top of the level established during the past year, it would seem that while trade appears to be quiet on the surface, there must be a moderate quantity of business passing. At the same time, such shops maintain standing orders for help.

Milwaukee, a center of the mining machinery and equipment industry, profited materially from the presence a short time ago of several thousand members of and delegates to the American Mining Congress. It is stated that representatives of concerns in Mexico placed orders valued at more than $250,000 with Milwaukee equipment shops. The Pawling & Harnischfeger Co. received an order for the largest type of its excavating units, the success of which in operation will control the purchase of numerous additional units in prospect. Otherwise no notable instances of large individual orders have been reported, although other concerns in this market admitted an accentuation of business during and since this occasion.

The city of Milwaukee is preparing to establish a central machine and general service area for all automotive and other municipally-owned equipment within the coming six months and while no official lists have been issued, it is understood that a fair-sized lot of miscelleanous tool and other equipment will be purchased.

New York Selling Used Tools

Very little actual buying is evident in the New York market this week. The Delaware, Lackawanna and Western R.R. and the New York Central R.R. were both in the market for a few tools, but there have been no lengthy lists issued by the roads and no buying of more than single tools. Some little purchasing is noted among the automobile manufacturers, but dealers state that this is not up to expectations either.

The two bright spots in the current market are the purchasing of heavy machinery by general industrials and the good demand that is existing for used tools. The used tool market was exceptionally lively during the past seven days, but there were no indications of how long this condition would keep up.

While September proved to be a poor month from the actual total of sales, during the first part of the month there were many inquiries and hope is still held out for actual sales during the month of October.

Exporting has improved during the first week in October with several big sales reported.

Production in Buffalo at Good Rate and Sales Improving

The Buffalo machine tool market is considerably better than it was thirty days ago, although heavy equipment is still rather dull and there is sharp competition and many inquiries for second-hand equipment. Most of the business in the smaller lines is coming from small manufacturers. The bigger plants are slow in buying at the present time.

Most reports indicate that manufacturers are somewhat pessimistic, but it is a significant fact that the great majority of them are working full time and many of them overtime. There is no doubt that part of the pessimism is due to the slow collections of the last few weeks which, for some unknown reason, seem to be much slower than usual. Banks here, however, do not expect that this condition will continue long. It seems to be due to the vacation season and the fact that in this locality there has been a rather constant expansion in nearly all lines.

Reports from the Buffalo Forge Co. indicate that buying has not been as heavy in its diversified line during the last few weeks as formerly, but there are orders on the books to keep the plant running full time with full personnel for two months. One line has been unusually good. That is the tools exported. There has been a heavy buying movement in its export lines, particularly in supplies for blacksmiths, such as forges, blowers and the like. Most of these sales are going to Australia, New Zealand and South Africa, in which this company has had connections for the last forty years.

This company also reports that the railroads are still buying. It recently sold a bar cutter for 4-in. rounds to the Pere Marquette R.R. and a cut-off shear for flat stock to the same company. The Reo Motor Car Co. recently purchased a bar cutter for 4-in. rounds.

The Wheeler-Murray Co. states that there is a good demand for contractors equipment. Business is considerably better than last year at this time and the prospects for the Fall are very good. There has been a steady increase in inquiries and sales in the last sixty days.

Henry Prentiss & Co. find that the tone of business has gradually improved during the last few weeks. The only quiet factor is that which has to do with the automobile and automobile accessory line, some plants reporting that they are working only one-third time. This is not considered as important at this time because of the problems in manufacture, such as that dealing with the four-wheel brake. It is expected that as soon as such problems are solved and policies definitely determined upon that the automobile line will be even better than last year.

Conditions Steady in St. Louis

Increase in the number of inquiries being received by machine tool manufacturers in St. Louis and the healthy condition of business in general would indicate that midsummer predictions of a better Fall trade would be fulfilled. But these prophecies have not come up to expectations. Buyers of machine tools are buying just what they absolutely must have and are not putting into effect the plans for expansion which they had in mind. These plans are in the making or are perfected and when put into practice will require the purchasing of machine tools.

Railroads are buying, as they have for the past several months, for pressing needs only. The oil industry of the Southwest is still out of the market.

Concerning conditions in this district during the past thirty days, the Federal Reserve Bank survey states: "General business in this district during the past thirty days was featured by slight improvement over the similar period immediately preceding, and as contrasted with a year ago the gains of recent months were well maintained. The acceleration was due in part to seasonal considerations, but according to reports of a majority of leading interests in all lines scattered throughout the district, the principal factor favorably affecting the situation was a distinct improvement in expectations of the business community for Fall and Winter trade."

The statement concerning the iron and steel industry reports: "New bookings during the period under review were sustained at or slightly better than the rate of the similar period just preceding. There has been a decided improvement in the volume of inquiries directed to manufacturers and jobbers, and the character of the inquiry is indicative of reduced stocks and actual need of the tonnage specified. Job foundries and specialty makers have received a fair volume of new orders, and are extending their commitments for raw materials. Buying by the railroads continues on a liberal scale, and the automotive interests are also accounting for heavy tonnages of materials going into that class of construction.

"Steel plants specializing in railroad castings are operating at capacity, and have orders which will insure the present pace for the next 60 to 90 days. A further decline in buying of drilling and oil working supplies was reported."

Railroad Lists Out in Chicago

Thus far October has not shown any improvement in the volume of machine tool sales. The Burlington R.R. has postponed its purchasing on its large pending list from time to time, but now makes announcement of an intention to purchase this week. The Rockford Lathe & Drill Co., Rockford, Ill., has bought three milling machines, a horizontal boring mill, and two radial drills. The American Maize Products Co., Hammond, Ind., has purchased a second-hand 6-ft. radio drill and a 60-in. boring mill. The Chicago, Burlington & Quincy R.R. has placed an order for a 20-ton overhead electric traveling crane for its West Burlington shops. The Southern Pacific Co. has purchased an axle lathe and a 6-ft. radial drill. The New York Central R.R. has purchased an engine lathe. The Chesapeake & Ohio Ry. is reported to be in the market for a 20-ton locomotive crane.

The metal trades continue production in satisfactory volume and Chicago dealers believe that buying will gradually return.

Iron and steel bookings showed a slight increase during the last week, but the average for September was below August. A number of the U. S. Steel Corp. subsidiaries and several independents reported a gain in business last week, but the orders were not sufficient to bring the average for September up to August. Production by the leading interest registered a gain of 1 per cent during the week.

Detroit Business Is Good

A gradual settling of business conditions to a normal Fall basis is the outstanding development of the past week in the machine tool industry in Detroit.

The slight pick-up in production and market noticed in September at the close of the vacation period has established industry on what careful observers believe will be the basis for the next two months.

Further changes in automobile models and announcements of the 1924 models featured the past week. Price reductions in several lines have also become effective.

Freight movements on all the railroads show a decided increase, according to reports. For several weeks the received shipments have been heavy, although the outbound movement was somewhat off. This is thought due to the stock-taking season which obtains generally at this time of the year. The indications are now that September freight movement will exceed that of March which holds the record for the present year.

Employment figures, which have hovered around the 215,000 mark for some weeks past showed a decrease during the week ending Oct. 2, according to figures of the Employers' Association which shows 214,590 employed, a decline of 1,383 from the 215,973 figure of the previous week.

Building construction is likely to hit a new high figure for the year. All construction work is being speeded to completion before the advent of colder weather.

Executives in the machine tool plants of the city are anticipating a fair business during October and November with a seasonal decrease in December.

New York University Has Industrial Course

"The Human Equation in Strikes" might well be the name of a new course on Labor and Employment which is being offered at New York University this year for the first time. J. D. Hackett, an experienced consultant on labor problems for many large manufacturing concerns will have charge of the course.

J. B. Doan Hurt in Auto Accident

While motoring from Syracuse to Schenectady Saturday, Sept. 29, J. B. Doan, president of the American Tool Works Co., Cincinnati, Ohio, Albert E. Robinson, plant manager of the American Tool Works Co., W. H. Birdsall, manager of the Syracuse Supply Co., Syracuse, N. Y., and Samuel Stevens, a capitalist of Rome, N. Y., were severely injured when the automobile in which they were riding skidded and turned over twice on an embankment near Schuyler, N. Y.

Mr. Doan and Mr. Robinson were on their way to New York previous to their intended attendance at the meeting of the National Machine Tool Builders' Association held at Lenox, Mass., Oct. 2, 3 and 4. Mr. Birdsall, whose firm represents the American Tool Works Co. in the Syracuse district, had offered to take them to Schenectady in his new enclosed car that had been driven less than 800 miles.. In turning out for another automobile Mr. Birdsall's car plunged down an embankment. All four of the occupants were rushed to the hospital at Utica, N. Y., where it was found that Mr. Doan was suffering from shock and a laceration of the scalp, Mr. Robinson from bruises about the body and possible internal injuries, Mr. Birdsall from abrasions about the face and Mr. Stevens from a badly cut left ear and lacerations on the hands and leg. While none of the injuries were of a serious nature, they were severe enough to confine Mr. Doan, Mr. Robinson and Mr. Stevens to the hospital for more than a week.

A telegram of sympathy was dispatched to Mr. Doan by the members of the National Machine Tool Builders' Association in which it was regretted that he was unable to attend the meeting and expressing hopes for a rapid recovery.

Personals

WALTER V. LAWTON has been appointed district manager for the Boston district, with headquarters in the Textile Building, for Manning, Maxwell & Moore, Inc., New York City.

W. H. JELLY, heretofore connected with the office of the eastern Pennsylvania district of the United American Metals Corp., at Philadelphia, has been transferred to Pittsburgh, where he will manage the sales of babbitt metals and bushing bronze in the western Pennsylvania district.

JOSEPH WAINWRIGHT has been appointed sales manager in the Philadelphia district with headquarters at the Pennsylvania Building, for Manning, Maxwell & Moore, Inc., New York City.

LEE H. LANDIS of San Francisco, Calif., has been named general manager of the Alaska Railroad by Secretary of Interior Work.

W. C. CHAPMAN has been appointed district manager for the Philadelphia district, with headquarters in the Pennsylvania Building, for Manning, Maxwell & Moore, Inc., New York City.

Business Items

The plant of the Pittsfield Machine Tool Co., Pittsfield, Mass., consisting of five acres of land, a large brick building and smaller buildings, has been sold to the Eaton, Crane & Pike Co. The plant was built in 1908 by Alden Sampson for the manufacture of automobiles.

The Aetna Foundry & Machine Co., Warren, Ohio, has been acquired by the Shenango Machine Co. of Sharon, Pa., which concern will operate it in conjunction with the Warren plant. The Warren plant will be used for the production of blast furnace steel mill castings. The two plants will have a capacity of 800 tons and will employ 200 men.

Expansion of the Homer Engineering Co., Canton, Ohio, is announced by F. A. Carlisle secretary and general manager of the concern. Additions to the plant and installation of new machinery will result in the plant's capacity being almost doubled. Additional grinding machinery is being installed. Machinery also is being installed to manufacture a sheet metal specialty. A blacksmith and forging department will be a new feature.

Work of removing the pipe machinery manufacturing departments of the Columbus Machine Works to its new home at Crothersville, Ind., has been begun. The removal will take a week or ten days, and by Oct. 15 it is expected that the department will be in operation. Other departments of the machine works will remain at Columbus until the first of the year.

The Moore Drop Forging Co., with plants in Springfield and Chicopee, Mass., has acquired the Page-Storms Drop Forging Co. at Springfield, by a quitclaim deed transferring all properties and the right to use the Page-Storms name. The Moore company had previously acquired a large part of the stock in the smaller concern. It took over the Page-Storms Chicopee plant two years ago, and has made expansions consisting of three different additions at a total cost of $180,000. An increased business has been done in the manufacture of automobile parts.

The Norma Co. of America has placed contracts for the erection of the first unit of its new plant upon the property recently acquired at Stamford, Conn. The plant will be equipped for the manufacture of Hoffmann precision roller bearings, the American rights to which were recently acquired from the Hoffmann Manufacturing Co., England.

An addition to the core room and foundry of the National Radiator Co., New Castle, Pa., recently completed, has increased the capacity 25 per cent. A shortage of men is all that keeps the plant from working full time on current orders.

The Cheswick plant of the Peerless Sand Co., Pittsburgh, Pa., which was recently damaged by fire, will be rebuilt soon, according to plans. The loss sustained was $90,000.

Equipment and materials belonging to the Belcher & Taylor Agricultural Tool Co. plant of Bateman & Co., Inc., at Chicopee Falls, Mass., have been disposed of at auction and the sale of buildings and land was set for a later date. The equipment and materials went to different purchasers.

Fire recently destroyed the one-story frame factory building of the Amco Manufacturing Co., Indianapolis, Ind., manufacturers of shock absorbers and accessories for automobiles. Officials of the company said the loss might reach $100,000. The fire apparently started in the shipping room in the rear of the factory building. The machinery used in the manufacture of shock absorbers was destroyed.

Officials of the Atlantic Coast Line Railroad Co. have advised that a contract will be awarded within a few weeks for the construction at Montgomery, Ala., of new machine and equipment shops to cost approximately half a million dollars. When completed the new shops will about treble the capacity of the present Montgomery shops. James A. Bowdoin is superintendent of the branch at Montgomery.

The old Miramichi Foundry & Machine Works at Chatham, New Brunswick, will in the future be operated under the name of the Miramichi Foundry Machine Works, Ltd., the new company planning a greatly extended business program which will take in bridge construction.

Two new Wisconsin corporations have been organized by identical Milwaukee interests to engage in the manufacture of tool steel and tools. The Jolite Co., Inc., of Milwaukee, with a capital consisting of 1,000 shares of common stock having no par value, is chartered to engage in the manufacture and treating of high speed steel. The Jolite Tool Co. of Milwaukee, is to manufacture and design tools of all descriptions. The incorporators in both instances are Dean R. Williams, George M. Wolff, Curys L. Cole, Winfield S. Nussbaum and John Last. Headquarters are being established in the plant and warehouse of Williams, Cole & Wolff, Inc., manufacturers' agent, 610 Sycamore Street, Milwaukee.

The Arctic Ice Cream Co., Detroit, has purchased from the Commerce Motor Car Co. the plant and real estate embracing four acres of ground at Green, Mackie, Solvay Aves., and the Wabash Railway. Walter E. Parker, president of the Commerce Motor Truck Co., announces that all tools and equipment have been purchased by that company, which is a re-organization of the Commerce Motor Car Co., and that the business will be continued.

Obituary

W. H. BALDWIN, formerly secretary of the Ohio Steel Co., before the formation of the U. S. Steel Corp., died recently at his home in Washington, D. C. Mr. Baldwin was well known in the iron and steel industry before his retirement in 1901.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

. By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THE week's business developments were all of a nature to strengthen the cheerful confidence with which most far sighted men view the outlook for Fall and Winter trade. Short sellers on the New York Stock Exchange at last found that prices could not be depressed further and the resulting covering movement advanced quotations quite sharply. This in itself was as void of significance as the decline which they had previously caused, but its influences on the temper of those whose dispositions are largely governed by the course of stock prices was most salutary. It obliterated the bewilderment and hesitation which was developing because one of the business indicators was pointing in a contrary direction to most of the others, and there was an audible sigh of relief as the market swung around in harmony with trade reports.

Second in importance was the continued strength in prices of the chief agricultural products. Corn sold at over a dollar in Chicago, the highest price in three years, and as the December future is quoted at 75 cents there is every reason to expect very high prices for the new crop also.

Hogs and cattle, too, have scored and held sharp advances from the year's low prices. Good times in the Central States therefore seem assured.

Cotton has withstood the shock of a crop report considered in excess of most guesses in a manner which leaves no doubt that spinners have little hope of getting their supplies much lower than at present. In parts of the belt the farmers are selling freely, paying their debts and increasing their bank deposits. The prosperity of the South is not a matter for conjecture, since it has already arrived.

Reports from the California fruit crops and the Northwest lumber markets all indicate that the remarkable affluence of the Pacific Coast will be undiminished, since the yield of the former and demand for the latter both promise to be unusually great.

The sugar producers of the West and of Louisiana will market larger crops than last year at virtually the highest prices of the season. Manufacturers are buying more wool than in some time, and hides and leather, long laggards, are at last looking up. Even the one-crop wheat farmer of the Northwestern states, the most ill-starred of our producers, is better off than seemed likely two months ago, for wheat is some 15 cents higher than it was then and the market is steady. Furthermore, the outlook has been improved by the action of President Coolidge in sending Directors Meyer and Mondell of the War Finance Corporation to the central Northwest to direct the formation of co-operative marketing associations among the wheat growers, to which loans from government funds will be made. By some this will be regarded as an unwarranted extension of government activity, but the fact is more important than the theory.

As for the manufacturing sections, there is no unemployment to speak of and payrolls are uniformly very high, so high in fact that the buying power of labor in terms of commodities is probably the largest it has ever been in our history. And while it is to be expected that payrolls will be decreased to some extent during the Winter there is no reason to believe the cuts will go far. Enough building is in progress and planned to assure more Winter employment of the building trades than in any other year except last year.

> "As for manufacturing, there is no unemployment to speak of and payrolls are uniformly very high, so high in fact that the buying power of labor in terms of commodities is probably the largest it has ever been in our history . . . . The General Motors Corp. expects to turn out more cars in October than in any month of its history. There is no reason to look for any cut in railroad payrolls as their Fall traffic is almost sure to break all records."

The usual curtailment will be enforced in automobile production, but automobiles are now priced at very attractive levels and the General Motors Corp. expects to turn out more cars in October than in any month of its history. There is no reason to look for any cut in railroad payrolls, as their Fall traffic is almost sure to break all records and since the "Big Four" brotherhoods are asking wage increases which they have an excellent chance of getting if they will agree to certain changes in working rules.

The short time of some textile mills and the shut down of the Amoskeag gingham mills have occasioned some pessimistic talk, but the condition of the markets is almost a guarantee that curtailment will not become epidemic. Production in all lines, in fact, while below the peak of the year, is still far above 1922 levels and promises to continue so.

Out of such fecund soil bountiful business easily grows. Trade continues everywhere heavier than last year. Mail order stores report a 25 per cent increase. The hardware trade makes a like statement. Dry goods business is excellent. Many lines have not been marked up to a parity with raw cotton and distributors realize that there is little hope of getting goods cheaper. I hear talk of "resistance against higher prices," but it will be time enough to consider that when higher prices develop. Meantime retail trade seems to be good everywhere.

Copper shows no improvement, and iron and steel production is declining somewhat, but consumption continues high, coming needs appear great enough to supply the mills with good Winter business and now that Judge Gary has said that prices will not be cut in the near future, buying will probably be accelerated. Indications are multiplying that the oil flood has begun to recede and the markets may soon recover from their inundation.

Money rates are slightly above average because our huge trade is naturally making heavier demands, but the banks are financing business without having much recourse to the Federal Reserve Banks and there is no danger that all requirements cannot be easily supplied. The Federal Reserve statement shows a reserve ratio of 75.8 per cent. With such untapped resources behind them there is no doubt that the crop movement can be handled without strain, particularly as the agricultural banks have not yet felt the expansion of credit as much as the industrial banks and the sharp decline in flotations of state and municipal bonds has reduced a hitherto steady drain on the country's capital.

The news from Germany superficially has appeared even more depressing than usual, but from the standpoint of its influence on business, the worst happened in Germany long ago. No European nation drifting into republicanism could hope to escape years of unrest and periodical outbreaks, but business in general goes on "as usual." In this case that phrase may not mean much, but at any rate there is no further cause for pessimism.

Steel Institute Will Meet Oct. 25

The American Iron and Steel Institute will hold its twenty-fourth general meeting Oct. 25 at the Hotel Commodore, New York City. Following addresses by Elbert H. Gary, president, papers on various topics connected with the industry will be read by Col. T. C. Dixon, Dr. F. C. Lagenberg, F. B. Quigley, C. L. McKenzie, John L. Cox and Chung Yu Wang of Hankow, who will speak on the iron and steel industry in China. Following the banquet a special train will be run to Aberdeen, Md., where the institute will hold a joint meeting with the Army Ordinance Association.

American Salesmen Successful in Foreign Markets

By Paul Wooton

IF AMERICAN-MADE goods are to be exported, Americans first must be exported.

This is paraphrasing the words used by a French senator in admonishing the producers of his country of that essential step in the securing of export trade.

Both England and France long have practiced such a policy. While they do not equal the Germans in that respect, the urgency of their present need for additional markets is resulting in the dispatching abroad of unusual numbers of their own nationality.

American firms frequently make the mistake of selecting as their representative, people of the nationality of the country in which they are establishing the agency. Even in England and France, where men trained in the particular line are available, results generally will be more satisfactory if an American is sent. This applies to France as well as to England, despite the handicap of language. It would be better to send an American who has been brought up with the product, even if he has no knowledge of the French language. This is the opinion of the most intelligent observers in that country. The average buyer, particularly of machine tools or other articles of relatively large first cost, wants to deal with a man who knows the product. He wants to be acquainted with the details of the tool as applied in American plants similar to his own. He wants to ask a hundred questions which only a man from the home office can answer. Moreover, the American would be able to convince, where well justified statements by a Frenchman would fall short of that mark. Literally hundreds of examples can be cited in France to substantiate these views.

The chances are that the American will not be long in acquiring enough of the language to do a good deal of talking for himself. Half of his prospective customers will speak English.

The usual procedure among the representatives of foreign houses in France is to secure the services of a capable French assistant who knows English. He acts as interpreter when the necessity arises and in addition is in charge of administrative matters in the conduct of the office.

Americans in France

One of the most successful salesmen of machinery ever sent to Paris was an American representing a company manufacturing a widely-used special purpose machine. On his arrival, his knowledge of French was confined to the motto of the Order of the Garter. Even at the time of his death, many years later, after a remarkable record of sales, his knowledge of French was very imperfect. Not all the American machine-tool makers, however, had that much vision. Before the war, some of them were represented in France by Germans.

An actual case illustrates the point further. An American machinery manufacturer had a French agent. Sales averaged ten machines per year. A man who had been associated with the business for a long time finally was sent to Paris to succeed him. The company soon had to build an addition to its plant to take care of the business he secured. No such results, however, should be expected in France just at this time, particularly in the matter of machinery as only essential purchases are being made, due to the unfavorable rate of exchange.

What has been said of the French situation can be applied equally well to any other country and the principle works out almost as well with canned salmon as it does with machine tools and allied lines.

Depreciated currencies work against the sale of British products as well as against our own. Despite this fact, they are sending out men to all parts of the world with the idea that they are to take up permanent residence there. Frenchmen already are conducting one or more drygoods stores in cities and towns throughout the world in countries in which they have natural markets. They are rapidly extending the policy to many other lines and in many parts of the world.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb....	$0.0337	$0 0337	$0.0292
Cold finished shafting.....	per lb....	0.0433	0.0433	0.0378
Brass rods.....	per lb....	0.165	0.17	0.171
Solder (½ and ½)	per lb....	0.262	0.276	0.2283
Cotton waste...	per lb....	0.1225	0.1225	0.1458
Washers, cast iron (½ in.)...	per 100 lb.	4.66	4.66	4.33
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100...	3.08	3.08	2.96
Lard cutting oil	per gal...	0.575	0.575	0.575
Machine oil....	per gal...	0.349	0.349	0.36
Belting, leather, medium.....	off list....	37%	37%	44½%
Machine bolts up to 1x30 in.	off list....	49½%	49½%	49%

Improving the Lincoln Plant

A large portion of the machinery in the Lincoln plant of the Ford Motor Co., Detroit, is being gradually moved to new locations in order to provide greater room for departments now cramped. Moving of the several departments into a new addition, which increases the plant floor space by 311,000 sq.ft., is being carried on under a plan which provides that raw materials and stock shall enter one end of the receiving room and pass slowly through the manufacturing processes to emerge at the other end of the building as finished products. Conveyor systems, new and improved machinery and many other facilities are being installed.

Increase Shown in Canadian Trade

In a summary of Canada's trade with the United States for the twelve months ending with August this year, prepared by the Dominion Bureau of Statistics, the total value of machinery imported into Canada from the United States is shown as $24,506,646, an increase of $3,789,000 over the preceding twelve-month period. There was a slight increase in the value of tools purchased in the United States, the figures being $1,589,427, as compared with $1,102,718. The total value of vehicles imported from the United States was $28,788,183, being an increase of $3,654,000. The principal item in this group was passenger automobiles, which totalled 10,119 valued at $10,322,386, as against 9,945, valued at $10,724,555 in the preceding twelve months.

Automobile parts also figured largely in the expansion of the United States trade with Canada. The total imports of parts were valued at $14,691,777, as compared with $11,626,407.

The most important item under this heading in Canada's exports to the United States is engines, represented by a value of $2,389,912, as against $61,985 during the previous twelve months. There was a slight falling off in the value of farm implements exported to the United States viz: 1922, $1,129,184; 1923, $1,055,914. Canada sold to the United States during that period 153 passenger automobiles as compared with 106 in 1922.

Canadian Locomotive Elects New Head

The Canadian Locomotive Co., Ltd., of Kingston, Ontario, has unfilled orders to the extent of $2,300,000, it was announced at the annual meeting. The plant has enough work on hand to keep it running well into next Spring. F. G. Wallace of Pittsburg, resigned the presidency and Amelius Jarvis of Toronto was appointed to succeed him, also retaining the chairmanship of the board. Mr. Jarvis pointed out that there had been a shutdown of the plant for over twenty months and that very little profits from the new business had entered into the current year.

Despite this the operation profits, together with the income from the investments, has enabled the company to show an operating profit for the year of $7,400 over the charges for the shutdown period.

Modern Machine Tools and the Thrifty French

How American machine tools have been introduced into France—Competition with domestic products and German tools—France's awakening to its mineral wealth predicted

By OUR PARIS CORRESPONDENT

THE French machine tool trade is today feeling outside competition less than ever before. American, British and Swiss tools are checked by the handicap of high dollar, pound and gold franc exchange rates and the German mark has become so unstable as to be no longer, at least temporarily, a factor.

A reasonably low priced mark should have been Germany's opportunity, but when the bottom all but dropped out of the mark the very uncertainty of production, delivery and price at delivery date did the rest. More than 50 per cent of the value of the machine tools imported into France in the year before the war were of German origin.

Undoubtedly, in the years immediately following the armistice, a considerable quantity of German machine tools, indeed metallurgic productions of all kinds, drifted through the "Hole of the Saar," which the makers of the Versailles treaty forgot or neglected to provide against.

This, of itself, should not have worked detrimentally for French production so far as was foreseen by all but an enlightened few, nor for imports from the United States, since German heavy machine tools were at that time taxed for customs' dues at the rate of 64 francs the 100 kilos while those from America paid but 16 francs per 100 kilos. In reality, however, it did, as was even then noted by those who visioned the steadily failing mark while French customs' dues remained constant. German prices at the source were jacked up (in paper marks) from time to time, but never so rapidly as to catch up, least of all pass the 64 francs a hundred kilos limit.

German and American Prices

In 1920 a German turret lathe sold on the Paris market, according to the statement of a representative handling American, French and German lines, for 30 per cent less than a similar American article, and even then the French product was another 30 per cent under in price. A steadily falling mark upset this formula, but also a falling franc with respect to the dollar (10 francs to the dollar at that time as against 18 to the dollar at this moment) subverted calculations with regard to the American product with the result that today no foreign made machine tool commonly to be had in open stock in Paris can compete in price with the French commodity. When it competes at all it sells itself on merit, by reason of some inherent superiority of fabrication or operating efficiency, not by any means on the price issue.

Born of the war, of the reconstruction period and the general progression of France as an industrial nation, tools and machines of all kinds are certainly more in demand, more in use than ever before. For a considerable period after the war, the French buying public was absorbing all manner of left over American war stocks, from electric cranes to refrigerating machinery, from lathes, borers and millers to motor trucks and locomotives. French finances would not allow of cash being sent beyond the frontiers, hence the French machine tool trade, among all the branches of metallurgical industry, got a flying start in so far as any innovation may be said to roll up in big waves in France.

Imports of "machines and machinery" and "tools and hardware" (to give them their French customs classification) from the United States decreased 150 million francs during the first six months of 1922 while the same elements exported from France to the United States increased 700 per cent. The entire exports of French machine tools of 1920-21 exceeded those of 1913, the year before the war, by 180 per cent.

> "When all is said and done, there is little hope of a drawing together of prices of American and French machine tools so long as the wide divergence exists between the dollar and the franc. Besides which the French manufacturers are one and all protectionists and if there is any immediate or remote juggling with the French customs tariff it will result rather in a revision upward than downward."

Francs and Dollars

The extreme fluidity of the situation as it now is prevents any definite estimate as to when and how conditions will improve, but inasmuch as the tendency of the dollar is to rise, exports from its country of origin to a country whose monetary unit is the depreciated franc, are bound to decrease and imports—up to a certain point—increase. This is an axiom; the marvel is that the motives thereof are so often neglected or ignored.

Manufacturing costs are high in France and usually production along most metallurgic lines is high grade, or was. Latterly, however, they have been producing more popular grades of tools in point of price and finish—another effort to hold at home a proportion of that business which, before the war, so greatly went to Germany. This comparison can hardly be made with respect to America though before the war the American product offered in the French market while not as cheap as that of Germany was usually rather lower in price than a similar French article, and better.

When all is said and done there is little hope of a drawing together of prices of American and French machine tools so long as the wide divergence exists between the dollar and the franc. Besides which French manufacturers are one and all protectionists and if there is any immediate or remote juggling with the French customs tariff it will result rather in a revision upward than downward.

Big business is becoming more and more efficient in France by the adoption of machinery for the accomplishment of many operations which were formerly done by hand, and by higher speed, more efficient tools replacing those of a mediocre output. Automaticity plays its part, but there is big work ahead to do in this line.

Labor Difficulties

French labor in point of numbers is at a lower ebb than ever and the eight-hour law has cut off another 20 per cent. It has not been French experience that the workman will produce as much in eight hours as in ten, no matter how he may be encouraged or stimulated.

Potential sales are shown by the fact that France is bound one day or another to find the way to make use of its magnificent and extensive siderurgical industries by employing raw and semi-finished products for fabricating at home instead of shipping pig iron to the Pacific coast or strip steel to England to have it come back to France in various manufactured forms. With such an argument it is small wonder that the French machine tool makers have taken on the post war spurt that they have. More than two hundred French makers of machines and tools continually keep their advertisements before the readers of the technical and lay press, covering most forms of wood and metal working machinery and such accessories as are intimately related thereto.

One virgin field that as yet scarcely has been touched by the French manufacturer is that of agricultural machines and farm machinery in general—pumps, motors and tractors. When the French manufacturer of *machines agricoles* goes out after business on a large scale some American firms will have sharp competition. The best off will be those who are already manufacturing in France, as, in the first instance, the International Harvester Co. at Lille, or again, in a not too remote example, the Wellman Morgan-Seaver interests in their line in association with the Schneiders at Creusot, the "Delco" combination at Nancy, or for that matter the Kodak concern, the typewriter companies the soap makers and the patent medicine manufacturers.

Working With the French

All of these have found out that conditions imposed upon them when they manufactured solely abroad were daily piling up in an almost impenetrable barrier and that the way to get a fair chance at the French market in these days was to manufacture on the spot, either wholly on their own account or in association with some French going concern which had facilities to offer and showed possibilities of expansion. In this way are annulled the effect of low production costs in France against a product manufactured in the United States in the first instance, then the elimination of customs' dues and the handicap brought about by the inconstancy of dollar and franc exchange, which latter is no myth and will probably continue to exhibit its mercurial tendencies for years.

Machine Tool Men in Japan Safe

Arthur Jackson, representative for the Potter & Johnston Machine Co., Pawtucket, R. I., in Tokio, Japan, reports that he and his wife are both safe, but after many harrowing experiences in the earthquake that recently damaged Tokio and Yokohama. Mr. Jackson also states in a recent letter to the *American Machinist* that Jay W. Myers, representative of the National Acme Co. in Japan, is also safe.

That Japan is in a distressing condition and that it has experienced and is experiencing extreme hardships are shown by the following excerpt from Mr. Jackson's letter:

"I was in our agents' office, the Yamatake Co. of Tokio at the time of the quake. The building did not fall, but nearly all the buildings around did and fires started immediately so it is very doubtful if it is saved.

"I helped in rescue work for two hours and then started to walk to my home in Yokohama. I passed the office of the Andrews & George Co. which was still standing, but the fires were creeping toward it.

"I passed the following engineering works which were down or on fire: Shibaura Engineering Co., Oki Denki, Nippon Electric Co. all of Tokio. Tokio Gas & Electric Co. of Omori, Niigata Ironworks of Kamata, Nipponophone Co., Tokio Electric Co., Kanagafugi Mill, all of Kakasaki, Asano Dockyard of Tsurumi, Yokohama Dockyard and every factory in Yokohama.

"The Yokosuka Naval Arsenal is also entirely destroyed. There were large oil tanks on the hills above the town of Yokosuka, all of which caught fire and sent streams of fire into the town and Dockyard.

"The loss of life is enormous as many were caught in factories or in homes and there was no chance of escape. Thousands got caught in the rivers of burning oil that came from the oil stores of the large oil companies that were burning.

"I had many narrow escapes from falling buildings or of being roasted alive, but I managed to get through it all and found my wife quite safe, except for a few bruises, in a field near what was left of our home, at three o'clock the next morning.

We walked through the ruins of Yokohama the next day and got picked up by a boat from the Steel Navigator. We stayed on her decks all that night and transferred to the President Jefferson the next day.

"We were also very pleased to meet Mr. and Mrs. R. Kimbara on board ship both unhurt. Mr. Kimbara is a partner of the Yamatake Co.

"Japan will be in the market for every type of machine tool, especially if it is decided to rebuild the devastated area. It is very doubtful if Yokohama will ever be rebuilt again. It seems as though the factories in the Osaka, Kyoto and Kobe districts will have a busy time ahead of them. They are out of the earthquake zone."

American Papers at Foundry Congress

The French Association Technique de Fonderie, on Sept. 12, organized its first international foundry congress in the Paris Ecole des Arts et Metiers, the opening session being presided over by Monsieur Gaston Vidal, Under Secretary of State and a member of the French cabinet.

Among the delegates present were the president of the American Foundrymens' Association; Mr. Stubbs of the Institute of British Foundrymen; Monsieur Leonard, president of the Association Technique de Fonderie de Liege —Belgium; Piesek, president of the Czecho-Slovakian Foundry Association; Signor Vanezetti—Italian, and Senor Espana of the Spanish Foundry Association, of which there were present at the congress and exposition 146 members.

The inviting French association was represented officially by Monsieur Emile Ramas, its president, who last year at the American Foundrymens' Association was present as the guest of his American colleagues.

M. R. Moldenke, from United States, presented a paper on the question of casting specifications, which paper brought forth a direct discussion with a French authority, Monsieur Portevin, who declared that there were really two problems involved therein, one which concerned the composition and quality of pig iron and that which concerned the same details with respect to merchant castings which were made from a previously manipulated semi-raw material, arguing that a change might supervene in the process and that actually a satisfactory pig iron from the point of view of analysis might produce an unsatisfactory line of castings in the second operation.

Monsieur Galley, a founder of Charleville in the French Ardennes submitted a paper on "The Application of American Methods for the Production of Malleable Iron."

The congress closed with the traditional banquet at which Monsieur Gaston Vidal, speaking in the name of the French government, addressed the foreign delegates.

A paper was submitted by H. M. Lane of the H. M. Lane Co., Detroit, on the "Equipment and Arrangement of the American Foundry." The French government announced to the president of the congress that it was about to establish a College of Foundry Practice as an adjunct of the high school system of Paris.

Safety Congress Is Held in Buffalo

Many interesting sessions and group meetings were held at the twelfth annual Safety Congress, Statler Hotel, Buffalo, N. Y., Oct. 1 to 5, and many exceptionally fine papers were read by authorities from all parts of the country. A great many subjects were treated, and due to the many phases of the safety problem, it was found that the only feasible way was to divide and subdivide into various sections of specific interest. Thus there were the following sections; automotive, chemical, cement, construction, education, electric railway, engineering, ice and refrigeration, marine, metals, mining, packers' and tanners', paper and pulp, petroleum, public safety, public utilities, rubber, steam railroad, taxicab and delivery, textile, and woodworking.

E. F. Blank, safety director of the Buick Motor Co., Flint, Mich., acted as chairman of the automotive section and discussions on punch press safeguarding, forging hazards, supervision and safety, the value of accident statistics on the standard basis, and eye injuries were participated in.

Handling materials in a foundry was the subject of an interesting discussion in the metals section which was presided over by T. H. McKenney, superintendent of labor and safety for the Illinois Steel Co., Chicago. Safety, fire protection, and the medical situation in large plants were other discussions.

E. Ross Farra of the American Car & Foundry Co., Wilmington, Del., had charge of an interesting round table discussion on the problems in woodworking machine safeguarding in the woodworking section of the meeting. Another interesting phase of the industry was the round table discussion on training machine operators in safe methods. This was led by M. C. Goodspeed, the General Electric Co., Erie, Pa.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Automobile accessories and supplies. Vigo, Spain. Purchase and agency. Reference No. 7840.

Automobile accessories and component parts for low priced cars. London, Eng. Exclusive agency. Reference No. 7807.

Copper rock ore concentrating machinery. Santo Domingo, Dominican Republic. Purchase. Reference No. 7803.

Diesel or semi-Diesel engines, 75 and 350 hp. San Pedro Sula, Honduras. Purchase. Reference No. 7804.

Lead pipe manufacturing machinery and accessories. Lapaz, Bolivia. Purchase. Reference No. 7843.

Tool machinery. Stockholm, Sweden. Purchase. Reference No. 7862.

Cutting and gouging woodworking tools. Marseille, France. Agency. Reference No. 7868.

Forthcoming Meetings

American Society for Steel Treating. Annual convention at Pittsburgh in connection with the International Steel Exposition, Oct. 8, 9, 10, 11 and 12. W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio, national secretary.

American Welding Society. Fall meeting, Oct. 24, 25 and 26. Fort Pitt Hotel, Pittsburgh, Pa.

Society of Automotive Engineers. Production meeting at Cleveland, Ohio, Oct. 25 and 26. Headquarters, 29 West 39th St., New York City.

American Gear Manufacturers Association. Fall meeting. Mountain House, Lake Mohonk, N. Y. Oct. 25, 26 and 27. T. W. Owen, secretary, 2,443 Prospect Ave., Cleveland, Ohio.

American Management Association. October 29, 30, and 31. Hotel Astor, New York City.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8. Headquarters, Grand Central Palace, New York City.

New and Enlarged Shops

Machine Tools Wanted

Ill., Chicago—Apex Co., 1410 West 59th St.—three Leland & Gifford 12 in. single spindle high speed drills.

Ill., Chicago — Illinois Central R.R., 135 East 11th Pl., J. J. Bennett, Purch. Agt.—one 20 in. x 10 ft. heavy duty engine lathe, including motor for 440 volt, 50 cycle, 3 phase, a.c.

Mich., Detroit — Mohler Eng. Co., c/o Simons Sales Co., 436 West Willis Ave.—2, 3 or 4 spindle drill press.

Mo., Eldon—City Garage, E. E. MacMeans—lathe for garage.

Mo., Eldon—J. W. Dunaway—drill press and lathe for blacksmith shop.

Mo., Eldon—E. White—drill press and lathe for garage.

Mo., Henley—J. Klug (blacksmith)—drill press, lathe and tire shrinker (used).

Mo., Jefferson City—E. Petty, Main St.—lathe for garage.

N. Y., Brooklyn—Shyer Bros., 822 Flushing Ave., A. Shyer, Purch. Agt.—20 ton press for automobile repair shop.

N. Y., Elmira—E. E. Kunzman, 756 Baldwin St.—garage and service station equipment.

N. Y., New York—Buell Boxman, Inc., 467 Eway.—plain milling machine with dividing head and vise.

O., Columbus—Amer. Water Motor Co., 796 East 11th Ave. (manufacturer of automobile parts, etc.), L. Lewis, Pres.—two quarter cable lathes and two drill presses.

O., Columbus—Thurman Machine Co., 53 East Lafayette St., W. M. Thurman, proprietor—general machine tools, including one small lathe and one grinder.

Tex., Dallas—Amer. Body Co., 2802 Williams St.—one 7 or 8 in. moulder and a boring machine.

W. Va., Anawalt—Jeanette Garage Co.—lathe, drill press and bench tools.

Wis., Clintonville—Four Wheel Drive Co.—equipment, small tools and metal working machinery for the manufacture of earth boring machines, mounted on trucks.

Wis., Madison — Auto Service Co., 213 East Washington Ave., D. Bilaic, proprietor—automobile repair machinery, gasoline tanks and pumps for proposed $40,000 garage.

Wis., Madison—L. F. Schoelkopf Co., 210 East Washington Ave.—automobile repair machinery, drill press, compressor, shop equipment and small tools.

Wis., Milwaukee—Everhold Co., c/o A. J. Engelhardt, 1413 1st Natl. Bank Bldg., (manufacturer of specialties)—miscellaneous machine tools, including lathe, emery grinders, drill press and buffer.

Wis., Milwaukee—T. Kattnig, 281 Grove St. (machinist)—medium size drill press, electrically driven.

Wis., Milwaukee—Wacho Mfg. Co., c/o I. T. Touhey, 198 West Water St.—bending rolls and seaming machine for the manufacture of milk cans.

Wis., Neillsville—O. Lerverenz—automobile repair machinery, drill press, gasoline tanks and pumps for proposed $40,000 garage and filling station.

Wis., Oshkosh—Pine-Ihrig Co., 36 Marion St., E. W. Ihrig, Secy.—miscellaneous tools, press, etc., for the manufacture of electric washing machines.

Wis., Waukesha—Glancy Malleable Corp.—foundry equipment, presses, hammers and shop equipment for plant at Janesville.

Ont., Almonte—Lemaistre, Son & King, Water St., A. King, Purch. Agt.—equipment for garage and repair shop.

Ont., Lancaster—D. J. Parisien—tool grinder, etc., for garage.

Ont., Russell—D. A. McArthur—lathe for garage.

Que., Montreal—Auto Export & Supply Co., Ltd., 503 St. Urbain St.—lathe, bench tools, chain hoist, etc., for new garage at 1171 Carrieres St.

Que., St. Eustache—F. Brunnelle—tool room lathe for garage.

Que., St. Henri de Levis—A. Mercier—automobile repair machinery.

Que., St. Jerome—E. Girout—grinding machine for garage.

Que., St. Jovite—P. E. Grenor—drill press for garage.

Machinery Wanted

Ark., Mariana—Mariana-Courier Index—newspaper cylinder press.

Fla., Miami—Polar Water Co., 1702 North Miami Ave.—machinery for the manufacture of ginger ale.

Ind., Connersville—Bd. Educ.—manual training equipment, including lathes, cutters, woodworking machinery, etc., for new $250,000 high school.

Ind., Evansville — North Star Coal Co., 301 Amer. Trust Bldg.—coal mining machinery, conveyors, etc.

Ind., Gary—Leonard Tractor Co.—planer.

Ia., Des Moines—J. Hanson, 600 East Market St.—vulcanizing machinery.

Ky., Dawsonsprings — Dawson Daylight Coal Co.—coal tipple, crushing outfit and loading booms for opening new coal lands. Estimated cost $30,000.

Ky., Louisville—Office of United States Engineer, P. O. Box 72—one 6,500 lb. steam pile hammer; chain block, 1 ton capacity; bench punch; three machinists' vises, various sizes.

Md., Oakland—Victory Mining Co., G. S. Hamill, Purch. Agt.—machinery and equipment, including tipple machinery, for coal field development.

Mich., Highland Park (Detroit P. O.)—Ford Motor Co.—complete equipment for proposed assembly plant at St. Paul, Minn.

Minn., St. Hilaire—Spectator—adjustable punch, also lead and rule cutter.

Mo., Eldon—O. O. Clark—belt sander, Universal saw and finisher for planing mill.

Mo., Eldon—Eldon Advertiser (newspaper and job printer)—punch, Miller saw and trimmer (used).

Mo., St. Louis—H. J. Gunn, 4485 Delmar Blvd.—two oil pumps, tanks, compressed air outfits, etc., for oil filling and service station.

Mo., St. Louis—T. H. Voelkerding, 4908 Terry Ave.—two 1,000 gal. underground tanks and pumps, also compressed air tanks and miscellaneous equipment for oil filling and service station.

N. Y., Batavia—T. E. Donovan—refrigeration machinery and equipment for cold storage plant at Elba.

N. Y., Binghamton—Nestles Food Co.—special machinery for proposed $45,000 powdered milk plant at Valders, Wis., to replace that which was destroyed by fire.

N. Y., Buffalo—Buffalo Waste Paper Co., 98 Terrace St.— baling machinery for waste paper plant at 355 Babcock St.

N. Y., Buffalo—W. Maltby, 21 Maryland St. (oil producer)—one belt driven compressor, about 30 cu.ft. capacity.

N. Y., Elmira—Elmira Coca-cola Bottling Wks., 415 West 2nd St., E. T. Grove, Purch. Agt.—equipment.

N. Y., New York—F. Hawley, 244 West 42nd St.—jig or bandsaw, motor driven.

N. Y., New York—New York Mchy. Co., 200 5th Ave.—threading and cutting machine for 10 in. pipe.

N. Y., Perrysburg—Wells Grist Mill, E. Wells, Purch. Agt.—complete machinery and equipment, to replace that which was destroyed by fire.

N. Y., Rochester—Wick & Bedier, 29 North Plymouth St.—two gasoline curb pumps and tanks for garage and service station.

N. C., Hickory—Hickory Lace Braiding Co.—braiders, reelers, tippers and pairers.

O., Bryan—Pet Garment Co., W. Gardner, Purch. Agt.—machinery for proposed branch plant at Montpelier.

O., Cambridge—Cambridge Steel Products Co.—straightening machine for light rails up to 40 lbs.

O., Canton—Capital Paint & Varnish Co.—machinery and equipment for branch plant at Butler, Pa.

O., Cardington—K. S. Baskin—woodworking machinery, two cutoff saws, one planer and drying equipment.

O., Columbus—Brandt & Hollerbaugh, 180 North High St., H. S. Brandt, Mgr.—complete machinery, including mixer, dryer, shafting, etc., for stucco plant, to replace that which was destroyed by fire.

O., Columbus—City Ice & Fuel Co., 5th and Naghten Sts., C. M. Rose, Purch. Agt.—ice making equipment, also loading equipment for coal yard.

O., Columbus—Green Lawn Gravel Co., 315 North 4th St., H. R. Gill, Mgr.—loading tipple, screens and steam shovel.

O., Columbus — Maple Grove Coal Co., 2269 Cleveland Ave., E. C. Riley, Mgr.—mine scales.

O., Hubbard—Amer. Sintering Co.—machinery and equipment, including furnaces, for $200,000 addition.

O., Toledo—Swan Creek Lumber & Supply Co., Park Ave., K. Aschbacher, Purch. Agt.—four coal storage tanks, unloading equipment, automatic conveyors, etc.

O., Warren—Phillips-Custom Co., F. M. Phillips, Purch. Agt.—machinery and equipment for plant for the manufacture of automobile bodies.

Pa., Bally—Bally Burial Casket Co.—machinery and drying equipment, to replace that which was destroyed by fire.

Pa., Phila. — Campbell Constr. Co., 910 North Front St., S. Campbell, Purch. Agt.—one arm sander or disk sander for planing mill.

Tenn., Knoxville—Duncan Mchy. Co., Dempster Bldg., 721 North Central Ave., J. G. Duncan, Purch. Agt.—24 in. double surfacer; planer and matcher (used); automatic saw sharpener for gumming and sharpening circular saws up to 64 in. diameter.

Tex., El Paso—Tri-State Lumber Co.—ice making machinery.

Va., Ashland—D. R. Peregoy, R. F. D. 2 (sheet metal worker)—cornice brake, tools and machinery.

Va., Graham—Pocahontas Coal Land Corp., C. L. Shuffleburg, Secy.—loading and unloading equipment, conveyors, tipple machinery, etc.

Va., Richmond — Hackley Morrison Co., 1708 Lewis St.—one 10 or 12 hp. single cylinder single friction drum electric hoist, 3 phase, 60 cycle, 220 or 240 volt; well drilling machine; six standard gage side dump cars, 6 to 12 yd. capacity.

W. Va., Fairmont—Monongah Glass Co.—machinery to enlarge output, also machinery and equipment for 700 acre coal property.

W. Va., Wheeling—Wheeling Steel Corp.—conveyors, loaders, stone crushers, etc., for development of limestone deposit.

Wis., Algoma—Algoma Wood Products Co.—woodworking machinery for proposed $50,000 factory.

Wis., Berlin—Bd. Educ., P. Talbot, Pres.—ash conveyor and ash handling machinery for high school building.

Wis., Cuba — New Mills Constr. Co.—equipment, conveyors, etc., for new lead and zinc mine.

Wis., Hartford—I. L. Bonniwell—dairy machinery, churns, sterilizers, testers, belting and shafting for proposed $40,000 creamery.

Wis., Kohler—Kohler Co. (manufacturer of plumbing fixtures), c/o A. Treich, Supt. of Constr.—enameling equipment and furnace for proposed $50,000 shop.

Wis., Madison—Roxana Petroleum Co., 119 East Washington Ave., C. F. Ellis, Purch. Agt.—several 100,000 gal. gasoline tanks and pumps for station on East Main St.

Wis., Madison — Wisconsin Wagon Co., 115 South Blair St.—50,000 gal. gasoline storage tanks and pumps.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Iron and Steel—Pig-iron market weak with low prices and few buyers. New York steel warehouse orders increasing slightly over summer months. Steel and iron pipe in good demand. Bars firm at $2.40; plates and shapes, $2.50 per 100 lb., f.o.b. mill. Fewer inquiries for structurals at Pittsburgh. Drop in tank plate demand due to curtailment in crude oil output. Car specifications are more numerous but structural needs appear satisfied for the present time at least.

Advances—Tin higher; advanced 1¼c. in New York. Coke and charcoal plates higher in Cleveland. Linseed oil reviving from recent decline, in New York. Raw oil (5 bbl. lots) 98c., against 95c. per gal., last week. Decline, however, continues in Cleveland.

Declines—Copper more stable, but at level, ⅜c. lower than week ago. Lead and zinc quiet; zinc down ⅛c. per lb. in New York. Fabricated brass and copper lower in Cleveland warehouses. Reduction in both furnace and foundry coke at Connellsville.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$27.05
Northern Basic	25@26
Southern Ohio No. 2	25.50
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	30.00
BIRMINGHAM	
No. 2 Foundry	23.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	26.25
Virginia No. 2	30.17
Basic	26.00
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	26.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	29.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	26.77
Basic	26.77
Bessemer	27.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	6.25@6.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.95	4.45	5.05
Nos. 22 and 24.	3.75	5.00	4.50	5.05
Nos. 25 and 26.	3.80	5.05	4.55	5.10
No. 28	3.85	5.15	4.65	5.20
Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00	5.15	4.70	5.35
Nos. 12 and 14.	4.10	5.25	4.80	5.45
Nos. 17 and 21.	4.40	5.55	5.10	5.75
Nos. 22 and 24.	4.55	5.70	5.25	5.90
No. 26	4.70	5.85	5.50	6.05
No. 28	5.00	6.15	5.80	6.35

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	62	50½	¾ to 1½	30	13
		LAP WELD			
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	28	13
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	60	49½	¾	28	12
2 and 3	61	50½	1 to 1½	30	14
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
⅛ to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.65	3.90	4.55
Cold finished flats, squares	5.15	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			13.75
Tin, 5-ton lots, New York			43.50
Lead (up to carlots), St. Louis	6.70	New York	7.37½
Zinc (up to carlots), St. Louis	6.30	New York	6.70

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.20	27.00	25 50
Antimony (Chinese), ton spot	8.75	10.50	7.50
Copper sheets, base	21.75	21.50@22.00	23.00
Copper wire, base	16.00	18 75	16.25
Copper bars, base	20.25	22.00	19.50
Copper tubing, base	24.50	27.00	23.00
Brass sheets, base	18 00	21.75	18.75
Brass tubing, base	23.00	27.00	20.50
Brass rods, base	15.75	17.75	15.75
Brass wire, base	18.50	21.75	.....
Zinc sheets (casks)	10.25	10.45	.....
Solder (½ and ½), (case lots)	29.50	29.00	20.00
Babbitt metal (83% tin)	52.00	53.50	40.00
Babbitt metal (35% tin)	25.00	17.50	17.00
Nickel (ingot and shot)	29.00	.....	35 00
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.75	11.75	12.00
Copper, heavy, and wire	11.25	11.25	11.25
Copper, light, and bottoms	9.50	9.25	10.25
Lead, heavy	5.75	5.50	5 75
Lead, tea	4.75	4.25	4.75
Brass, heavy, yellow	7.00	....	7.25
Brass, heavy, red	9.50	9.50	9.00
Brass, light	5.50	5.25	6 50
No. 1 yellow brass turnings	6.50	6.00	7.00
Zinc	3.75	3.00	4.00

TIN PLATES—American Charcoal—Bright—Per box.

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 20x28, 112 sheets	$25.10	$22.85	$18.50
"A" Grade:			
IC, 20x28, 112 sheets	21.40	18.00	17.00
Coke Plates—Primes, 20x28 in.			
100-lb., 112 sheets	14.00	13.00	14.50
Terne Plates—Small lots, 8-lb. Coating			
IC, 14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13¼x13¼, per lb.	11.00	36.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.98	1.02	1.14
White lead, dry or in oil	100 lb. kegs.	New York, 14.00	
Red lead, dry	100 lb. kegs.	New York, 14.00	
Red lead, in oil	100 lb. kegs.	New York, 15.50	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.00@4.50	
Coke, prompt foundry, Connellsville	per net ton	5.00@5.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40-10%	50-10%	45-5%
1½ and 1¼x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	25-10%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30-10%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	40-10%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30-10%	45%	40-5%
Bolt ends, with hot pressed nuts	40-10%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 9/16 and smaller	60%	.....	....
Semi-finished nuts, ⅝ and larger	55%	65–10%	80%
Case-hardened nuts	40%	.. ....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	3 50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	0.50	2.75	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	50-10%	50–10%	60%
Rivets, tinned	50-10%	50–10%	4½c. net
Button heads ⅜-in., ½-in., 1x2 in. to 5 in., per 100 lb (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1½ to 1⅝-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30–10%	30–10%	30–10%
Heavy grade	20–5–2½	30%	20–5–2½%
Rubber and duck:			
First grade	.50–10–5%	50-10%	40-10%
Second grade	60–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20

Wis., Marshfield—Hub Granite Co., c/o T. Harshner—power saws and planer for stone cutting.

Wis., Mayville—Mayville Improvement Corp., c/o A. D. Naber—shoe making machinery, cutters, etc., for proposed shoe factory.

Wis., Milwaukee—L. L. Albert, 628½ Oakland Ave.—emery wheel, stand, portable drilling machine and air service equipment for automobile repair shop.

Wis., Milwaukee—B. Gill, 1075 15th St.—laundry equipment, including mangle, extractor, drying outfit, belting and shafting.

Wis., Milwaukee—Gridley Dairy Co., 1329 North Ave.—engine driven ice machine for proposed addition to dairy.

Wis., Milwaukee — Lemm Electric Co., 3324 Fond du Lac Ave.—battery testing and charging equipment for proposed $40,000 service station.

Wis., Milwaukee—A. H. Luedecke, 140 8th St. (dairy products)—refrigeration machinery, about 30 ton, belt or motor driven.

Wis., Milwaukee—Roberts Brass Co., 178 Lincoln Ave., J. F. Howard, Purch. Agt.—moulding machines and buffing machine.

Wis., Neenah—Fox River Valley Co-operative Co.—refrigeration machinery and cold storage equipment for proposed cheese warehouse.

Wis., Neenah—J. W. Hewitt Machine Co., 131 North Commercial St.—special machinery for the manufacture of dies, etc.; hand operated traveling crane.

Wis., Oshkosh—Oshkosh Fuel Co., 239 F. R. A. Bldg. (sawmill), E. Moerke, Purch. Agt.—large circle saws, rip saw, belting, shafting and hangers.

Wis., Oshkosh—Oshkosh Wood Specialty Co., 416 7th St.—wood turning lathe.

Wis., Racine—Gold Medal Camp Furniture Co., 1700 Packard Ave.—tools and small equipment.

Ont., Amherstburg — Amherstburg Glass Co., A. A. Icenhour, Pres.—special equipment for the manufacture of glass by a new process.

Ont., Apple Hill—A. D. Clingen—bandsaw, etc.

Ont., Belton—H. Jones—complete equipment for proposed creamery and cheese factory at Thorndale.

Ont., Blenheim—S. B. Nichol, John St.—equipment for proposed $38.000 planing mill.

Ont., Dundas — Kaustine Co. (manufacturer of chemical closets and plumbing specialties), J. F. Crowley, Mgr.—machinery for proposed addition to factory.

Ont., Eganville—Schulrink & Smith, John St.—emery grinder, etc., for garage.

Ont., Guelph—Malt Products Co., Waterloo Ave.—special equipment, to replace that which was destroyed by fire.

Ont., Krugersdorf—Tesserton Timber Co.—equipment for sawmill, to replace that which was destroyed by fire.

Ont., Larder Lake — Blue Quartz Gold Mines, Ltd., J. F. Louden, Purch. Agt.—mill.

Ont., Lion's Head—J. H. Cook representing syndicate—equipment for oil drilling at Spry.

Ont., London—S. Jones, 374 Tecumseh Ave.—complete equipment for proposed $40,000 plant for the manufacture of mastic flooring.

Ont., London—Silverwoods, Ltd., A. E. Silverwood, Mgr.—cold storage plant, also equipment for the manufacture of ice cream for branch at Lucknow.

Ont., Madawaska — O. McCrea — small grinder, etc., for garage.

Ont., Midland—International Fibre Board Co.—machinery and equipment.

Ont., Morrisburg—W. Roach, Main St.—air compressor, tank and pump for garage.

Ont., Russell—H. Miller—bench tools, emery wheel and stand for garage.

Ont., Russell—A. Walker—machinery for planing mill.

Ont., St. Eugene—G. N. Lerout—panel raiser for sash and door factory.

Ont., Simcoe — Stacey-Wagner Leather Co.—Union splitting machine; rolling jack; small tools, including knives, etc.; 1½ in. shafting with hangers and pulleys.

Ont., Walkerville—Berry Bros., Inc., Walker Rd.—equipment to enlarge paint and varnish factory.

Que., Campbell's Bay—E. Laforest—forge, small tools, etc., for blacksmith shop.

Que., Matane—Price Bros. Co., Ltd., A. E. Tweedell, Mgr.—circular and bandsaws.

Que., Montreal—A. Brisebois, 6150 De St. Real St.—forge, bench tools, etc., for new blacksmith shop.

Que., Montreal—L. Desrosiers, 182 Hadley St.—gasoline tank, pump and air compressor for new shop at 178 Hadley St.

Que., Montreal—C. Plouffe, 1906 St. Denis St.—chain hoist, small lathe, emery wheel, etc., for new automobile repair shop at 532 De St. Valier St.

Que., St. Agathe—E. Maille (blacksmith and wheelwright)—forge, chain hoist and equipment for carriage repairs.

Que., St. Francois de Salle—Montreal Cut Stone, Ltd.—equipment.

Que., St. Jerome—E. Meunier—dowel machine and other equipment for sash and door factory.

Que., St. Narcisse—E. Gagnon (sawmill)—rip saw, swing saw, etc.

Que., St. Placide—J. P. Lefebvre & Fils—foundry equipment.

Que., St. Scholastique—I. B. Tarsie & Co.—foundry equipment.

Que., St. Therese de Blainville—Charron & Freres—mortiser, dovetailer, etc., for sash and door factory.

Nfld., St. Johns—Parson's Pond Oil Co., Ltd., J. D. Henry, Purch. Agt.—drilling machinery and equipment for oil field.

Nfld., St. Johns—St. George's Coal Fields, Ltd., J. T. Freeman, Dir.—mining machinery and equipment for coal fields.

Metal Working Shops

Calif., Long Beach—C. Bellows, 30 Locust St., is having plans prepared for the construction of a 2 story, 125 x 175 ft. garage and salesrooms on American Ave. and 20th St. Austin Co. of California, Bartlett Bldg., Los Angeles, Archts.

Calif., Los Angeles—A. Costello awarded the contract for the construction of a 4 story, 72 x 200 ft. garage at 1348 South Figuroa St. Estimated cost $129,000.

Calif., Los Angeles—D. E. Foster, 1259 Maryland St., is having plans prepared for the construction of a 2 story, 65 x 140 ft. garage. Private plans.

Calif., Los Angeles—The Los Angeles Motor Bus Co., 806 Railway Bldg., awarded the contract for the construction of a 1 and 2 story garage and office building on North Virgil St. Estimated cost $115,000. Noted Sept. 13.

Calif., Oakland — The Chevrolet Motor Co. of California, Foothill Blvd. and 69th Ave., awarded the contract for the construction of a 1 story addition to its factory. Cost will exceed $150,000. Noted Sept. 13.

Calif., San Francisco—The Otis Elevator Co., 2300 Stockton St., awarded the contract for the construction of a 2 story shop and office building on Beach St. and Grant Ave. Estimated cost $350,000. Noted Oct. 4.

Calif., Vernon—The California Metal Enameling Co., East 51st St., is having plans prepared for the construction of a 1 story, 50 x 120 ft. and 60 x 75 ft. addition to its plant. Estimated cost $40,000. Hamm & Grant, Inc., Ferguson Bldg., Los Angeles, Engr.

Ia., Dubuque — Koenigsberg & Weisfeld, Archts., 155 North Clark St., Chicago, are receiving bids for the construction of a 3 story, 100 x 103 ft. automobile sales and service station, for the Balsky Motor Co., 6th and Iowa Sts., here. Estimated cost $200,000.

Wis., Kohler—The Kohler Co., c/o A. Treich, Supt., is receiving bids for the construction of a 1 story, 67 x 210 ft. enameling shop. Estimated cost $60,000. Private plans.

Wis., Madison—The Auto Service Co., 213 East Washington Ave., is receiving bids for the construction of a 1 story, 50 x 90 ft. garage and repair shop. Estimated cost $40,000. D. Bilaic, proprietor. Private plans.

Wis., Madison — The Madison Medical Assn., c/o R. S. Ingersoll, Lakeside St., plans to build a 2 story, 45 x 100 ft. garage, boiler house and laundry. Estimated cost $50,000. Engineer or architect not selected.

Wis., Markesan—W. Dehn is having plans prepared for the construction of a 1 story, 50 x 90 ft. garage and repair shop. Estimated cost $40,000. Private plans.

Wis., Milwaukee—The Hoyer Eng. Co., 281 Grove St., plans to build a 1 story, 60 x 100 ft. machine shop. Estimated cost $40,000. Engineer or architect not selected.

Wis., Milwaukee—The Lemm Electric Co., 3324 Fond du Lac Ave., awarded the contract for the construction of a 2 story, 34 x 80 ft. battery service station. Estimated cost $40,000.

Wis., New Lisbon—F. J. Bunker plans to build a 2 story garage and repair shop. Estimated cost $40,000. Engineer or architect not selected.

Wis., North Milwaukee—W. P. Schwartzburg, 43rd St. and Hammond Ave., awarded the contract for the construction of a 1 story, 60 x 100 ft. garage on Villard Ave. Estimated cost $40,000.

Wis., Portage—E. Weinke awarded the contract for the construction of a 2 story, 50 x 70 ft. garage and repair shop. Estimated cost $40,000. Noted Aug. 23.

Wis., Spring Valley—The Pierce Auto Co. is having plans prepared for the construction of a 1 story, 50 x 75 ft. garage and repair shop. Estimated cost $40,000. C. W. Pierce, Mgr. J. M. Kotts, Spring Valley, Archt.

Ont., Dundas—The Kaustine Co., manufacturer of chemical closets and plumbing specialties, plans to build a 60 x 120 ft. addition to its factory. Estimated cost $30,000. J. F. Crowley, Mgr.

Ont., Eastview—The Musical Clock Co. plans to build a 2 story, 50 x 100 ft. factory. Estimated cost $30,000. Engineer or architect not selected.

Ont., Ridgetown—E. Fysh plans to build a garage, automobile repair shop and service station. Estimated cost $40,000.

Ont., Welland—W. G. Somerville & Son, 36 Main St., North, awarded the contract for the construction of a 1 story, 52 x 100 ft. garage, automobile, tire and battery repair shop. Estimated cost $50,000.

Reaa the

SEARCHLIGHT SECTION

the "Opportunity" Advertising of the Machinery Field

See pages 109 to 121

American Machinist

Volume 59 NEW YORK, OCTOBER 18, 1923 Number 16

Car Shop Press Work

BY L. C. MORROW
Managing Editor, *American Machinist*

Production limitations — Multiple punching operations on large work —Heating diaphragms in a "continuous" furnace and pressing them in a 450-ton high-speed crank-press—Two meritorious time-saving devices

UPON its press operations the railway car shop depends for production. Forming, bending, punching and shearing comprise the major machining operations for freight and passenger car parts, and the character of the machines used is, on that account, of the greatest importance.

Machine work on cars is production work, not in the sense that a machine is set-up for and run on one operation only for a long time, but rather in the sense that a machine is operated on as many as several hundred parts before the set-up is torn down. Cars are ordered in lots of from several hundred to several thousand, a point favoring production work; but frequently, in order to make deliveries without delay, and to keep completed cars moving out of the shop, it is necessary to run the parts through in small lots. For this reason, and also because of the difference in design of the cars of different roads and the long intervals of time between orders for the same road, set-ups must be as simple and as flexible as possible and the machine equipment must be adaptable for differing operations on a variety of parts. The limitations mentioned should be kept in mind in reading the following descriptions of machines and set-ups which are representative of the practice of the Pressed Steel Car Co., of McKees Rocks, Pennsylvania.

The operation of shearing a single slot for the draft rigging in center sills is shown in Fig. 3. With a similar set-up two slots are sheared in some sills at one stroke of the press. The slots are 2¼x9½ and 2½x12⅝ in. Handling is the greatest item of this operation, three men being required to place the pieces on the machine and to remove them and to hook up and unhook for the crane. The machine is an A-frame, multiple punch, 122 in. between housings, made by the Covington Machine Co., Covington, Va., and driven by a 75 hp. motor.

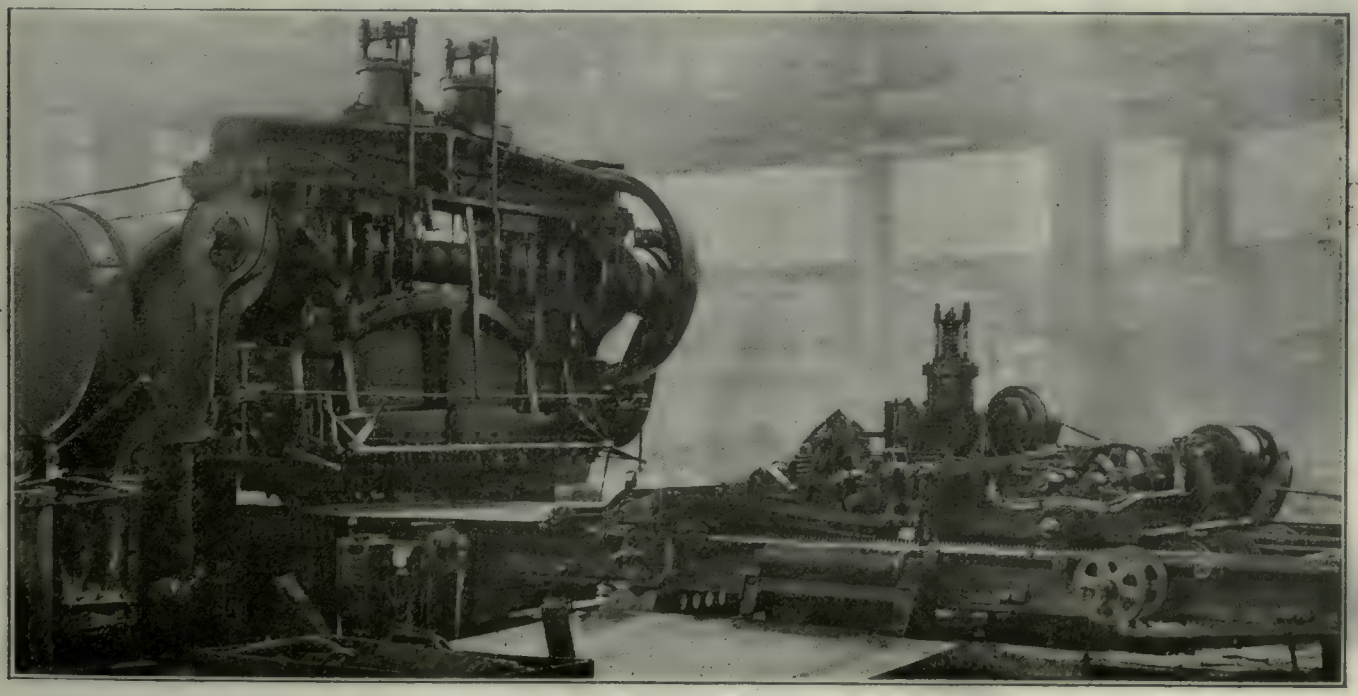


FIG. 1—PUNCHING SIDE SHEETS, USING SPACING TABLE

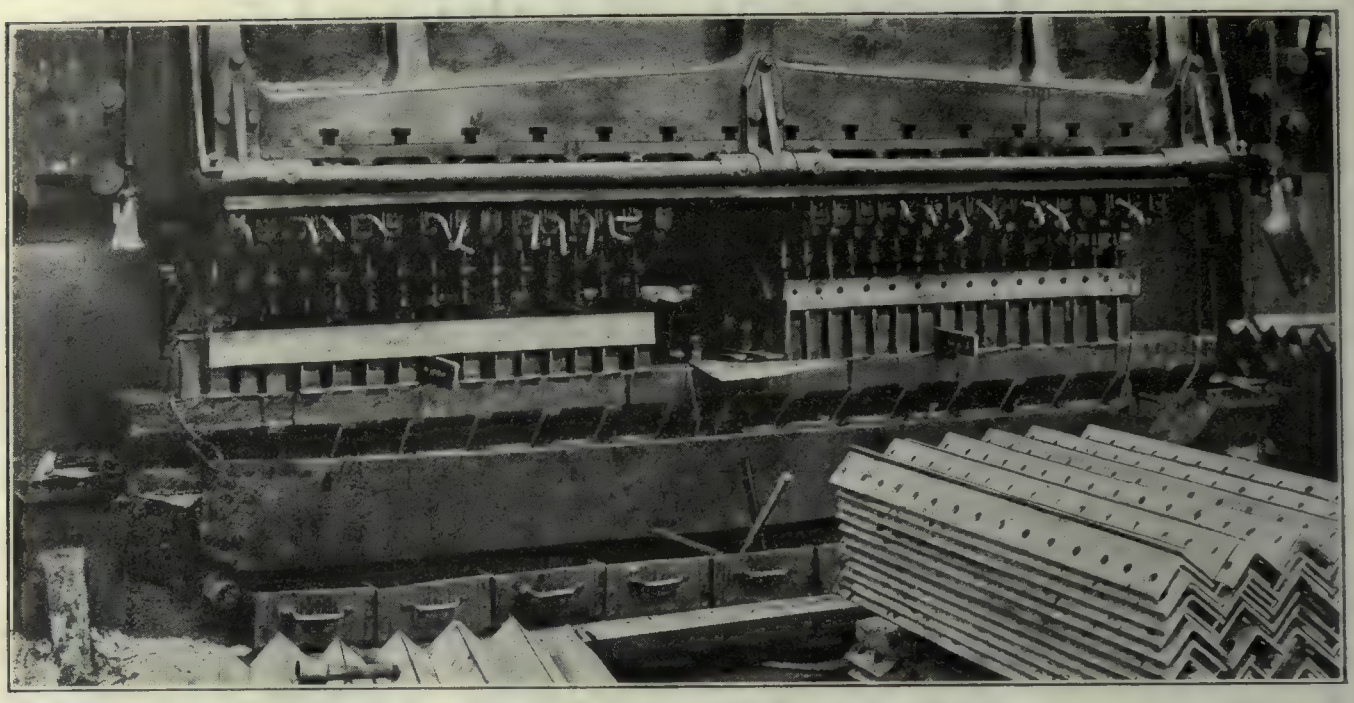


FIG. 2—PUNCHING 31 $\frac{13}{16}$-IN. HOLES IN $\frac{7}{8}$-IN. ANGLE IRON

Its capacity is 60 $\frac{13}{16}$-in. holes and one $2\frac{1}{2}$-in. hole in $\frac{3}{4}$-in. open hearth steel. When it is used as a gang punch, the punches are placed on three levels.

Before being pressed the spring plank for the B. & O. cars, which is made of $\frac{3}{8}$-in. steel has 16 $\frac{13}{16}$-in. holes and 2 $4\frac{1}{4}$-in. holes punched in it at one stroke of the press. The machine is a multiple punch, 122 in. between housings, made by Williams, White & Co., Moline, Ill., and driven by a 30 hp. motor. The depth of throat is 30 in. and the length of stroke 6 in. The press is rated as having 600 tons pressure and has a capacity of 40 $\frac{13}{16}$-in. holes in $\frac{5}{8}$-in. open hearth steel. An oscillating stripper is used at each end of the piece, an arrangement facilitating entering and removing the work.

A multiple-punch job is shown in Fig. 2, which illustrates a machine made by the Cleveland Punch and Shear Works, of Cleveland, Ohio, punching 31 $\frac{13}{16}$-in. holes in a $\frac{7}{8}$-in. angle, 4 ft. 1 in. long, known as the bolster bottom flange angle, another B. & O. part. Two operators are required, one for each leg of the angle, the work being passed from one operator to another. The machine has a 3-in. stroke, is 120 in. between housings, punches on three levels and has a capacity of 40 $\frac{13}{16}$-in. holes in $\frac{5}{8}$-in. open hearth steel.

The same kind of a machine equipped with a Thomas spacing table is shown in Fig. 1. The operation is punching the holes in side sheets, a two-man operation. One man operates the spacing buggy, pushing it against successive stops adjusted in position along the table. The other man operates the trip and handles the gags. The front end of the side sheet is, of course, clamped to the buggy, but that method of holding, by itself, would not guide the sheet in a straight line. Consequently a follower buggy is necessary; it is clamped to the rear end of the sheet and, being itself guided on tracks, forces the sheet to travel in a straight line.

An operation of importance is that of pressing the diaphragms, or spacers, used to space and connect the



FIG. 3—SHEARING DRAFT RIGGING SLOT IN CENTER SILLS

side and center sills. There are from 6 to 18 diaphragms used on a freight car and on account of the quantity made on a large order, economy in forming them is necessary and outlay for an expensive equipment is justified. The press is one of several used by the Pressed Steel Car Co. and has a capacity of 450 tons and a very high speed.

With such great capacity the task of supplying the heated sheets to the press becomes a problem of importance, which has been solved by using a continuous plate-heating furnace. The furnace is made by Tate, Jones & Co., Inc., Pittsburgh, Pa., and is 6 ft. 6 in. wide and 30 ft. long. The work is carried through the furnace on two reciprocating beams each 12 in. wide and spaced 30 in. from center to center. The beams have a vertical lift of 4 in. and a stroke of 48 in. The conveyors are actuated by air hoists, one lifting them vertically and the other moving them horizontally. The hoists are operated separately, so that work may be fed in either direction. A pit 3 ft. 6 in. wide and 6 ft. deep extends under the furnace for its entire length, to make every part accessible for adjustment and lubrication. The charging and discharging platforms are approximately 4 ft. long so that it is possible to handle an amount of metal equivalent in area to 24 sq.ft. of the hearth area at each stroke. Plates of any size from 18 in. up to 6 ft. long and up to 48 in. in width can be handled.



FIG. 4—PARTS OF DIAPHRAGM PRESSING DIE

Firing is done by means of 14 high pressure burners. The doors are raised and lowered by means of air hoists. When working on heavy material, the furnace temperature has been run up to 2,300 deg. Fahrenheit.

Eight men are required on the operation of pressing diaphragms. One places the material on the charging platform, one operates the air hoists, two take the heated plates from the discharging platforms and place them in the die, and four carry away and pile the finished pieces.

In Fig. 4 is shown the die, which is made of cast iron and consists of holder, wearing plates, bottom, and plunger. The wearing plates are wedged into the holder and may be renewed when worn. The bottom is actuated by the crank movement of the press and pushes the pressed diaphragms from the die. No stripper is provided, as it has been found that the work rarely sticks to the plunger.

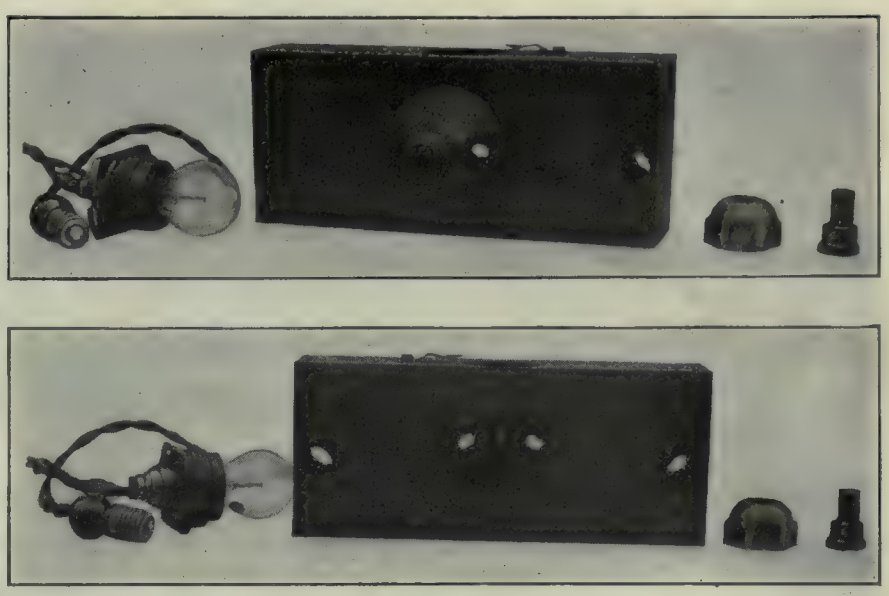


FIG. 5—PARTS OF SPOTTING ARRANGEMENT FOR LOCATING CENTER-PUNCH MARKS UNDER PUNCHES

Excepting the side sheets, sills and long angles, where the spacing table is used, and for parts that are multiple-punched by a single stroke of the press, hole locations must be center-punch marked by templet. The operation is slow, but cannot be avoided. The punching operation, however, can be speeded up by employing some signal to inform the operator when the sheet is located with the punch centered over the center-punch mark. A device that is highly commendable is employed by the Pressed Steel Car Co. It has proved to be so valuable that a patent has been requested. In this device, the punch holder, as shown in Fig. 5, is arranged to hold an electric light above the punch. The punch is drilled, and the light, passing through the hole, falls directly below the center of the punch. When the plate is located so that the spot of light falls on the center-



FIG. 6—SPOTTING ARRANGEMENT APPLIED TO PRESS

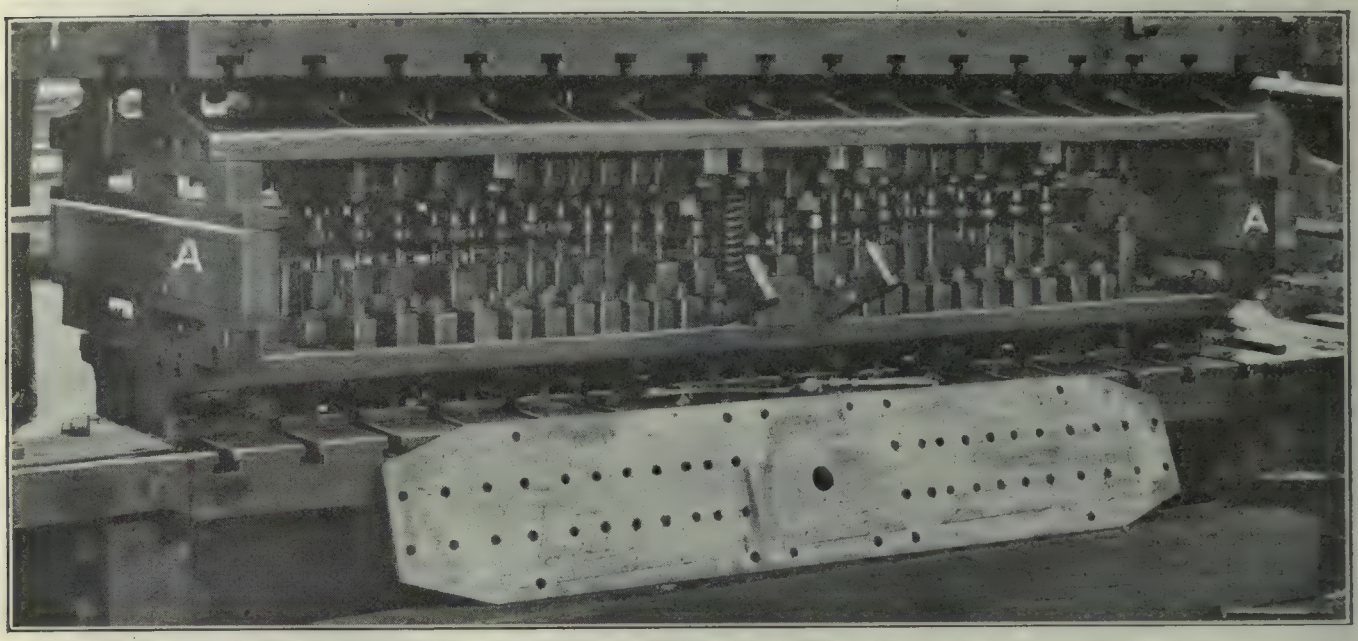


FIG. 7—PERMANENT SET-UP OF MULTIPLE PUNCHES AND DIES, WITH LOW FILLERS IN PLACE

punch hole, it is in the proper position and the press is tripped. When the first punch was arranged in this manner, it was found that the filaments of the lamp, lying horizontally, threw an oblong spot of light on the work. A corrective device consisting of a washer with an oblong hole was inserted in the punch, and no more trouble was experienced. The major axis of the hole in the washer had to be placed at right angles to the lamp filaments. In Fig. 6 a machine equipped with the spotting device is shown in operation.

Mention was made of the necessity to break up the set-ups frequently in car work. A plan to avoid dismantling some of the more difficult punch and die set-ups has been devised by the Pressed Steel Car Co., and is now being carried out. The set-up shown in Figs. 7 and 8 is used on the large press illustrated in Fig. 3 and its preservation saves not only time that would be required for dismantling and re-assembling but also the time during which the press would stand idle while the punches and dies were being adjusted and removed.

The old method was to locate the dies on the press by templet and position the punches to the dies. By the new method the dies are set up on the bolster plate by templet and blue print and the punches are located to them, much as formerly, but cast-iron fillers, *A*, Fig. 7, are placed between the upper and lower bolsters. These fillers are of such size that they would support the upper bolster at the proper height to allow the ram to just touch it, if the set-up in that condition were placed on the press, and the ram were in the lowest position. The punches are, of course, placed in the dies before the fillers and top bolster are attached. After the fillers and bolster are in place, the die holders are clamped to the bolster and the low fillers are replaced by higher ones, *B*, Fig. 8, that raise the upper bolster to such a height that when the set-up is placed on the press, the top of the bolster is $\frac{3}{8}$ in. below the bottom of the ram when in its top position, the distance of $\frac{3}{8}$ in. being allowed for clearance to facilitate placing the set-up on the press. Up to date the arrangement just described is the only one in use but it is working out so well that others will no doubt be made.

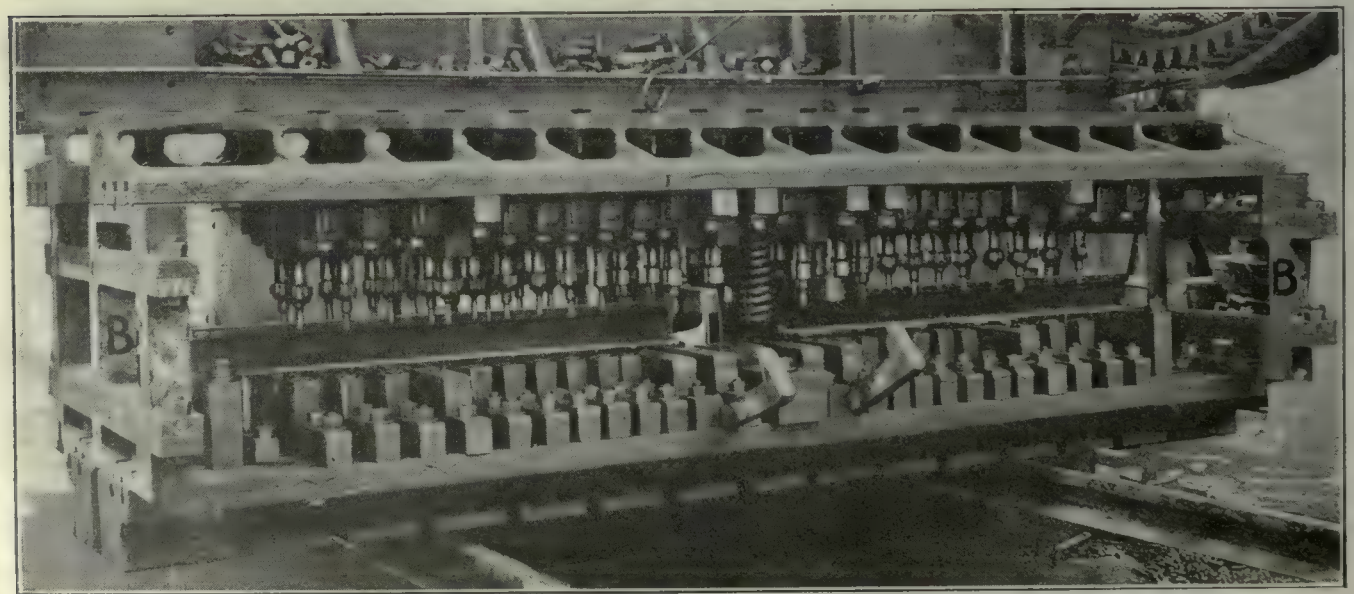


FIG. 8—PERMANENT SET-UP OF MULTIPLE PUNCHES AND DIES, WITH HIGH FILLERS IN PLACE

Special Tools for Making Paper-Mill Machinery

By E. T. SPIDY
Asst. Supt. Dominion Engineering Works

Some of the machines and methods used by the Dominion Engineering Works—Turning, boring and grinding large cylinders and rolls of various materials

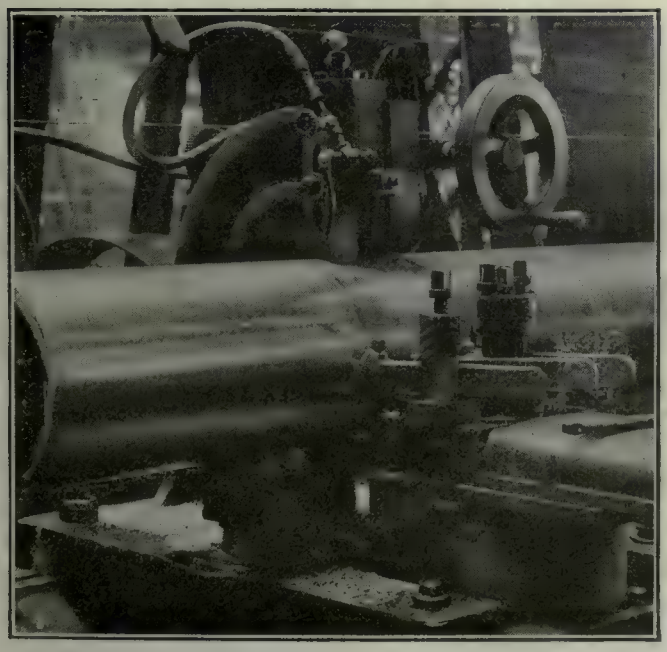
THE plant of the Dominion Engineering Works is situated at Rockfield, about seven miles from Montreal, Canada, and close to the St. Lawrence river. This plant was originally designed to build the well known Quebec bridge. On its completion and after a period of munition work, the plant was taken over by the present company, which was formed to manufacture hydraulic turbines and paper-making machines. The hydraulic machinery is made under arrangements with the I. P. Morris department of the William Cramp & Sons Ship and Engine Building Co. of Philadelphia. The paper-making machine department is taken care of by the Dominion works' own staff of designers and the success with which it has built some of the largest producing newsprint-machines testifies to its capability.

The plant consists of a main machine shop, with its sub-departments, a gray iron foundry and pattern shop. The organization includes a production department which acts as a clearing house for all information from the engineering or other departments, to the shop. This work in particular will be dealt with later and is consequently, of more than usual interest. Much of the machinery in the machine shop has been developed for the special needs of this plant. Concerning the machinery used for paper machine manufacture, there is, first of all, a large number of rolls used for various purposes. Some of these rolls are made from steel pipe, while some are heavy castings. Others are made of steel pipe with copper or brass jackets on them, while some are made of granite and have iron journals. Some are of wood, and still others are rubber covered. Occasionally more than a hundred of these rolls go into one paper-making machine, giving the opportunity for production methods and machinery.

Turning steel pipe, as anyone who has tackled the job knows, is not so easy as it looks. I refer, particularly, to pipe over 10 ft. long and from 6 in. diameter up. On the machines being built at present pipe 12, 14 and 16 in. in diameter, outside and over 20 ft. long is used.

Pipe has the knack of what the shop calls "working." If you take a cut on some pipe in the ordinary way and lay it aside for a few days, and put in back in the lathe, you are liable to think that an unsteady operator handled it the first time. This is due to the effect of breaking the skin of the pipe and releasing internal stresses in the metal.

In order to speed up this work, special tool carriages



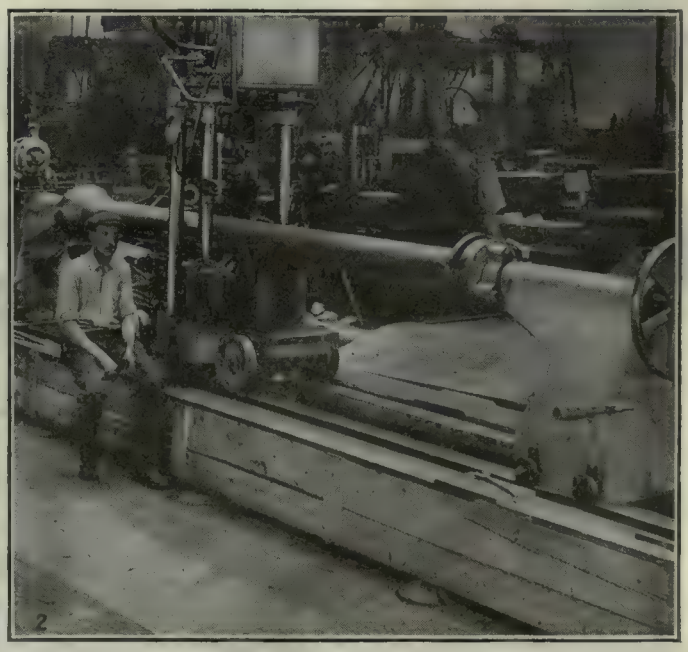


FIG. 1—SPECIAL TOOL HOLDER FOR TURNING PIPE. FIG. 2—AN EFFICIENT PIPE STRAIGHTENER

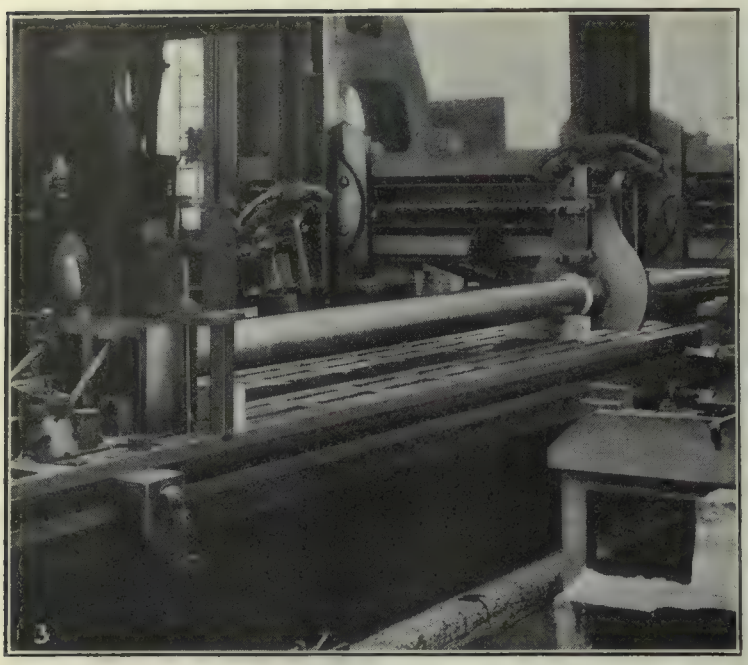


FIG. 3—DRAWING COPPER SHELL ON STEEL PIPE.

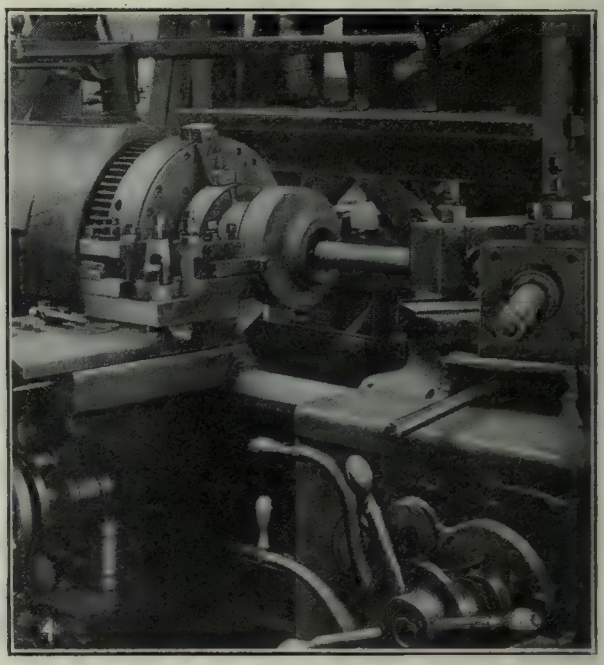


FIG. 4—TURNING ROLL HEADS ON STEINLE LATHE

have been developed and fitted to existing lathes as seen in Fig. 1. This combined tool carriage and steadyrest carries three tools in front and one in the rear, in addition to three steady blocks, two of which are shown. In many cases pipe is "good," and where the purpose for which it is to be used permits of a little extra tolerance, the whole turning operation is completed in one traverse of the carriage along the length of the pipe.

At the end of the shop where the material is received is a special machine for straightening pipe and similar work. This machine was developed by Logemann Bros., especially for this class of work and it straightens pipe in one tenth of the time required by the previous method which included a press, torch, jacks and other paraphernalia. This new machine is illustrated in Fig. 2. It should be mentioned that pipe and tubes, even when made by most advanced methods, are straight only in a relative sense. Pipe which would be "straight" for many purposes would be unsuitable for a roll that has to be turned all over. Since this is the condition confronting users of long pipe and no straighter pipe is procurable, it simply has to be straightened.

Another interesting operation is the drawing on of either brass or copper tubes over steel rolls. Some people press them on successfully but our experience has proved that thin walled copper tubing tends to buckle and loosen when pushed on. When pulled over a pipe, however, it acts in the reverse way and tends to tighten, which is what we desire. Fig. 3 shows the fixture on the planer used to draw the copper-jackets on steel pipe. The steel pipe is in front of the fixture, the thrust being taken by the block at the left. The copper pipe is behind the cross-rail.

Roll heads are usually of cast iron and are bored and reamed for the press fit on the journal in a Steinle turret lathe as shown in Fig. 4. After pressing the

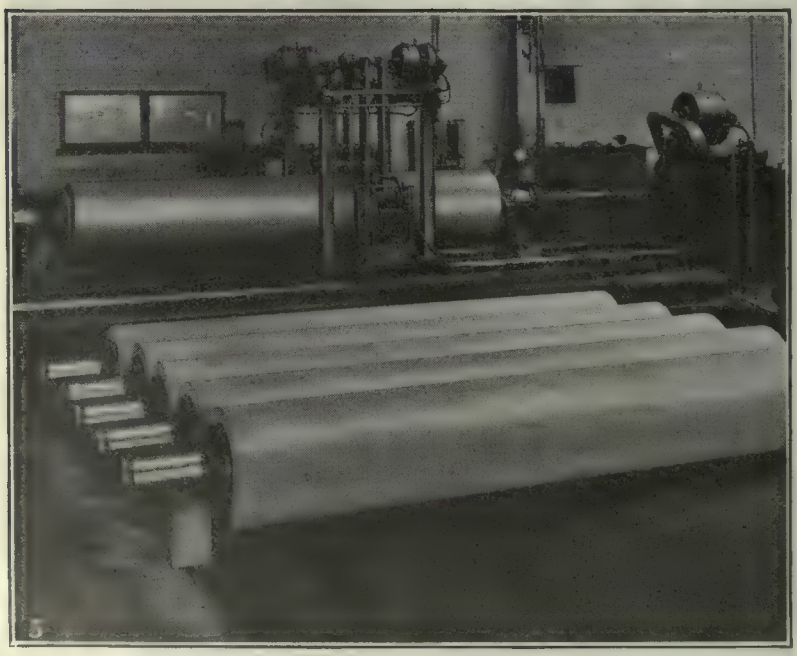


FIG. 5—GRINDING ROLLS OF GRANITE.

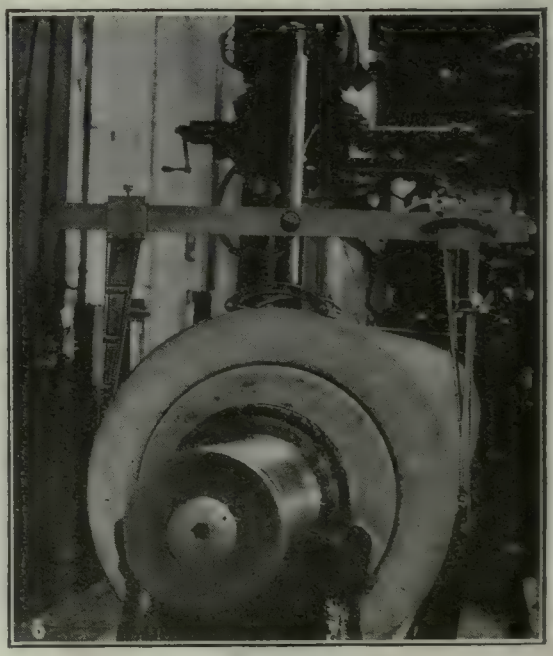


FIG. 6—CALIPERING LARGE GRANITE ROLLS

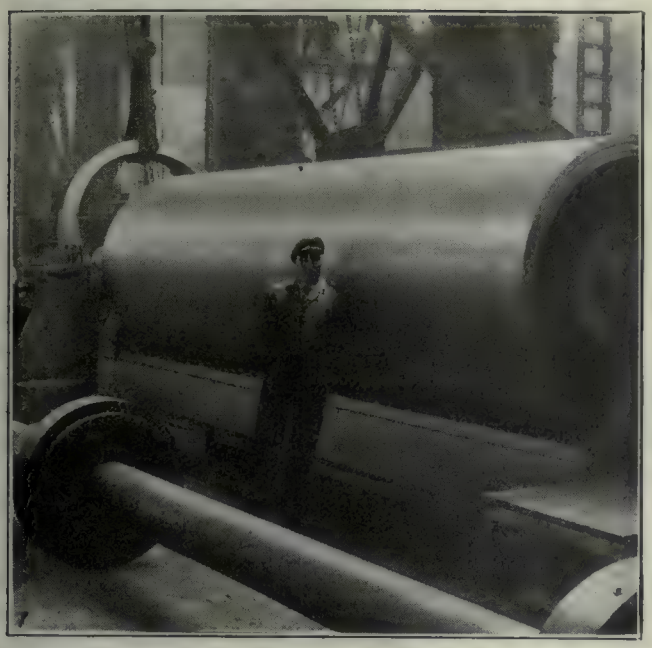


FIG. 7—BACK SIDE OF DRIER-CYLINDER LATHE.



FIG. 8—FRONT OF DRIER-CYLINDER LATHE

head on the journals, the combined journal and roll head are turned on centers. The head is then turned to make a shrink or press fit into the pipe, as may be required for the particular job in hand.

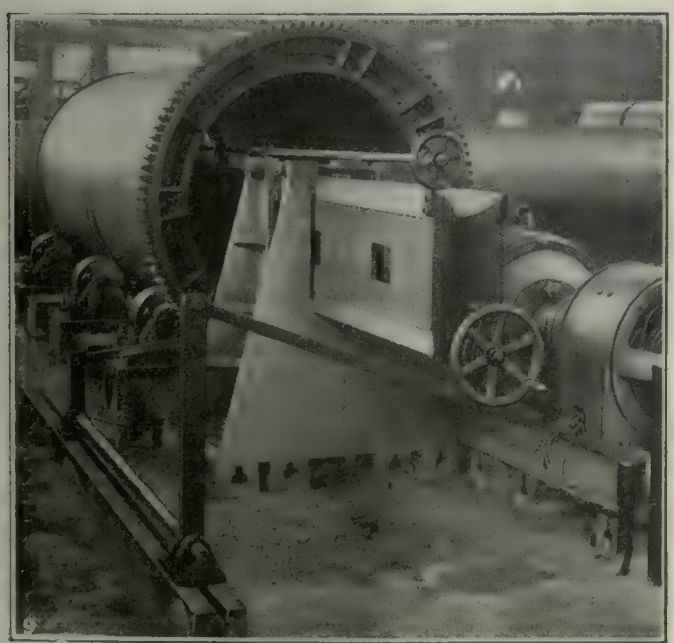
Grinding rolls of all kinds is done on a special machine. The illustration, Fig. 5, shows a Farrell grinding machine finishing rolls of granite. The machine has two grinding wheels of the proper grading, one on each side of the roll, and has a profile attachment which is adjustable for crowning such rolls as require it. For the grinding operations, the rolls are run in journals instead of on centers to insure concentricity with the journals.

Fig. 6 shows a special micrometer gage for use on the grinding machine. By sliding the gage along the roll, the indicator shows variations of diameter in thousandths of an inch.

Another group of special machinery of large dimensions, is that used in the manufacture of "driers" for paper machines. Driers are cast-iron cylinders up to 72 in. in diameter and up to 230 in. long. They are turned outside and bored inside. Heads and journals are then fitted, the assembly balanced, and the cylinders finally ground on the outside, on journals, to a high finish. The driers are steam tested. In operation the paper passes over a bank of thirty to forty of these cylinders which are heated with steam to dry the paper before it is calendered and reeled.

The rough turning latches and the boring machines illustrated in Figs. 7, 8 and 9, were developed by the Dominion Engineering Works and are of extremely rugged construction. For rough turning the outside, the drier cylinders are mounted on spiders on a bar and mounted on a special bed as shown in Fig. 7. This view also shows one of the bars on which these cylinders are turned in the foreground.

Two carriages operate on the front side of the cylinder while a carriage on the back side cuts off the end of the cylinders. Extra long ends are cast on the cylinders in order to insure perfect metal at the faced



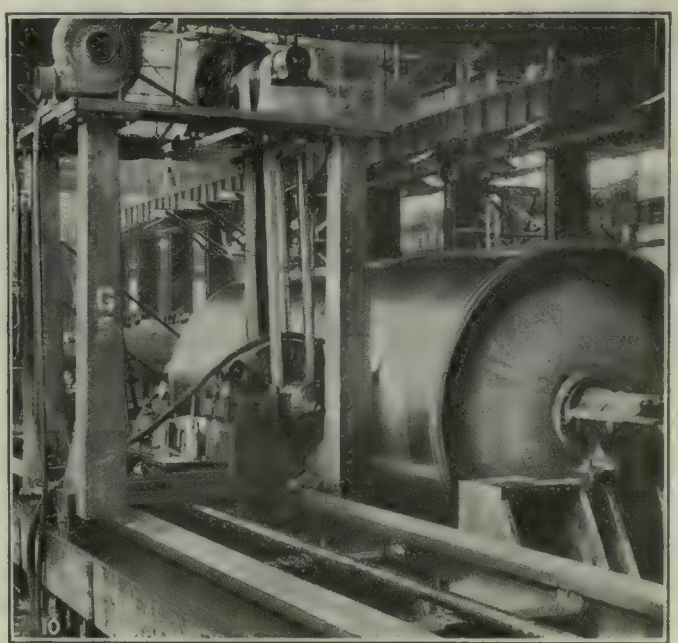


FIG. 9—SPECIAL MACHINE FOR BORING THE CYLINDER. FIG. 10—GRINDING A LARGE DRIER CYLINDER

joints. The cast weight of one of these drier cylinders is around 12 tons. Fig. 8 shows the front of the lathe, the two carriages and the separate bed on which they move. The cut-off riser is shown hoisted out of the way.

The boring machine, Fig. 9, is designed to have four tools cutting at one time. It consists of a rigid bar

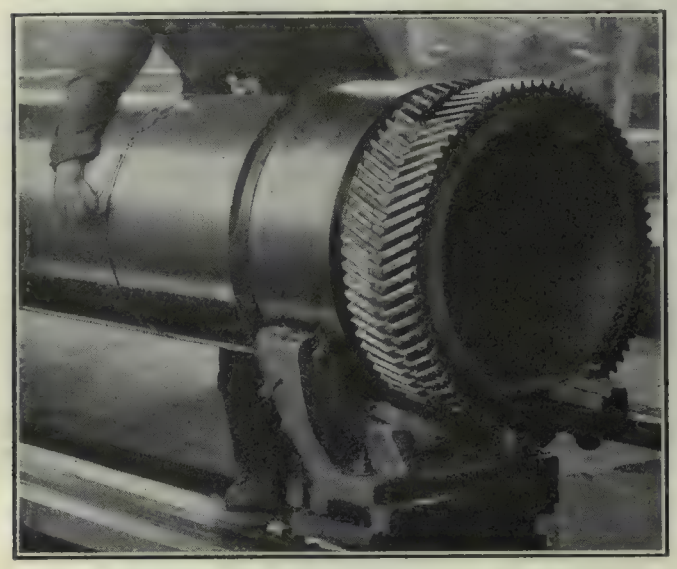


FIG. 11—MEASURING CYLINDERS WITH A TAPE

made from an old lathe bed and has a movable end support which is removed while a drier cylinder is being "threaded on," so to speak. A gear ring is bolted to the end of the drier and this gear meshes with a pinion on a Foote reduction gear box that is directly connected to the driving motor. Size is not so important in boring, as is uniformity of wall thickness, so that a uniform heat transference can take place between the cylinder surface and the paper. The weight of the drier on the rollers holds it steady against the tools which are arranged to react in a line inside the roller base area. It will be noted that the cylinder is supported by, and revolves on, rollers.

A Special Grinding Machine

Grinding the large drier cylinders is done on a special machine shown in Fig. 10, which was also built by the Dominion Engineering Works. It consists of one traversing grinding wheel with its motor, all combined with feed gear on the carriage. The driers are mounted on their journals at the proper distance away and at correct height from the grinding wheel and driven by an independent motor. It will be readily seen that the capacity of this machine is limited only by the length of travel on the bed, which is 25 ft., and the distance of the wheel center from the floor, which is 5 feet.

A brass suction roll being measured by a special tape gage is shown in Fig. 11. All cylinder diameter measurements are made by tapes, which are made in the tool room from verified standards. We find that operators quickly get used to this method and that it also prevents many errors that operators are liable to make when using calipers, because it magnifies the readings by the relation of circumference to diameter and results in more accurate work. A spring balance between the end of the tape and the operator's hand insures regular tension on the tape and is necessary for use when inspectors are checking operator's work.

Westinghouse Scholarships

FOUR scholarships, each carrying an annual payment of $500 per year, are awarded annually by the Westinghouse Electric and Manufacturing Co. to employees and sons of employees on the basis of competitive examination. Of the group completing the work last year, one graduated as a leading man in the Engineering School at the University of Pittsburgh. Two others stood high in the Engineering Division at the Carnegie Institute of Technology.

The effort of the company in selecting men for these awards has been to find young men of a many-sided nature. Intelligence, physical qualities, aptitude for engineering work, ability to shoulder responsibility and to guide their own affairs have been the general points on which the candidates are compared.

Careful consideration is given to the physical qualities of the applicant, and scholarships are awarded only to those who have the proper qualifications and adaptability. The candidate must be free from disease to be regarded as physically fit. He should also have a condition of body tending to activity. Physical vigor generally indicates mental vigor.

It is considered that general intelligence is more essential than acquired knowledge. This characteristic may be measured by one's ability to grasp quickly and accurately a new point and retain it. While different from acquired knowledge, it is generally readily measurable in terms of one's progress in such scholastic subjects as algebra, geometry and physics. These scholarships are awarded only to those who have a fundamental interest in engineering work.

Scholarship Restrictions

It is essential that the recipients of scholarships be representative individuals in the activities of whatever society they may find themselves. It is not enough merely to have a high scholarship record. Success in securing employment and in making progress in whatever line may be chosen will depend very largely on ability to mix with one's fellows, to co-operate with them in community effort, and to harmonize one's life and activities generally with the mass as a whole. For these reasons social qualities are given a large consideration in the selection. The recipients reflect credit or discredit on the donors of the scholarships according to their social prestige in school life.

It is believed that scholarships should not be awarded to those who are not willing to help themselves to a considerable extent. The annual payment of $500 is intentionally not quite large enough to cover the entire expense involved in attending a first-class engineering school. The amount is, however, sufficient to put the engineering training within the reach of certain individuals who are able and willing to add their own efforts in striving for themselves. This characteristic, so easily developed in college days, results in the initiative and resourcefulness that make those men who have put themselves through college outstanding as engineers.

With one exception so far, the men have, after graduation, entered the employ of the company, finding their way into field work in the service department, commercial engineering, research department, design departments, etc. The single exception noted is in the case of a young man who strongly preferred construction engineering work and he was placed with an associated company specializing in this field.

Development of Machine Tools in New England

By GUY HUBBARD

The eighth article—Richard S. Lawrence, blacksmith and inventor—The first peep sight put on a rifle—Telescope rifles made for sharpshooters in the civil war

IN 1838—about the time that the name of the Hydraulic Co. was changed to N. Kendall & Co.—there came to it by the way of Asa Story's gunshop in the West Parish, a young man of twenty-one, who had received his meager education in the "school of hard knocks" in the neighborhood of Watertown, N. Y., yet who was destined to exert a profound influence—not only upon the industries of Windsor—but upon the development of the mechanic arts in the United States and in Great Britain.



Courtesy of Capt. Hugh Smiley

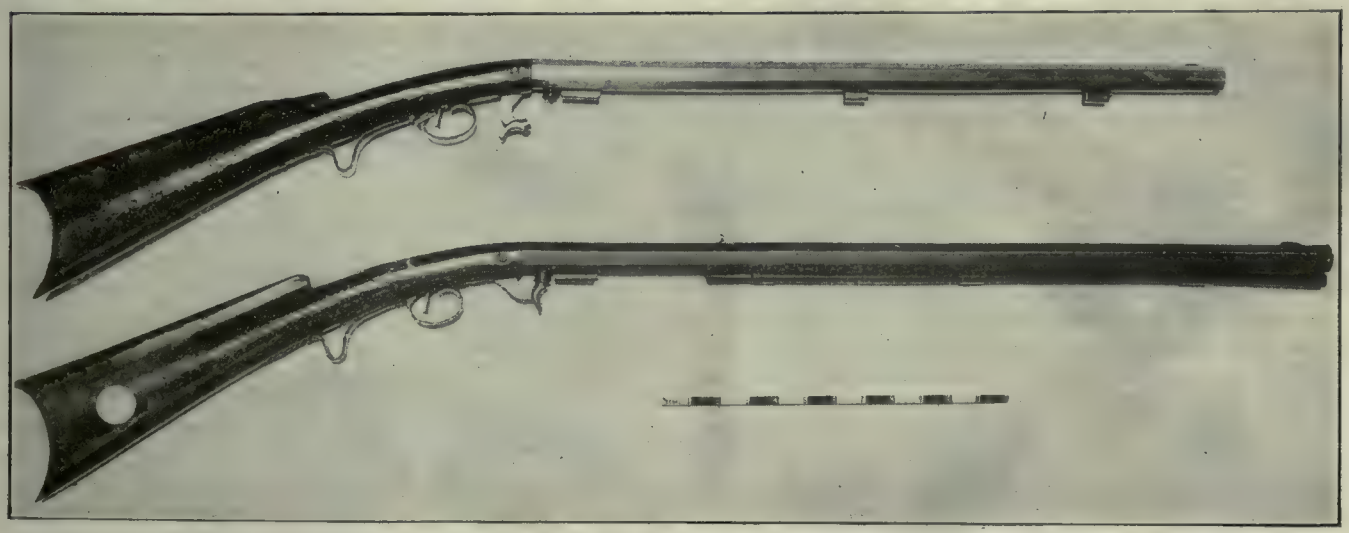
FIG. 44—HEAVY MATCH RIFLE BUILT BY N. KENDALL & CO.

The old account and time books reveal that the duties of this apprentice were many and varied, for not only did he do all kinds of gun work, but after hours he locked up the prisoners in their cells, boxed pumps and guns for shipment, cleaned out the boiler and did some of the bookkeeping.

His schooling had in all amounted to but a few months, so he practiced penmanship upon the backs of some of the sheets in the books upon which he worked. On one of these he wrote, in a flourishing copy-book style, "R. S. Lawrence, Superintendent." That this dream had something substantial behind it is indicated by the fact that in less than ten years he was at the head of a large machinery industry in Windsor, and in less than twenty years was superintendent of one of the largest industries in Hartford, Connecticut.

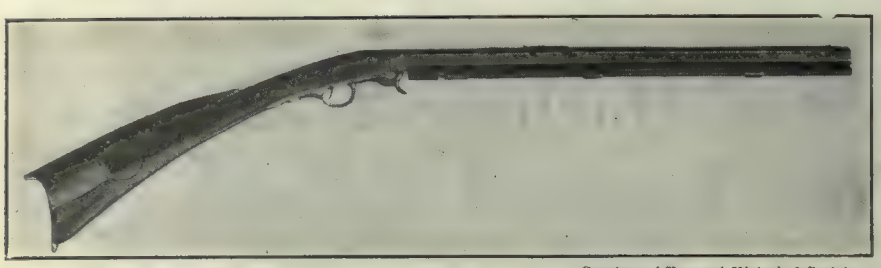
One of the favorite books of his apprenticeship days was Henry Howe's "Eminent American Mechanics," and this book, which is now in the possession of the writer, he must have read again and again as attested by its thumbed and worn condition. When Professor Roe, in 1916, wrote his "English and American Tool Builders," this same Richard S. Lawrence was one of the eighteen eminent American mechanics whose portraits appeared therein. It was a fortunate circumstance that his son, the late Ned Lawrence (sometime superintendent of the Pope Manufacturing Co. at Hartford) prevailed upon this pioneer mechanic in the evening of his long and useful life, to write his memoirs. To the present writer this all too modest document has served as a most fruitful and authoritative source of information. Of his debut in Windsor and of the West Parish incident leading up to it, Mr. Lawrence has given the following quaint account:

"While with Dr. Story, I found he had two rifles,



Courtesy of the Governor of the Tower

FIG. 45—TWO KENDALL RIFLES IN THE MUSEUM OF THE TOWER OF LONDON



Courtesy of Vermont Historical Society

FIG. 46—KENDALL RIFLE OWNED BY THE LATE PRESIDENT ARTHUR, AS A BOY

one of which he called his turkey rifle, made by his brother Asa Story who had a gun shop close by, and the other an old Pennsylvania rifle, full stocked, with barrel four feet long, and all rusty. This last the Doctor said had been one of the best—he had killed many a deer with it.

"I asked him to let me repair it and put a peep sight on it. He had heard of this sight but had never seen one and was very much interested, yet at first dared not let me repair the rifle for fear I would spoil it. After a while he consented to let me make the trial and went over to his brother's shop and obtained his consent to let me use his shop and tools. I then went to work, took the gun all apart, leaded out the barrel, forged out the sight, finished it, and put it on the gun. Asa Story watched me all day—he had never seen a peep sight, and a mere boy handling tools and forging out work as I did was a little astonishing to him.

"On the Doctor's return from his daily trip, he made for the shop to see what I had done with his rifle, and he found it in such nice shape that he could not say too much in praise. He made an appointment for trial the next day as to the shooting qualities. I had most of the day to give the rifle a trial, and adjusted the sights.

"When we went out the Doctor paced off twelve rods from a maple tree, which had a three-quarter-inch auger hole in it made from a sap spile. He said, 'Fire at that.' I lay down on the ground and fired, and the Doctor tended target. He could find no ball hole, and said I had missed the tree. I fired again—no ball hole to be found!

"The Doctor then came up to me and said I had spoiled his rifle—before my repairs he could kill a chicken every time at twelve rods. I said 'Uncle, I am very sorry, but I will make the gun all right before I leave it.' He replied that he could not consent to my doing anything more to improve the shooting qualities, though the sight he liked very much.

"I said that as the gun was loaded I would take one more shot and see if I could not hit the tree. After this third shot I went up to the tree to investigate, and all three balls which I had fired were found in the auger hole. The Doctor was astonished—dumfounded. He had never heard of such shooting and we spent half the night talking about guns. He said, 'We must go to Windsor Prison where N. Kendall & Co. are making guns. They must know about the peep sight.' Mine was the first in that section.



FIG. 47—DAVID H. HILLIARD

"We went down to the prison next day and the Doctor told them all about the sight and his rifle. The company hired me at once for the term of two years at about $100 a year and board. My first work was stocking rifles. The rifles were stocked only at the breech with short stocks, and the first day I put on five stocks. Mr. Smith, one of the company, came along and looked the work over, saying: 'The work is well done but it will never do to rush work as you have, for you will soon gun stock us out of town. You must hold up a little and take it more easy.'

"After a few days I was put on iron work. As I made it a point not to let anything be done in the shop that I did not make myself familiar with, I soon found myself capable of doing the best work. The company had quite a number of free men in various branches of the work—nice parts, engraving, etc.—and I found that I was equal to any of them except on engraving. But soon after I could compete with any of them, and at the end of six months I was put in charge of the shop—much to the disgust of some of the older hands. However, I carried the work along without any trouble and to the satisfaction of all. The foreman of the shop, by the rules of the prison, acted as turnkey, so I had a portion of the prisoners to lock up. Thus I worked out my two years' engagement."

N. Kendall & Co. continued in the pump and gun business at the prison until 1842 and during that time it built underhammer arms in the form of rifles, smooth bore muskets, pocket pistols and both single- and double-barreled shotguns—fowling pieces they were called. Some of its heavy target or match rifles of about 0.45 caliber, were fitted with octagon barrels at least two inches across the flats. See Fig. 44. These massive rifles weighed nearly 20 lb. and were necessarily fired from a rest. They were frequently used at the turkey shoots which were important ceremonies at Thanksgiving time. At these turkey shoots, each



FIG. 48—TYPES OF UNDERHAMMER GUNS MADE BY HILLIARD

contestant contributed a certain amount for the privilege of shooting at a turkey tethered to a stake. Extremely long shots were required, and the rule was that if the marksman drew blood, the bird was his.

On one of these occasions, a careful marksman who wished to capture his turkey alive, succeeded in knocking off a bunch of feathers but was ruled out as no blood was drawn. Highly disgruntled, he quietly retired with his heavy telescope rifle to a clump of bushes on a distant hilltop, and those in charge were



FIG. 49—SHOPS OF KENDALL & LAWRENCE
(From an old wood cut)

horrified to see the reserve turkeys in their crates drop dead one by one. Marvelous shooting was done by these rustic experts and they were the men who filled the ranks of the Union sharpshooters during the civil war.

Few Underhammer Rifles in Existence

It is a peculiar fact that of the thousands of Kendall underhammer rifles made between 1836 and 1842, but few specimens are now in existence, and that of these, two of the finest are preserved in Case 71 in the Museum of the Tower of London. These rifles were discovered not long since by a gentleman from Windsor, who happened to notice them as he was passing through the firearms division. By courtesy of the authorities of the Science Museum and of the Governor of the Tower, a photograph of these rifles is reproduced in Fig. 45. Another and older specimen is preserved in the Museum of the Vermont Historical Society. This last, shown in Fig. 46, was the hunting companion of President Chester A. Arthur during his boyhood days at Fairfield, Vt. Most of the others are in the collection of Capt. Hugh Smiley of Mohonk Lake, N. Y., who possesses the largest number of underhammer guns of any collector.

When N. Kendall & Co. reorganized, the underhammer gun business was continued by one of its skilled workmen, David H. Hilliard, in his shop across the river in Cornish, N. H. He had associated with him, William B. Smith, a former Kendall Contractor and one of the joint inventors of the waterproof rifle—to be described later as one of the earliest repeaters.

David Hall Hilliard, whose portrait is shown in Fig. 47, was born in Cornish, N H., Dec. 3, 1805, and learned the trade of blacksmith at the shop of Mr. Watrous on Mill Brook in Windsor Village. It was while working here that he built his first gun, a smooth bore, using the tools to be found in such a primitive blacksmith shop. He later went to work for the Woolson Stove Co., pioneer in the range business, at Claremont, N. H., and Ludlow, Vt., and finally learned pattern making in its branch factory at Cleveland, Ohio.

Returning to Windsor, he worked with N. Kendall for a time, and then set up his own shop at Cornish, where he built his own boring and rifling machines and, until 1877, continued to build underhammer sporting guns, which because of their high quality and low price achieved a national reputation in competition with the large makers. Although he never employed over fifteen men, they learned their trade so thoroughly under Mr. Hilliard that many of them later filled very responsible positions in the large armories of the country.

At the outbreak of the civil war, Mr. Hilliard worked day and night to build enough of his heavy telescope target rifles to arm a company of sharpshooters. When these rifles were finished he carted them to Concord and presented them to the Governor of New Hampshire, as his contribution to the cause of the Union. The rifle at the bottom of Fig. 48 is one of this type.

Hilliard's Death Universally Regretted

Mr. Hilliard was one of the most respected citizens of Cornish, and his death on June 10, 1877, was not only a blow to the townspeople but was regretted by sportsmen everywhere. To this day many of the Kendall underhammer rifles, made by Mr. Hilliard, are being used in the back country districts, and will be as long as rifle powder and percussion caps are available.

Of the reorganization of the Kendall business, Mr. Lawrence says: "During the year 1842, N. Kendall & Co. gave up the gun business, and for about a year and a half I worked for the State as foreman of the carriage shop at the prison. At the end of that time, in company with N. Kendall, I hired a shop in Windsor Village on Mill Brook and did custom gun work and jobbing." Fig. 49 is from an old wood cut of this shop.

It should be mentioned here that Kendall & Lawrence were influenced to locate in this "water shop" on Mill Brook by reason of the fact that in 1833, some of the public-spirited citizens had incorporated as the Ascutney Mill Dam Association and, at a cost of $20,000, had rebuilt and improved the three dams in Windsor Village in the hope that these more highly developed water powers would serve to promote the industrial activity of their town.

In Kendall & Lawrence this hope was to be realized, for its business was destined to rapidly expand into one of the leading armories and machinery plants of the country. It was upon this site that the principal industries of Windsor were to remain until the year 1910—nearly seventy years.

Japanese Machinery Requirements

Machinery for the re-equipment of the Japanese factories will undoubtedly be needed, and most of it will come from the United States and Great Britain, which in the past have divided Japan's machinery trade almost equally between them, states the Department of Commerce in a recent trade information bulletin. The principal industry in Yokohama was shipbuilding, and there were a number of industries at Kawasaki, midway between Yokohama and Tokio, including a phonograph factory, a cement works, an electric-bulb plant, and an iron-pipe manufacturing establishment. Most of the foreign firms importing machinery and iron and steel products had headquarters in Tokio.

Book Reviews

Kent's Mechanical Engineers' Handbook. By Robert T. Kent, Editor-in-Chief. 2247 pages, 4¼x7 in. Published by John Wiley & Sons, Inc., New York. Price, "Atholeather," $6, genuine leather, $7.

The tenth edition of "Kent," as the book is familiarly known to engineers, represents the work of the late author's son and a staff of thirty-five engineers. Following the original lines of William Kent it is a handbook for engineers and designers rather than for the men directly connected with the production of manufactured articles. The revision has brought it up to date and added much to its value.

There are 27 complete sections beginning with mathematical tables and ending with safety engineering. In between are sections dealing with materials of engineering; strength of materials, iron and steel; nonferrous metals and alloys; mechanics; heat; air; water; pumps and pumping; fuels and combustion; steam power; gas and oil power, power transmission; transportation, hoisting and conveying; machine design; function and lubrication; shop practice; refrigeration and ice making; buildings; heating and ventilation; illumination; marine engineering and electrical engineering.

A review of such a book is much like attempting to tell what is contained in an encyclopedia. And the book is too well known to need more than a notice that a new and revised edition has been published.

Strength of Materials. By Walter E. Wines, assistant professor of mechanical engineering, University of Wisconsin. First edition, clothboard covers, 6x9 in., 241 pages, 103 illustrations, 31 reference tables. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York N. Y. Price $2.25.

This book, which is classed by the publisher in the engineering education series, was prepared in the Extension Division of the University of Wisconsin, for the use of both correspondence and class students. The writer believes that the text is suited for use in other extension divisions, vocational and shop schools, and by those who without the aid of a teacher wish to review the subject or acquire a reading knowledge of it.

One of the first things that can be noted in the volume is the simple, clear and concise treatment given each subject. The arrangement and division of the subject is very good, and makes the volume suitable for reference purposes. In the front of the book are listed symbols, abbreviations and equations, while the appendix at the end is filled with tables of use for reference purposes in connection with the work.

The object of the volume is to explain the type of problems that ordinarily confront designers of machines and structures. Sample problems are worked out, and further questions and problems are submitted at the end of each chapter. The discussion is carried on with the practical utility of the subject in mind, as the application of the principles to engineering practice is brought out. In general, it may be said that the treatment is simple, rather than advanced; a knowledge of calculus is essential for only some few portions of the work. The use of many illustrations makes it easier to explain some parts of the subject. Of particular interest are the photomicrographs used to show the composition of ferrous metals.

The work is begun by treating the fundamental properties of materials and the methods of measuring those properties. After a chapter on the materials themselves, simple stresses and elastic properties are treated in turn. Thin-walled cylinders and riveted joints receive attention in the next chapter. The center of gravity and moment of inertia are then explained. Beams are given attention on points such as reaction, shear, bending moment, stress and deflection. After a chapter on columns, the subject of torsion is treated. The matter can be seen to be sufficiently comprehensive for general purposes.

Report of the Lathe Tools Research Committee, Manchester Association of Engineers. Published by His Majesty's Stationary Office, Imperial House, Kingsway, London, W.C.2. Paper covers, 89 pages, 5½x8½ in., 50 illustrations and charts, price 5s. net.

The research, of which this book contains a report, was commenced by the Manchester Association of Engineers in 1916 under grants from the Department of Scientific and Industrial Research. The work of investigation was done under the supervision of Dempster Smith in association with the Lathe Tools Research Committee, which body has prepared and is responsible for the report.

The first part of the investigation, as reported, was to obtain a heat treatment for tools which would give consistent results. Many trials were made, the results of which are tabulated and logical deductions are made.

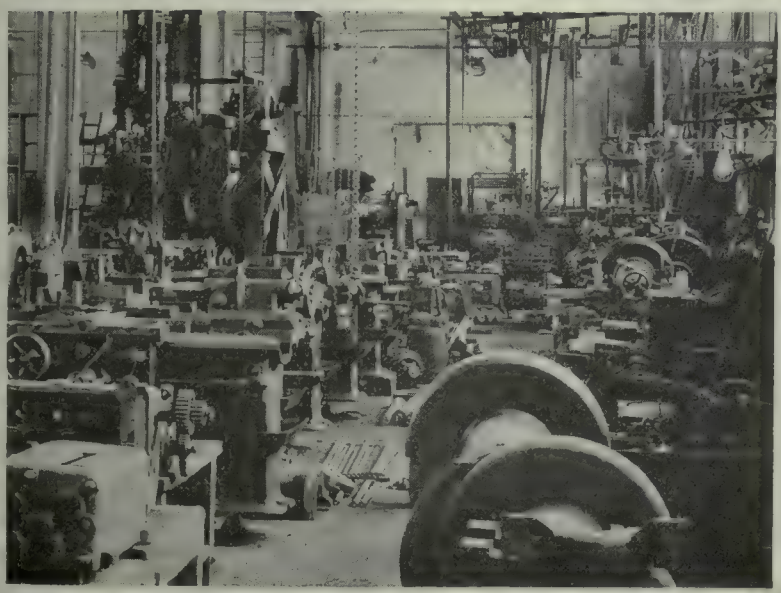
Hardness and magnetic or electrolytic properties as a measure of the durability of a cutting tool is considered and the multitude of tests are carefully charted. The special forms of apparatus required are illustrated. It is stated that the attempt to determine the condition of tool steel by its magnetic and electrolytic properties was very unsatisfactory.

The variation in the durability of tools with change in the cutting speed, shape, cutting angle, and nose radius is shown by a great variety of tests, all of which are discussed, charted and illustrated by diagrams. The investigation of the forces acting on a tool and the power consumed in cutting concludes the report. An appendix giving practical data and charts obtained from the tests is added.

Lathe Work. By Paul N. Hasluck. Two hundred and thirty-two pages, 5x7 in. Published by D. Van Nostrand Co., New York. Price $2.

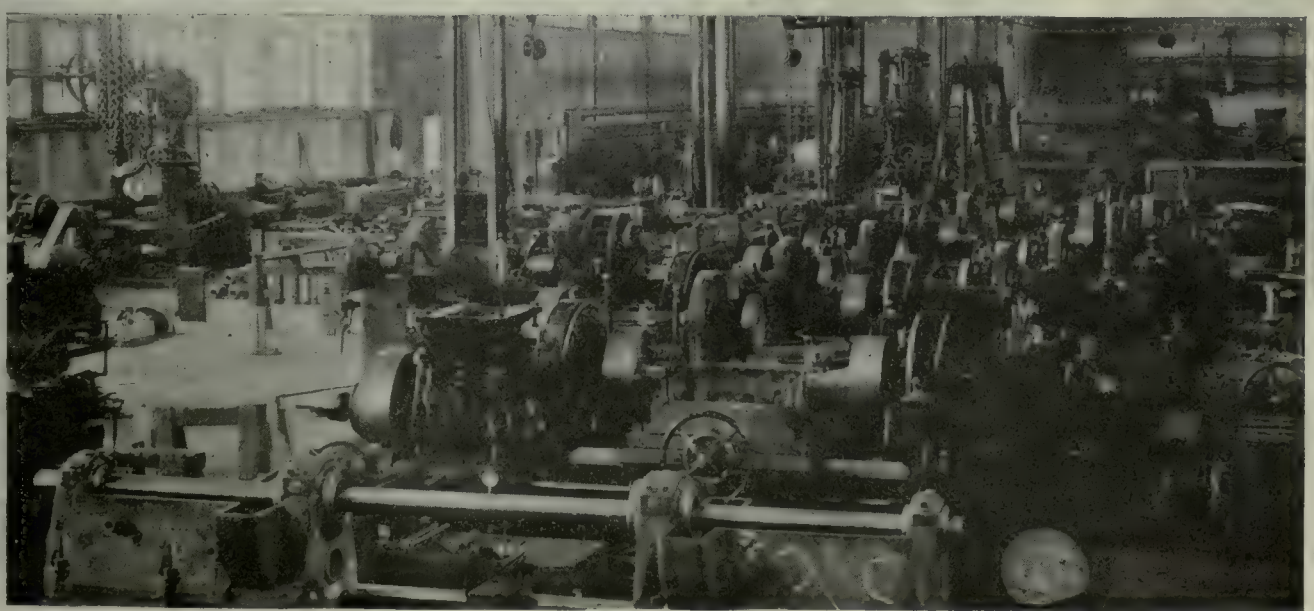
This is the eleventh edition of a book on English lathe practice which has been before the public for many years. The last two chapters, totaling 15 pages, are new and show some late forms of English capstan or turret lathes including examples of multiple tooling. The body of the book, however, remains the same as in years gone by. While it contains much information that was of value to the young mechanic of past generations, both machines and methods have changed to such an extent as to make it of little or no use in any modern shop. In view of the author's wide experience and his ability to write a modern book, it is difficult to see the reason for issuing a book of this kind with the subject matter so much out of date.

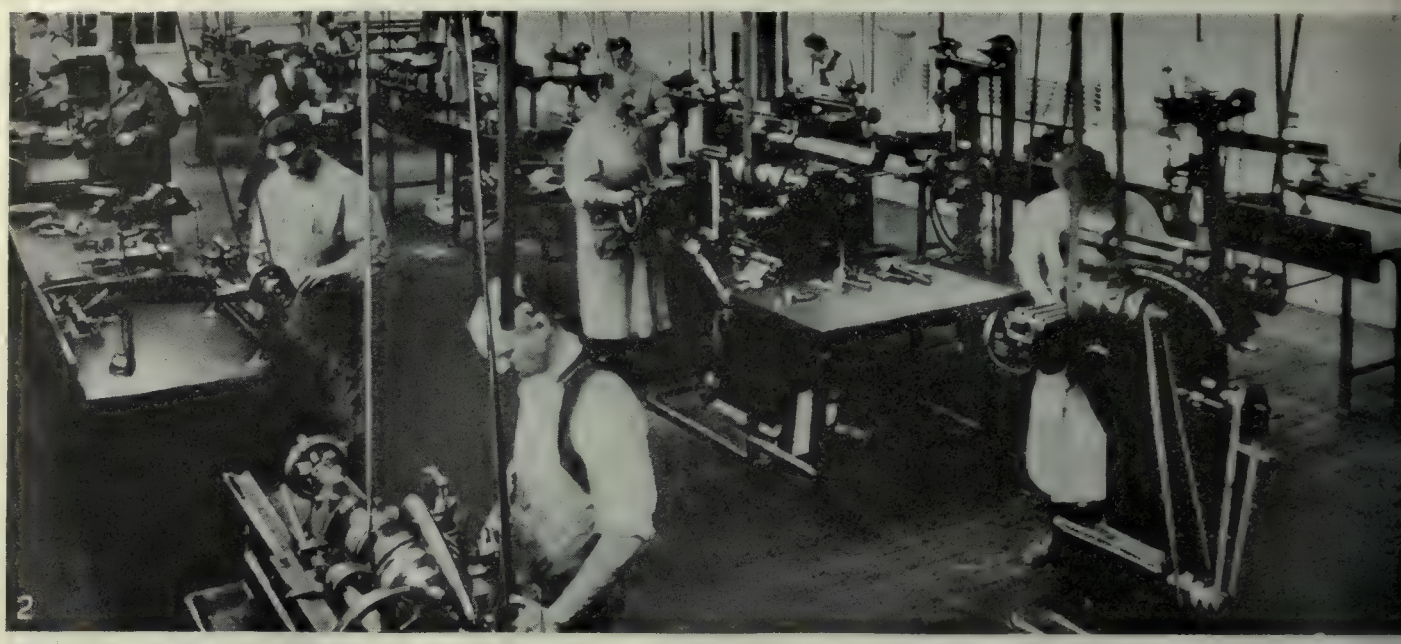




Where Machine Tools Are Made

Wickes Brothers
Saginaw, Mich.







Some Shop

On a Modern

Todd Protectograph Co

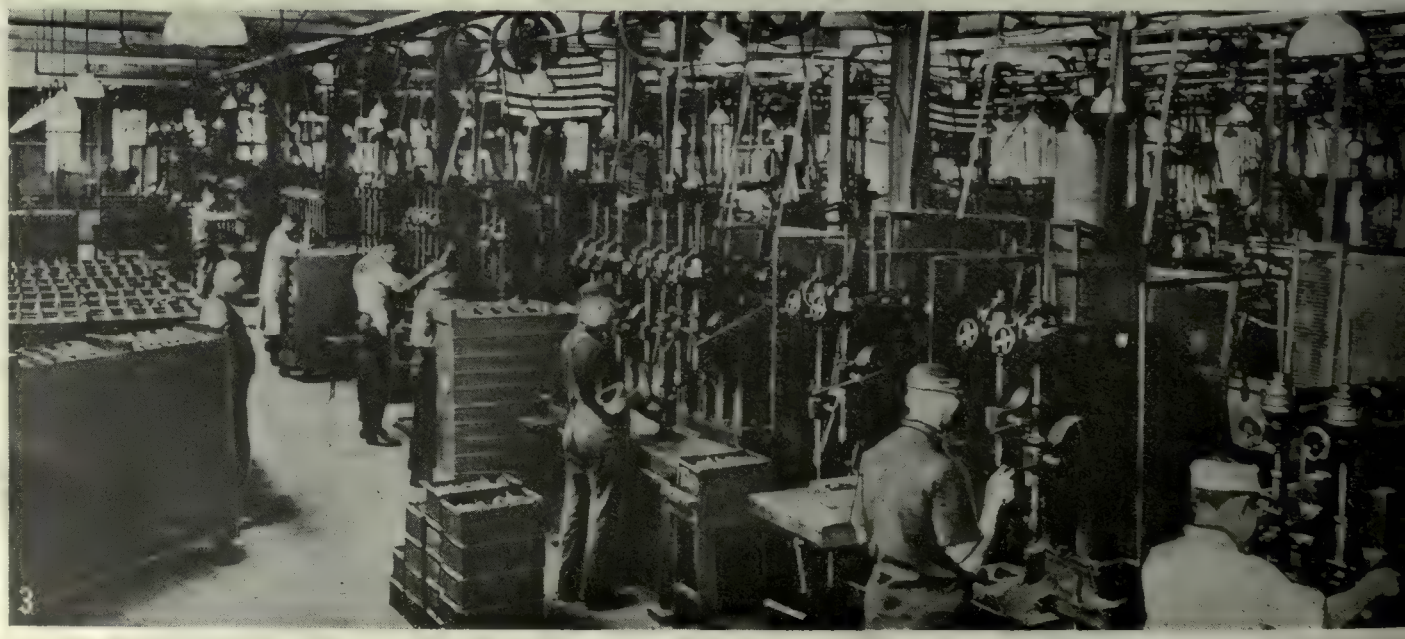
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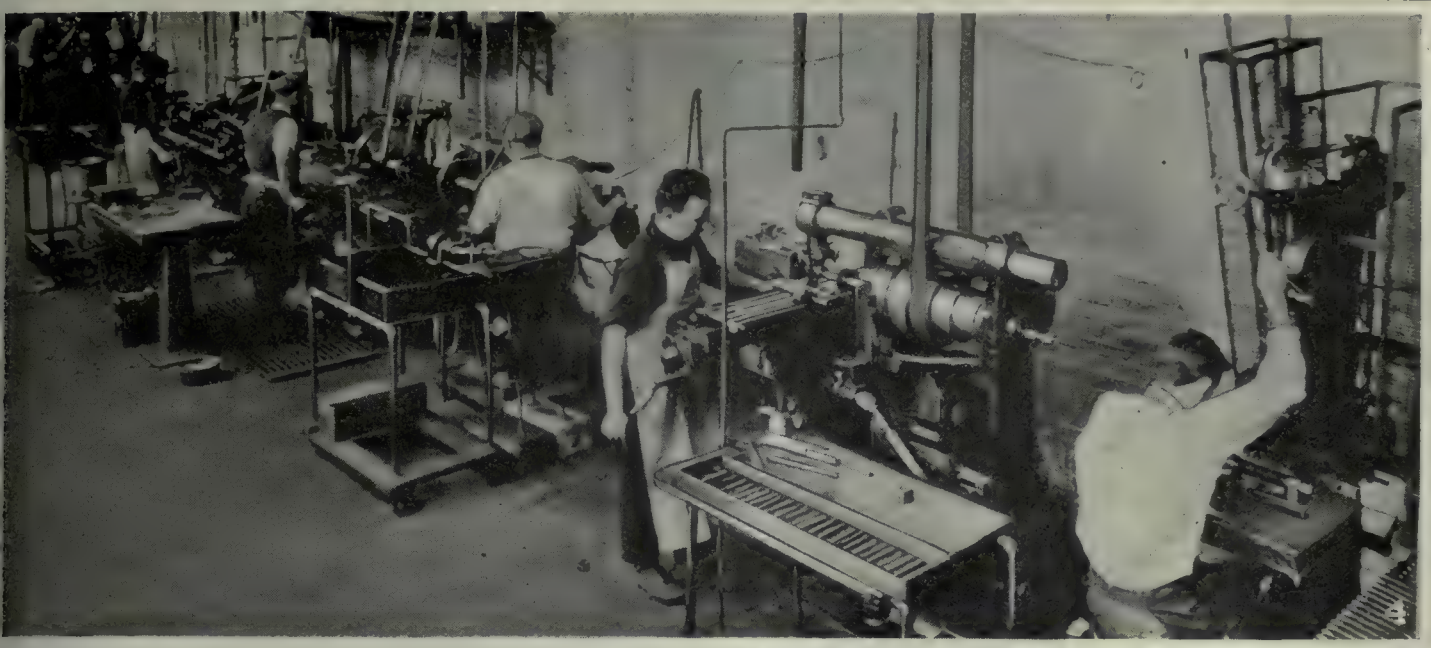
Fig. 1—The Todd Protectograph

Fig. 2—Experimental Department

Fig. 3—Drilling Department

Fig. 4—Mounting the Bronze Type





Operations

Check Protector

Rochester, N. Y.

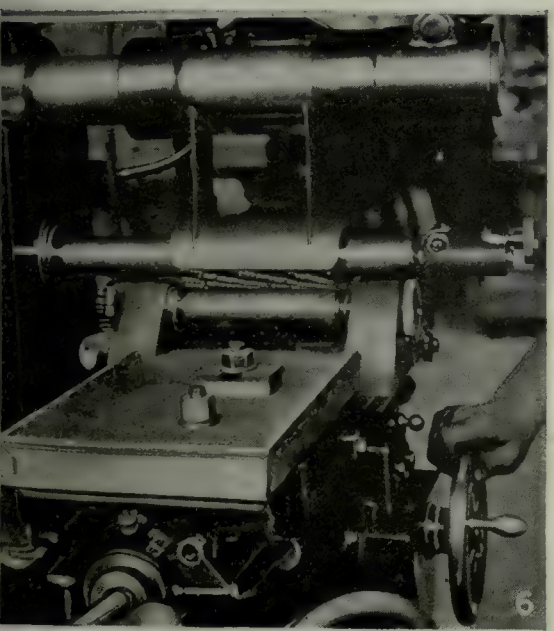
in 1899

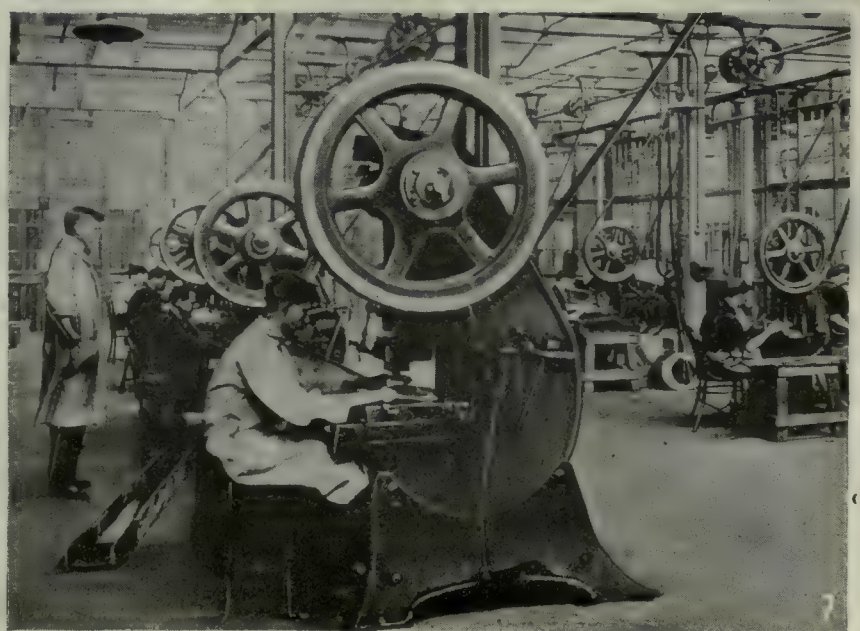


Fig. 5—Assembly Room

Fig. 6—Cutting "Shreds" in the Type

Fig. 7—Stamping Brass, Steel and Copper Parts







NORMAN MACLEOD
Golf Champion



HOTEL GARDEN
A select spot for informal committee meetings



W. LACOSTE NEILSON
Runner-up

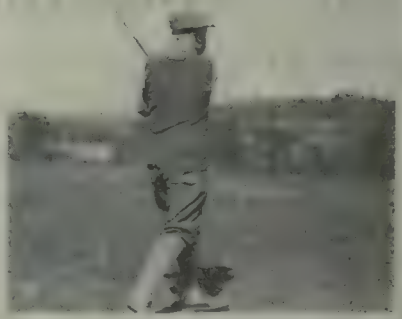
MACHINE TOOL BUILDERS
at Lenox



EDWARD P. WELLES
Wondering whether it went into a trap

FRED A. GEIER
Making his famous 100-yard putt





JAMES E. GLEASON
Hits one out

Championship match on the 18th tee



On the home green



Measuring the Tooth Thickness of Helical Involute Gears

By ERNEST WILDHABER

A new method—Comparison of a measured distance with a computed standard—Ordinary vernier caliper used for measurement

HELICAL gears have always presented difficulties to accurate measurement. Their tooth thickness is usually measured with a gear tooth caliper, placed at a right angle to the direction of the tooth. Inasmuch as it is not possible to measure exactly along a normal helix, errors are introduced, which are small usually, but which cannot be easily controlled or readily determined. The determination of the chordal tooth thickness and the chordal addendum involves tedious calculation, and in addition to this, errors in the outside diameter of the gear will necessarily affect the result.

Measuring the tooth thickness of helical involute gears in the following way is simple and accurate. It does not depend on the outside diameter of the gear, and thus is not affected by its errors. No special instrument is required, for the measurement can be made with an ordinary vernier caliper.

Helical Involute Gear Illustrated

A plan view of an 18-tooth gear provided with helical involute teeth, is shown in Fig. 1. The teeth are right hand and inclined at 30 deg. in the pitch circle. Fig. 2 represents a section taken at a right angle to the axis of the gear, along line *MN* of Fig. 1. The gear teeth are intersected in involutes *I*, and the curves *I'* are the involute profiles of the teeth, which appear at the gear face. These involutes correspond to a base circle *b*, shown as a continuous fine line, and the pitch circle is shown in broken lines.

The curves *I* and *I'* are true involutes, and incidentally, the intersection of a helical involute tooth with a plane perpendicular to the axis of the gear is the only plane intersection which produces a true involute as the intersection curve.

The tip edges *T* of the teeth are shown in coarse full lines in Fig. 1, while the root lines *R* are shown in finer lines, as far as they are visible. In certain teeth the root lines are hidden or partially hidden beneath the contour of the involute tooth surface itself.

An interesting characteristic of helical involute teeth is revealed by inspection of the gear. In these teeth or portions of teeth where the line of sight passes over the involute surface, the contour of the surface appears as a straight line. These straight lines are designated *S—S* on the teeth where they appear in Fig. 1. It can be proven mathematically that these lines are straight and, further, that their inclination equals the helix angle in the base circle, but the proof is long and complicated and will not be given here. As long as the actual involute surfaces are considered, all of the straight contour lines of the teeth in any one gear are parallel and equidistant.

By taking advantage of this characteristic of the helical involute tooth, the tooth thickness of helical involute gears may be determined easily and accurately

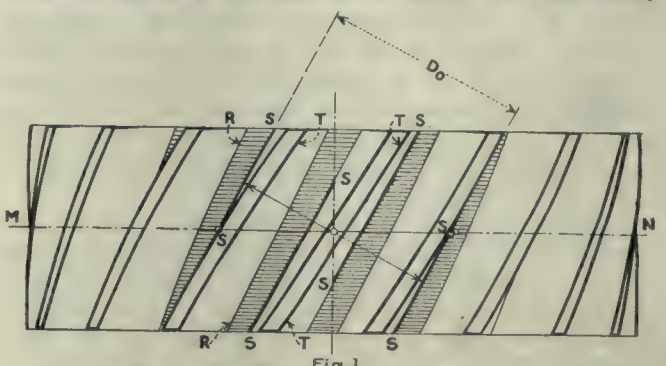


Fig. 1

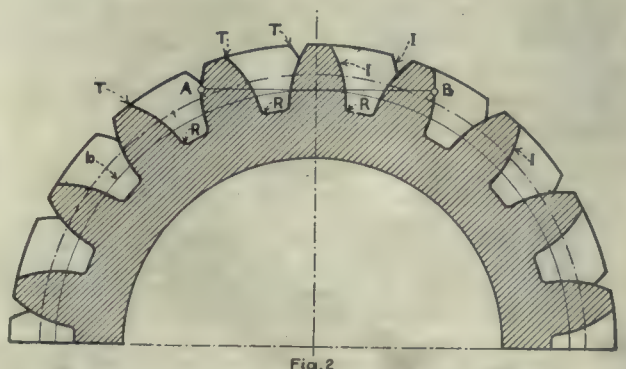


Fig. 2

FIG. 1—PLAN VIEW OF 18-TOOTH HELICAL INVOLUTE GEAR. FIG. 2—SECTION OF SAME GEAR NORMAL TO AXIS

by measuring the distance between the straight contours of outside tooth surfaces.

In Fig. 1 the distance, D_o, between the outside surfaces of alternate teeth would preferably be determined, or in other words, two tooth spaces should be left between the measured tooth surfaces. With the spacing it is evident that an ordinary vernier caliper may be used to measure the distance D_o, slipping the instrument over the outside involute surfaces of the teeth and holding the line of the jaws normal to the straight contours.

The number of tooth spaces left between the meas-

ured outside surfaces is optional, but it is preferable to leave such a number of spaces in between, that the contours are measured near the pitch circle. The contact points between the teeth and the instrument should not be far away from the pitch circle. This is recommended because the area around the pitch circle is the most important part of the tooth profile, since this area is generally left unmodified, and the tips and the roots of the teeth are frequently modified, so as to recede with respect to the theoretical involute.

To meet these requirements it will be found that the number of spaces to be left depends on the number of teeth in the gear, the pressure angle and the helix angle. The required number of spaces, S, determined for a pressure angle, α', of 14½ deg. and various helix angles, h, and tooth numbers, N, are shown in the table herewith. Whenever the face of the gear is so narrow compared with its diameter, that the contact points between the instrument and the teeth are outside the face of the gear, it will be impossible to hold to the recommended S. In such exceptional cases a smaller value of S may be used.

TABLE SHOWING VALUES OF S FOR VARIOUS VALUES OF HELIX ANGLE, h, AND NUMBER OF TEETH, N. α = 14½ DEG.

Helix Angle, h	Number of Teeth in Gear, N							
10	10–24	25–36	37–48	49–60	61–72	73–84	85–96	97–108
15	10–23	24–34	35–45	46–56	57–68	69–79	80–90	91–101
20	10–21	21–31	32–42	43–52	53–63	64–73	74–83	84– 94
22½	10–20	21–30	31–40	41–50	51–60	61–70	71–80	81– 90
25	9–19	20–28	29–38	39–47	48–56	57–66	67–75	76– 85
30	8–17	18–25	26–33	34–41	42–50	51–58	59–66	67– 74
45	5–10	11–14	15–19	20–24	25–28	29–33	34–38	39– 42
S =	1	2	3	4	5	6	7	8

The distance between the tooth contours can be computed from the distance between corresponding tooth profiles in an intersection as in Fig. 2, where the intersection plane is perpendicular to the axis of the gear. To determine the distance, D_o, between the contours, the distance, AB, between the profiles is multiplied by the cosine of the straight contour inclination in Fig. 1, and as mentioned previously, this inclination equals the helix angle in the base circle.

A formula for the distance AB may be written as follows:

$$AB = \frac{\cos \alpha'}{P \cos h}\left[(2S + 1)\frac{\pi}{2} + N\ (\tan \alpha' - \text{arc } \alpha')\right]$$

in which

α = Normal pressure angle, usually 14½ or 20 deg.,
α' = Pressure angle in a plane perpendicular to the axis, and in this case the pressure angle of the involute profiles in Fig. 2, $\tan \alpha' = \frac{\tan \alpha}{\cos h}$,
h = Helix angle in the pitch circle,
S = No. of tooth spaces from table,
N = Number of teeth in gear,
P = Diameter pitch in the normal section.

Multiplying this equation by cos h_o, h_o being the helix angle in the base circle and inclination of the straight contours, the following expression for D_o is found:

$$D_o = \frac{\cos \alpha}{P}\left[(2S + 1)\frac{\pi}{2} + N\ (\tan \alpha' - \text{arc } \alpha')\right]$$

To simplify the application, the following constants may be introduced for the trigonometrical terms:

$$C' = \cos \alpha \times \frac{\pi}{2},\ C'' = \cos \alpha\ (\tan \alpha' - \text{arc } \alpha')$$

$$D_o = \frac{(2S + 1)\ C' + NC''}{P}$$

The usual normal pressure angle, α, for helical involute teeth is 14½ deg. The value of C' for this pressure angle is 1.52076, and the value of C'' for various helix angles, h, are as follows:

Helix angle h	C''
10 deg.,	0.00561
15 deg.,	0.00593
20 deg.,	0.00642
22½ deg.,	0.00676
25 deg.,	0.00718
30 deg.,	0.00815
45 deg.,	0.01464

To illustrate the application of the formula for D_o, let us consider a gear in which α = 14½ deg., h = 22½ deg., P = 5, and N = 18.

From the table it is found that the number of spaces, S, is 1. The value of C' is 1.52076 and the value of C'' for a helix angle of 22½ deg. is 0.00676.

$$D_o = \frac{3 \times 1.52076 + 18 \times 0.00676}{5} = 0.9368 \text{ in.}$$

The distance, D_o, on the gear is measured over the outside straight contours of two consecutive teeth (S = 1), and a comparison of the measured distance with the computed value gives the required information regarding the tooth thickness. Should the measured distance equal 0.9368 in., the gear will have no backlash. If the measured distance is less than 0.9368 in., backlash equal to one-half the difference is indicated.

Another example of the application of the method may be of value, so let us take a gear with the same pitch and the same pressure and helix angles as the one just considered, but with 45 teeth.

In this case we find that the value of S from the table is 4, the value of C' and C'' being the same as before.

$$D_o = \frac{9 \times 1.52076 + 45 \times 0.00676}{5} = 2.7982 \text{ in.}$$

The distance between the outside straight contours, leaving four spaces, is then measured by the vernier caliper and compared with the computed value as before to determine the tooth thickness.

Polishing Crankshaft Bearings

By Charles F. Henry

Those who are not familiar with the grinding of crankshafts on a large scale, do not always appreciate the reason for polishing or buffing the crankpins and bearings after they are ground. We have become so accustomed to thinking of grinding as the last word in fine finishing that we overlook the fact that there is a vast difference in grinding, as in all other operations.

Highly skilled operators can leave bearing surfaces that require no further finish. But in large quantity production it is much cheaper to use an ordinary operator and have him produce a commercial grinding finish even though it requires another operation to make it satisfactory.

The polishing or buffing operation merely removes the fine fuzz left by the grinding wheel. If this fuzz is not removed by polishing, it acts as an abrasive and causes a wearing of the bearing surfaces which necessitates adjusting the bearings long before it should be necessary. The extra operation of polishing bearings is another of the many cases of expediency that has been developed by a careful study of all the costs of producing work of quality, in large quantities.

The New Screw Thread Standard—V

By RALPH E. FLANDERS
General Manager, Jones & Lamson Machine Co.

Discussion of the Screw Thread Report of the A.E.S.C.—Different classes of fits—Reduction of the number of threading tools required—Principles employed in specifying tolerances

TABLES II, III, IV and V, given in the previous article, completely define the new screw-thread standard for the various fits provided. The report recently given out by the Sectional Committee of the American Engineering Standards Committee, however, gives the following verbal descriptions of the fits which bring out their characteristics more plainly:

(5)—DEFINITIONS

(a)—*Loose Fit* (*Class 1*)—This class of screw threads is, in this report, recommended for use in tapped holes *in the numbered sizes only*. For such use it will be defined and specified as follows:—

Minimum Nut is Basic.

Direction of Tolerance on Nut:—The tolerance on the nut will be plus.

Tolerance Values:—The tolerance for a nut of a given pitch will be as specified in the tables.

(b)—*Free Fit* (*Class 2*)—This class of screw threads will be defined and specified as follows:—

Minimum Nut is Basic.

Maximum Screw is Basic.

Direction of Tolerance on Nut:—The tolerance on the nut will be plus.

Direction of Tolerance on Screw:—The tolerance on the screw will be minus.

Zero Allowance:—The allowance between the pitch diameter of the maximum screw and minimum nut will be zero for all pitches and all diameters.

Tolerance Values:—The tolerances for a screw or nut of a given pitch will be as specified in the tables.

(c)—*Medium Fit* (*Class 3*)—This class of screw threads will be defined and specified as follows:—

Minimum Nut is Basic.

Maximum Screw is Basic.

Direction of Tolerance on Nut:—The tolerance on the nut will be plus.

Direction of Tolerance on Screw:—The tolerance on the screw will be minus.

Zero Allowance:—The allowance between the pitch diameter of the maximum screw and the minimum nut will be zero for all pitches and all diameters.

Tolerance Values:—The tolerances for a screw or nut of a given pitch will be as specified in the tables.

(d)—*Close Fit* (*Class 4*)—This class of screw threads will be defined and specified as follows:—

Minimum Nut is Basic.

Maximum Screw is Above Basic:—The major diameter and pitch diameter of the maximum screw will be above dimensions by the amount of the negative allowance (interference) specified in the tables.

Direction of Tolerance on Nut:—The tolerance on the nut will be plus.

Direction of Tolerance on Screw:—The tolerance on the screw will be minus.

Allowance Values:—The negative allowance (interference) provided between the pitch diameter of the minimum nut, which is basic, and that of the maximum screw, which is above basic, will be as specified in the tables.

Tolerance Values:—The tolerances for a screw or nut of a given pitch will be as specified in the tables.

There is a vital difference between the two problems of maintaining standard tolerances on screws or bolts, and on nuts or other tapped holes. Screws and bolts are cut with an adjustable die or die holder, or by some other tool or process which permits the pitch diameter to be varied with ease. Holes in nuts, etc., on the contrary, are almost invariably threaded with a simple, non-adjustable tap. It is true that the pitch diameter of the finished thread in the hole can be varied by such expedients as the use of a larger or smaller supply of cutting oil, and machine tapping with a spindle out of line with the work, but these expedients can scarcely be classed as good practice.

Generally speaking, then, external threading, as of bolts and screws, is performed by adjustable tools which may be set for any desired class of fit, while holes are threaded by non-adjustable taps, which have to be made specially for the fit desired. The same general statement tends to be true for gages as well. Ring gages, projection apparatus and the like for measuring bolts and screws permit adjustment for pitch diameters of various fits. The plug gages used in tapped holes are non-adjustable.

Reduction of Number of Fits

From this it follows that the multiplication of fits and thread series, while presenting no particular difficulties so far as ring gages and dies are concerned, becomes a serious matter when we come to consider taps and plug gages. The original report called for four different fits in two thread series, or eight combinations in all. This, on the face of it, would call for the carrying in stock of eight ½-in. taps, for instance—the loose, free, medium and close fits in the coarse-thread series, and the same number of the fine-thread series. This vast multiplication of varieties of taps to be carried in stock was recognized as an economic evil of the first magnitude, for both maker and user. Two changes were therefore made in the original Progress Report to take care of this situation.

The first change consisted in cutting the number of regular fits down to three, by classing as "special" the close fit for the numbered sizes of nuts and tapped holes, and doing the same for the loose fit for the fractional sizes of nuts and tapped holes. The loose fit was also made special for all screws, bolts, studs, and the like. The reason for making a distinction between

numbered and fractional sizes is that on very small threads the tolerances for even the free fit become difficult to maintain in tap manufacture, though they are easily maintained for the fractional sizes. Again, there is not the same need for proportional accuracy in very fine threads, which usually have factors of safety immensely greater than is justified by their actual service. The same considerations lead to the setting aside of the close fit in the numbered sizes as "special."

Loose Fit Usually Undesirable

On the other hand, the Sectional Committee was very doubtful of the wisdom of standardizing the loose fit for general use in the fractional sizes of bolts, screws and nuts. There is doubtless a large volume of work of this grade being turned out today; but no manufacturer when confronted with it feels any pride swelling within his breast, and no user is really satisfied with what the manufacturer has handed him. It seems generally agreed that such work can be produced in the free-fit class without extra cost to the consumer.

This leaves us with only three fits for a given diameter and pitch. A second expedient reduces this number to two, as described below:

A Second Method of Obtaining Medium Fit (Class 3)—A detailed examination of the tolerances given in Tables II, III, IV and V will indicate that the same quality of fit as given by Medium Fit screws and threaded holes can be obtained by using screws to Close Fit tolerances in holes made to Free Fit tolerances, or vice versa. The general adoption of this practice will reduce the variety of taps, gages, threaded parts, etc., required to be carried in stock. However, the combination of Free and Close Fits should be used in place of Medium Fits only when the substitution is understood and agreed to by all parties concerned.

By the means just outlined the number of taps and plug gages for a given diameter and pitch is reduced to two, and it is hoped that this will be the result of the revision of the report.

In the case of taps, this arrangement will mean a commercial grade, of practically the tolerances now furnished by the best makers, to cover the loose fit numbered sizes and the free fit fractional sizes; and there will be, in addition, a precision grade, made in the numbered sizes perhaps by rolling the threads and in the fractional sizes by grinding. There is already a large business in ground taps, and its volume is constantly increasing.

It will be seen, therefore, that the report calls for no radical changes in tap manufacture, only a continued growth along lines already laid down.

The report gives the following general observations on the subject of tolerances:

V—TOLERANCES

1—*Tolerances Represent Extreme Variations*—The tolerances as hereinafter specified are for the classes of fit listed in the body of the report, and represent the extreme variations allowed on the work. (See Appendix A, Section 2.)

2—*Pitch Diameter Tolerances.*—These are derived from the pitch of the thread instead of from the diameter. The method of derivation is explained in Appendix A.

3—*Pitch Diameter Tolerances Include Lead and Angle Variations*—The relations between these quantities are expressed by lines 33 to 40, inclusive, of the tables, and are explained at the bottom of each table. See also Appendix B.

These relations may be automatically insured by using a "Go" gage of the length of engagement required, or by projecting an equivalent length of thread on a suitable chart, or by so projecting a single thread constrained for the required length of engagement, or by any other means which preserves the mathematical relation between variations in pitch diameter, lead and form.

The relations between pitch diameter, lead and thread angle are very important, and will be discussed in a separate chapter.

4—*Fitch Diameter Tolerances on Screw Same as on Nut*—The pitch diameter tolerances provided for a screw of a given class of fit will be the same as the pitch diameter tolerances provided for the corresponding nut of the same class of fit.

5—*Tolerances on Major Diameter of Screw Twice Pitch Diameter Tolerances for Free Fit*—The allowable tolerances on the major diameter of screws of all classifications will be twice the tolerance value allowed on the pitch diameters of screws of the Free Fit (Class 2).

6—*Tolerances on Minor Diameter of Screw*—The minimum minor diameter of a screw of a given pitch will be such as to result in a basic flat ($\frac{1}{8} \times p$) at the root.

The maximum minor diameter is that which would result from the use of a threading tool, set at the maximum pitch diameter, whose point has been worn or ground back from the basic outline by an amount equal to one-eighteenth of the basic depth of engagement ($1/18h$ or $0.03684p$). It is permissible that the resulting root line shall be rounded. In no case, however, should the form be such as to cause the screw to be rejected on the minor diameter by a "Go" gage, the minor diameter of which is equal to the minimum minor diameter of the nut.

7—*Tolerances on Major Diameter of Nut*—The maximum major diameter of the nut of a given pitch will be such as to result in a flat one-third of the basic flat ($\frac{1}{24} \times p$).

The nominal minimum major diameter of the nut equals the basic major diameter. In practice a clearance is provided to facilitate manufacture by permitting a slight rounding or wear at the crest of the tap. In no case, however, should the outline resulting from a worn tap or cutting tool be such as to cause the nut to be rejected on the major diameter by a "Go" plug gage made to basic form and dimensions at the crest.

It will be noted that neither the minimum minor diameter of the screw nor the maximum major diameter of the nut are given directly. These dimensions are limited by the smallest permissible flat allowed ($\frac{1}{8} \times p$ for the screw and $\frac{1}{24} \times p$ for the nut) in combination with the minimum pitch diameter given for the screw and the maximum given for the nut.

Some Dimensions Measured Indirectly

The reason for this is almost self-evident. The minor diameter of the screw and the major diameter of the nut are seldom measured directly. The pitch diameters are, however, and the shape of the threading tool should be. These two inspections cover the dimensions in a more practical way than by specifying them in tables to limits of one ten-thousandth of an inch.

8—*Tolerances on Minor Diameter of Nut*—The tolerances on minor diameter of a nut of a given pitch will be one-sixth of the basic thread depth regardless of the class of fit being produced ($\frac{1}{6}h$ or $0.10825p$). The maximum and minimum minor diameters are determined by the conditions set forth on Page 11, Par. 4 of this report. In the case of a punched hole the average diameter of the hole shall govern.

The next installment of this series of articles will deal with special threads and some additional general considerations.

Industrial Cost Accounting for Executives

By PAUL M. ATKINS

Article twenty-four—Mechanical labor saving devices—The reason for the use of adding, calculating and tabulating machines—The use of the schedule sheet

MODERN AMERICAN business is noted for the quickness with which it takes to labor saving devices. The accountant has been among the last to follow the lead and make use of mechanical aids to save time and labor. There are far too many offices where the adding machine even yet is unknown and where columns of figures are still laboriously added by the mental effort of the bookkeeper. Perhaps because cost accounting is such a comparatively recent development, and hence has not been hampered by tradition, it has taken more quickly to new devices, and hence we find few cost departments which do not employ labor saving equipment to a greater or less extent. There are some, however, in which the full possibility of the economic utilization of labor saving devices has not yet been realized.

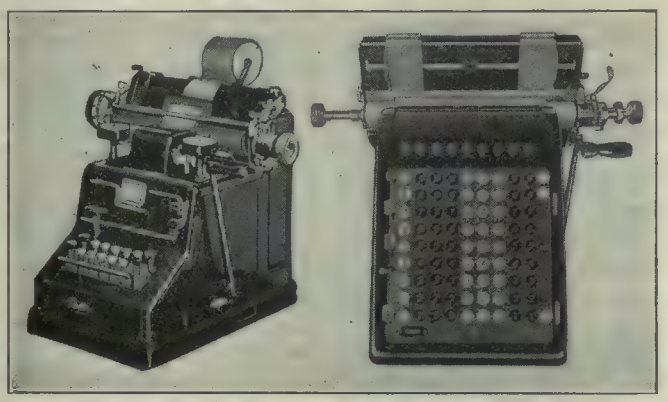


FIG. 55—ADDING MACHINE WITH TEN KEYS. FIG. 56—ADDING MACHINE WITH NINE KEYS ACROSS.

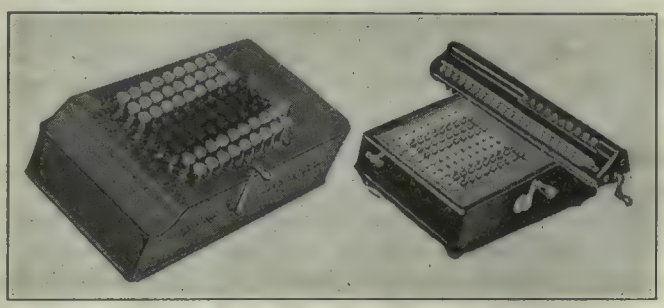


FIG. 57—EARLY TYPE OF CALCULATING MACHINE. FIG. 58—ANOTHER TYPE OF HAND-OPERATED CALCULATING MACHINE

There are two essential motives for the use of mechanical equipment in the operation of the cost department. In the first place there is the possibility of greater speed in the performance of the work and the preparation of the reports. The executives are beginning to realize that cost figures which are not ready till long after the close of the period in which the work was performed are interesting historical records, but are of very little value in the control of the business. Hence everything which can be done to increase the speed with which costs may be presented without the sacrifice of accuracy is worth careful consideration, and is frequently worth adopting even though it is more costly in operation than a slower method.

The other motive on its face is humanitarian—the saving of fatigue on the part of the employees redounds in a positive though indirect advantage to the employer in the form of greater accuracy. It is impossible for a person to work both rapidly and accurately when he is fatigued and hence labor saving devices make possible the assurance that reports are correct even though quickly prepared. We see, then, that the use of mechanical devices for the recording of costs leads to possible economies from several points of view.

It seems desirable, therefore, to call attention to some of the uses which may be made of labor saving equipment in the cost department, and, at the same time to point out some of the limitations thereon. The manufacturers and distributors naturally wish to present to prospective customers the extreme limit of the capacity of the equipment which they are producing, and hence they often recommend their machines for uses which are possible but which are not economical. Every factory man is aware that certain machines in the shop are capable of turning out tasks which are much more economically and efficiently performed on others. The same rule holds true in the office, and while it is possible, for example, to multiply on an adding machine and add long columns of figures on a non-listing computating machine it is not efficient to do either. The equipment should be chosen to meet the needs of the task in hand.

Of all the classes of mechanical devices in use in a cost department, the so-called listing adding machine probably has the largest variety of uses. There are few tasks which are slower, more fatiguing, or more likely to result in inaccuracy than to add long columns of figures in one's head. Long practice will permit a person to develop remarkable speed and accuracy but it is a waste not to direct the energy involved into more productive channels.

There are several varieties of adding machines, each of which has peculiar advantages in one way or another. There are machines which are operated by hand, and others which have the mechanism motivated by means of an electric motor. If the machine is to be used for any great consecutive length of time there is no question but that the power driven model is the more desirable for the physical labor involved is very much re-

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duced. On the other hand, it is possible in most cases to develop greater speed with a hand-driven machine, and the first cost is, of course, materially less. The power consumption of the power-driven variety is not very large, but if many of them are used it is an item which must not be overlooked.

Adding machines may also be divided according to the arrangement of the adding keys. There are ma-

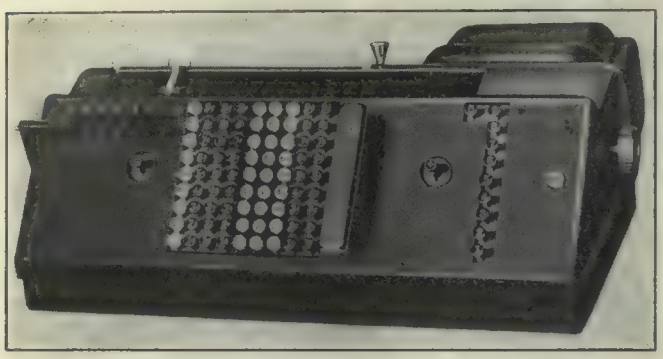


FIG. 59—POWER-DRIVEN CALCULATING MACHINE

chines which have nine keys—one for each number from 1 to 9—to each adding space on the machine, the zeros, when they appear, being printed automatically. A machine of this type is shown in Fig. 56. Another type which has become more or less standard now is one which has but ten keys, 0 to 9 inclusive. The number to be added is entered just as it would be written long hand, it being necessary, of course, to depress the zero key whenever one appears in the number. An illustration of this kind of machine is shown in Fig. 55. There are proponents of both kinds of machines, each stating that his favored kind is the faster. It is rather difficult to prove either to be true, for the speed of operation depends to a considerable extent on the operator and with the introduction of an individual we have brought in a factor which is composed of many variables. So far as we are concerned here it may be said the preference is pretty much a matter of individual choice, depending in a large measure on the particular charac-

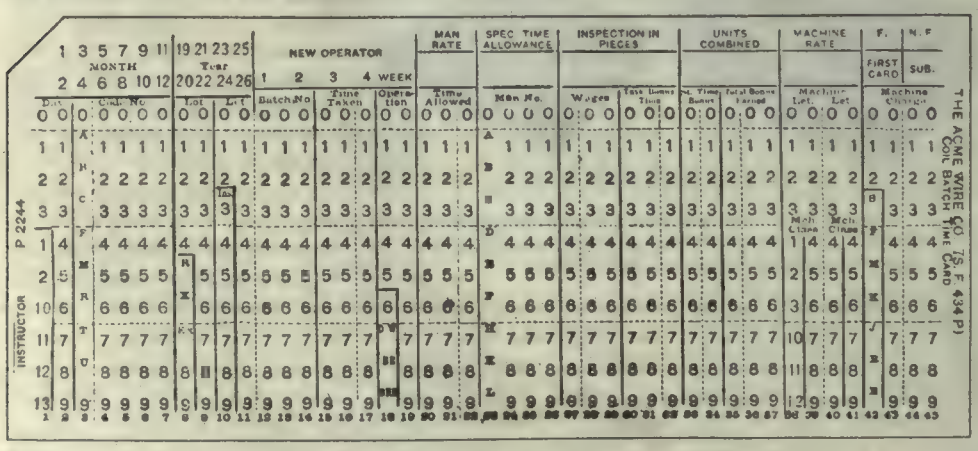


FIG. 60—TYPE OF AUTOMATIC TABULATING MACHINE CARD

teristics of the person making the decision. Both kinds have proved in practice to be entirely satisfactory.

The essential characteristics of all of these varieties of adding machines is the entering into the adding mechanism of the machine of the figure which is to be added by depressing certain keys, the addition by means of a crank operated by hand or power, and, at the same time, the printing of the figure added on a strip of paper. The total is given after all the figures have been added by depressing a "total" key and operating the crank once more, the total being printed just as the figures which were added were printed. Not only are the figures added, but a permanent, printed record is left of what they were. This makes it possible to check all additions to make sure that they are correct, but it also allows the preservation of the addition which is often wanted in the future. It is very convenient, for example, to have the record of the additions of the various cost elements for the orders, the operation which was described in the preceding article. It is the possibility of preserving the record in this form which renders unnecessary in many cases the copying of the detailed costs from the issues and time-tickets to the order cost-cards. A further illustration of this use will be mentioned in the following article in connection with the keeping of the material journal.

Sub-Total Mechanism

Most of the adding machines are so arranged that partial or sub-totals may be obtained at any point in the addition by the depression of the proper key. Such arrangements are very convenient when column totals are required which are to be carried forward to a following page but there is less use of this kind of thing in the cost department than there is in the accounting department. The arrangement which has been made on certain models of the Burroughs adding machines by means of which "transfer totals" may be obtained is usually of much greater value in the handling of cost accounting work. A description of the operation of this mechanism and its application to one task of the cost department has been given in the preceding articles, so that it seems hardly necessary to add much more here concerning it, except to say that there are many occasions when it will be found useful.

The second class of machines which are used largely in the cost department are calculating machines. These machines can ordinarily be used for all four arithmetical operations—addition, subtraction, multiplication, and division. It is for the last two that they are principally employed since for addition the adding machines are usually more satisfactory, and it is seldom any aid to use machinery to aid in making subtractions. These calculating machines can also be divided into groups in much the same manner as the adding machines. There are both hand-driven and motor-driven varieties, and differences in kind of keyboard.

One of the earliest and one of the most popular of the calculating machines is the Comptometer, shown in Fig. 57. It is a hand-operated device arranged with a nine-bank keyboard. The calculations are made by depressing the keys representing the multiplicand as many times as is indicated by the multiplier, moving the hands from right to left to include each digit in the multiplier. The product is shown in windows at the foot of the column of keys, but no permanent record of any kind is made. Hence the only way that one can be absolutely sure that the operation has been correctly

performed is to do it over again and compare the two results. Various safety devices have been developed which eliminate the possibility of making certain mistakes and greatly reduce the probability of others, and also facilitating their correction if made, but no proof is sure except repetition. This type of machine also has a considerable range of usefulness for making additions of comparatively short columns of figures. In fact, for a few figures it is possible to perform the addition twice in less time than it requires to enter the numbers on a listing adding machine and to check back to verify. After a certain number of figures has been reached, however, the listing machine becomes more valuable for this purpose, especially when the person using the machine is not an expert.

Another type of hand-operated calculating machine is that shown in Fig. 58. Here there are banks of keys as before, but once a key is depressed, it stays so till the calculation has been made and is then released. The operation is performed by turning a crank and the product or quotient or whatever the result may be appears in a set of windows while the other figures used appear in another set. The machine in this sense is self-proving for when the calculation has been completed, all figures are in view at the same time and a glance will show whether or not there is any error among them. If there is not, then the result must be right. This type of machine may also be used for addition, but it is rather slow and not very satisfactory for this purpose when adding machines are available. It is extremely versatile, and it is easily possible to extract square or cube roots and perform other operations quite beyond the capacity of most other types of machines.

So far as the writer knows there is only one power-driven calculating machine. It is illustrated in Fig. 59. In general arrangement it is very much like the machine described in the above paragraph, except that its mechanism is operated by an electric motor instead of by hand. Because of its somewhat greater complexity, also, it is not quite so flexible. Whenever it is necessary to make extension for any length of time, especially when the figures are large, this machine is most convenient and relieves the operator of a great deal of fatigue. This machine is also of the self-proving variety.

If the adding of long columns of figures is fatiguing and hence expensive, the extending of one figure by another offers rare opportunities for making mistakes when the pencil and paper method is the one employed. In the cost department these machines are a great boon for there is a large amount of this kind of work to be done. The making up of the payroll, the allocation of the earned burden, the extension of the time tickets, material issues, credits and worked material in slips are illustrations of the places where the calculating machine is almost indispensible. In the figuring of unit prices where the problem is one of division instead of multiplication these machines are also extremely useful, and whenever a short list of figures are to be added the type of calculating machine described is very handy.

In addition to these two classes of machines which are almost sure to be wanted in every cost department,

OCTOBER — COST DEPARTMENT SCHEDULE SHEET

TASK	2	3	4	5	6	7	9	10	11	12	13	14	16	17	18	19	20	21	23	24	25	26
MATERIAL JOURNAL																						
TICKETS SORTED																						
STORES ISSUES EXT'D																						
STORES CREDITS "																						
W M ISSUES "																						
W M CREDITS "																						
W M IN SLIPS "																						
TICKETS ENTERED																						
SORTING & FILING																						
STORES ISSUES																						
STORES CREDITS																						
W M. ISSUES																						
W M CREDITS																						
W M. IN SLIPS																						
TIME TICKETS																						
VOUCHERS																						
TOTALING & POSTING																						

FIG. 61—COST DEPARTMENT SCHEDULE SHEET

there are other mechanical devices whose utility will depend largely on the nature of the records to be kept. Perhaps the most important of this class of machines is the automatic tabulating machine which automatically sorts the tickets which are put into it in any manner decided upon, and then in another part of the machine adds the figures according to the sorting which has been made. When this machine can be used it does away to a considerable extent, though by no means wholly, with the need of adding machines in the department. It is necessary to have all tickets used with this machine of a special variety, as shown in Fig. 60, and specially punched to record the data since the sorting and tabulating is done by electric contacts made through the punched holes. This means ordinarily that all tickets must be made out twice—once in long hand when the original record is made, and once again when the special tickets are punched. It may at once be seen that there are limitations on the use of this machine for it will take a considerable gain to offset the double entry of all information. If only one figure for one compilation is to be taken from a single card it is hardly worth while to use this equipment. If two or more figures can be taken from a single card or if one figure is to be used in more than one table then the benefits to be obtained are proportionately increased and its use deserves much more serious consideration. It must be remembered, however, that this equipment can work with astonishing rapidity so that unless there is a mass of detailed material to be handled it can hardly be kept going more than a small part of the time. As its cost is considerable, this is a point which deserves careful consideration in deciding on its use.

The typing-adding and calculating machines which

are not infrequently found in billing departments are sometimes of value also in a cost department. Whenever there are many reports to be made out the use of one of these machines means that the work is proved as soon as copied. They are also sometimes useful for making the entries on cost sheets or cards, doing away in this fashion with one addition on the adding machine. They are expensive, however, and their utility should be carefully evaluated before they are acquired.

In the payroll section of the cost department two other kinds of equipment are often very helpful. One of these is the type which provides a chart in one form or another with the extensions of the rates of pay in use in the factory by the entire range of hours at such intervals as may be desirable. A device of this kind does away with the necessity of the use of calculating machines in the payroll section and usually proves more economical in time. The other device referred to is an automatic addressing machine—a machine which ordinarily is employed for addressing envelopes when repeated communications are addressed to certain parties. In the cost department this device is used for making out the payroll, printing name, number and rate of each, and it is often employed also to print the name and number on the pay envelope. It is obviously a great time and labor saving implement in this place.

The preparation of reports has already been mentioned in one connection. Whenever it is necessary to prepare many copies of reports some of the various duplicating machines on the market prove to be very useful. These machines also assure the correctness of all copies providing the first has no mistakes, and their use provides means for rapidly producing copies after the report has been completed.

The filing of material in the cost department is an important task. It differs fundamentally in many respects from the filing of correspondence or other kinds of filing which are likely to be found in various departments of the company. To a very considerable degree, however, standard filing equipment may be used provided adequate attention is given this problem when the forms to be used in the cost department are designed. Closely associated with filing equipment are devices to facilitate the sorting of the many tickets, some of which must be sorted several times before they reach their final destination.

The Schedule Sheet

Another device which should be used much more extensively in all departments in which there is routine work to perform, whether the periods into which it falls are daily, weekly, or monthly, is a schedule sheet for the various tasks. On such schedule sheet should be shown the various tasks to be performed and the working days of the month. Whenever a task is accomplished it is so indicated on the sheet and by reference to the dates at the top of the sheet it can be seen at a glance just how the work of the department is coming along. This form is illustrated in Fig. 61. When such a device is in use it enables the cost accountant to keep track of the progress of the work under his control with a minimum of effort; it permits him to see what tasks most need assistance, and to give them that immediate attention which will prevent their seriously hampering the other work of the department or of other departments.

One of the most important aids to cost accounting is the development of standard practice instructions in which should be recorded in permanent form the routine operations of the department and which serve for the instruction of the employees who are to perform the various tasks. This whole subject is so important that it justifies much more space being given to it than is possible here, and so the entire following article is devoted to it.

Machines Always Auxiliaries

The cost accountant would do well to give thoughtful consideration to the various machines and devices which may save labor in his department or aid him in exercising greater control. He must be careful, however, not to think that a full equipment of a variety of mechanism is a substitute for a scientifically planned system of cost accounts and records. They must be arranged first and then the labor saving devices introduced as a means of assisting in the carrying on of the work. The equipment exists for the benefit of the cost department, not the cost department for the benefit of the machines.

In giving illustrations of particular makes of equipment in this article it is not intended to give unqualified endorsement of them to the exclusion of other and possibly competing makes which may or may not be equally good as or better than those cited. The author has simply selected examples from his own personal experience which have given satisfaction in the work to which they have been put.

Editorials vs. News

By Entropy

It is said to be a sign of advancing age for a man to read editorials in the daily papers.

In spite of this I undertook some weeks ago to read editorials, not only in daily papers but in technical ones as well. May I say, publicly, that they are not so bad as they are painted, and that reading them is no more a sign of senescence than walking under a ladder is a sign of misfortune.

For the sake of the thousands of readers who have never tried this experiment, and who may be skeptical, I want to say that reading editorials is the proper way to get the news without the bother of reading it as it is spread at great length in the other columns. We all waste a great deal of time reading, for the simple reason that we are attracted by a head line and cannot tell whether it is best to read on until we have read the entire story. We may be intensely interested in the League of Nations, or herringbone gears, or horse racing, or overhead valves, but we cannot guess from the heading of the article what is contained therein.

The thing to do is to read the editorials and then, if they refer to anything that they do not wholly cover, read the articles on that subject. The editor is the chap that has to read a lot. We don't need to sympathize with him because he gets paid for it, but he reads a lot of stuff, and out of it he culls enough to fill up his space. But out of all that he reads, whether he prints it or not he is storing up impressions, he is making a sort of composite picture of what passes before him, and then he writes his editorials on the things that have seemed to him most worth while. He gives you in his columns, the boiled-down concentrated, and well-thought-out expression of all that you most want to know.

Transportation—The Master Key to Progress

By EDWARD J. KEARNEY
Kearney & Trecker Corp.

The place of transportation in the progress of the world—Advances of the railroads in recent years—Continued progress depends on machine tool development and application

MACHINE TOOLS are called, and rightly so, the "Master Tools of Industry," but they are not a primary product, creating their own demand, or connected, except very indirectly with individual consumption. They are the instruments necessary to the creation of machines that themselves reach the final consumer, such, for example, as carpet-sweepers, automachines that are many times removed from the ultimate consumer, such, for example, as the steel mills that make the rails, that carry the locomotives, that draw the cars, that deliver to the consumer the carpet-sweeper, the automobile and the radio outfit. So it turns out that new developments to which we look to give impetus to our industry are not of our creating. When a new machine, or a more highly developed old one, presents a demand, either for greater precision of manufacture or increased production at less cost, we meet that demand and in that way make our contribution to progress.

During the last sixty years there have been many new developments that were of such magnitude and which came forward with such a rush, that they, together with production already established, created a peak demand for machine tools. Every one of these forward movements left the industry on a higher level than before. Among the developments that have given this added impetus to the industry that may be mentioned as examples are the sewing-machine, the electric generator and motor, the bicycle, and the automobile.

Reaction After Post-War Boom

The reaction following the artificial stimulus of the war and the post-war boom, when machine tools were in uncompromising demand, has not yet left us. Our suffering has been long and intense. The statistics which we began to gather in 1920 show that as compared with the first quarter of that year, the business of the third quarter of 1921 was only 10 per cent, due to both reduced prices and reduced volume. The gradual improvement that has been made since shows that our factories, taken as a whole, are now working at only about one-third of their capacity. Under such conditions, it is not surprising that many of our members have been forced into receiverships, and the strongest have seen their surpluses diminish, and, in many cases, their capital impaired. There are no figures on which to base the assertion, but it is my belief that a combined financial statement of the industry made now, as compared with three years ago, would show a shrinkage or net loss of at least 25 per cent in the total net value of the industry. When we met in annual convention three years ago, we had on our membership roll 209. Today, it is reduced to 135.

Machine Tools in the Business Cycle

It is not known among business men generally that the machine tool industry suffers during the downward swing of the business cycle to a far greater extent than ordinary manufacturing lines, for the reason that our product is bought mainly during periods of expansion. The carpet-sweeper manufacturer, when his business shrinks 5 per cent, buys no more machine tools, so that our business, as far as he is concerned, falls 100 per cent. The example could be extended almost indefinitely. If we were sufficiently numerous to be of importance in our national elections, attempts would long ago have been made to capitalize our distress at the polls. Is it therefore any wonder that we are asking one another whenever we get together by two's and three's, "What is the next development that will sustain the machine tool industry?" Every one has an answer. I have mine. It is general, mechanical, industrial, and agricultural development and prosperity, with transportation the master key to progress. Unfortunately there are certain elements in our political life that would throw the key into the well and prevent entrance into that temple of well-being—"universal prosperity."

Future progress depends on adequate transportation facilities. So important is this that it should be a matter of the most serious concern of every businessman and citizen. It is this view that leads me to present an outline of the case and show where we can do something for ourselves and in the public interest.

There are few people not actively connected with railways or who have not made a study of their growth, who have any idea as to the enormous extent to which transportation in this country has grown, or to where it will lead with the present rate of growth continued. This is why we should be concerned.

It seems to be a part of our national genius to travel. This is due in part to the prosperity of our people, and in part to our universal educational system which carries with it the desire to see other sections of our country and other lands. For example, the Iowa farmer, when the corn crop is good and hogs are high, spends the winter at Long Beach, California. The Colorado

Delivered at Lenox, Mass., by its retiring President, before the National Machine Tool Builders' Association.

school teacher spends her vacation attending summer school at Columbia University. The Ohio business man goes South for a late and an early game of golf, and all of the newly-weds see Niagara.

In addition to this, the system of marketing our products has brought about extensive travel on the part of representatives of manufacturing concerns, wholesale, and others, so that railway travel, in spite of the coming of the automobile, is growing rapidly. In 1880 the per capita travel was approximately 100 miles, which has continued to grow steadily during each decade until it is now about 400. These figures show their true comparison when it is recollected that the population of the United States in 1880 was only 50,000,000, meaning that the number of passenger miles traveled at the present time is over eight times what it was in 1880.

The Freight Problem

When we come to the study of the subject of freight, we find a similar condition with the difference that the rate of increase is much more rapid. The per capita ton miles rising steadily during the period, multiplied itself about six to one. In 1880 the number of tons of freight hauled one mile was 32 billion (32,000,000,000); while it is estimated that for the year 1923 it will be beyond 415 billion (415,000,000,000), or 13 times as much.

Some investigators are of the opinion that the length of haul will diminish, owing to the tendency to establish factories in other than the strictly industrial sections and nearer to the point of consumption. This would have the effect of keeping down the ton-miles as compared with the number of cars loaded. But, on the other hand, the motor truck on hard roads is taking away many of the short hauls, tending again to lengthen the average haul. At the present time the product of the mine, the forest, and the farm furnishes 70 per cent of all the freight, and none of these can be moved. State traffic furnishes but 15 per cent of the whole, while interstate traffic furnishes 85 per cent. In this discussion passenger traffic would be eliminated if it were possible, but people will and must travel, and the high speed, preference trains furnished for their accommodation clutter up the tracks, increase the time and cost of getting slower-footed freight over the road, and consequently increase the number of freight cars and locomotives necessary for a given volume.

Future Transportation Requirements

Every factor in the economic progress of our country points to greater production, greater wealth, and higher standards of living; consequently, greater consumption, necessitating more and better transportation. There are ample grounds for the prediction that within 20 years we shall demand of the railroads the moving of twice the amount of freight carried today, or more than 800 billion ton-miles. In addition, they will be called on to provide for a 75 per cent increase in the passenger miles traveled. Given the vitalizing power of sustained credit, without which nothing can be done, is it a task capable of accomplishment? Will it be possible in this space of time to provide facilities to dispose of this overwhelming volume? Are there any improvements in sight that, if applied, will help to a solution?

Throughout the years of railroad building, when attention was principally given to the extension of lines and territorial development, locomotives changed mainly in size, the general construction remaining about the same. Each decade saw larger and larger locomotives in use, but all embodying approximately the same principles and methods of steam-making and distribution as were employed in the eight-wheelers of the sixties.

Investigation shows that improvements have now been made greatly increasing the economy and power of the steam locomotive. This has been brought about by adding new principles, such, for example, as superheating, which means that the temperature of the steam is raised above the temperature which it normally has when in contact with the water from which it is made, the additional heat added being entirely a gain in economy. This improvement has been applied to about 50 per cent of the locomotives now in use.

It may seem strange that such a simple device as a feed water heater, which has been used in stationary practice so long, has not been generally applied to locomotives. It must be remembered that the locomotive is limited to the width of the track upon which it runs, which cannot be made wider, and to the height and width of bridges and tunnels. Within this space everything that is to be attached to a locomotive must be placed, and it has taxed designers to the utmost to provide these extra devices within the limits allowed, and at the same time make them of sufficient simplicity to remain absolutely reliable in service and not too costly to maintain. This device is now applied to less than 1 per cent of the locomotives of the country, but will become universal.

Another Steaming Device

Thermo-syphon fire-box equipment, employed on a few locomotives, consists of large tubes which spread out into a fan-shaped structure connecting the crown sheet with the lower front part of the fire-box. Its effect is greatly to increase the circulation through and around the fire-box and over the crown sheet, the hottest part of the locomotive boiler, and therefore greatly increase steaming capacity. About 15 per cent can be added to the draw-bar pull at normal speeds by the use of this device. This also provides a support for brick arches which are now applied to 75 per cent of the locomotives in use.

The devices mentioned thus far are all for steam-making. By their combined use, either on new or old locomotives modernized, about 80 per cent more volume of steam can be produced with a given size boiler with the same amount of fuel consumption, which means that a 3,000-ton train can be increased to beyond 5,000 tons on the open road and proper speed maintained.

This picture is somewhat dimmed by the fact that these devices are of little or no value in starting the train, which requires a draw-bar pull of about 18 pounds per ton, whereas only about seven pounds per ton are required to keep it rolling when once started on straight and level track. Nor are they of any special use on the grade when the speed is reduced to near the stalling point, except on locomotives especially designed for heavy grades and low speed. Such locomotives are not adapted for service on the open road where relatively high speeds must be maintained to economize time and prevent congestion.

In order to enable the locomotive with its improved steam-making devices to get its enlarged train started and over the stalling grades, a mechanism has been applied called, in railroad parlance, a "booster." This is the newest development, and has been applied to only

a comparatively few locomotives, but quite sufficient to prove its value. In order to understand better its application and usefulness, it will be necessary to consider briefly the principle of locomotive-wheel arrangement for different kinds of service.

At low speeds the greatest tractive effort is exerted but owing to the low piston speed, less steam is needed; therefore, the switching locomotive has a comparatively small boiler and all the weight is carried on the drivers. The same principle applies to the so-called "Mallet" type, designed for mountain grades, where double sets of drivers and cylinders are placed under one boiler. Neither of these types is suitable for high speeds, as their boilers would not furnish a sufficient supply of steam.

In heavy passenger and fast freight service, the conditions are exactly reversed. The steam requirements go up with the speed, and the tractive effort goes down; consequently, large boilers are used and the weight carried in part on truck wheels, both front and rear. The rear set of wheels are called trailers and are smaller than the drivers in order to find accommodation under the fire-box, which places a limit to the rearward extension of the drivers. When the train is being started, or running on grades or sharp curves at very low speeds, then all of the tractive effort possible is needed. Under such circumstances there is a surplus of steam. These are conditions where the booster comes in. It is a double cylinder steam engine, spur geared to the trailing wheels at a ratio of three or four to one, by means of shifting gears, which automatically disengage when not wanted, leaving the trailing wheels to run free. Its action, when engaged, is very much like an automobile running in low to pull itself out of the mud. About 25 per cent is added to the draw-bar pull at speeds under 12 miles per hour on a locomotive with eight drivers coupled, providing that the trailers carry the same weight as each pair of driving wheels. The effect of the booster is to start a longer train with less shock due to slack taking, and take it over a steeper grade without stalling.

Electrification of Railways

The electrification of railways fascinates the popular mind, and for this there is ample justification.

Improvements in the steam locomotive, such as we have been considering, postpone the day of its extinction into the distant future, if, in fact, it ever takes place. Both the electric and the steam locomotive are sure to have a huge part in speeding the mighty stream of traffic that flows in an ever-increasing flood from state to state and onward to the sea. The use of electric locomotives will increase, for a very good and simple reason. It takes six or seven times as much draw-bar pull to take a train over a 2 per cent grade, as it takes to move it on the level. If the train is to go through unbroken, it requires double and triple heading, pushing and double pushing. With all this extra power, the speed is reduced to a crawl, congesting the line at a point where double tracking or quadruple tracking is liable to prove difficult and expensive, as these are the points where tunnels and other obstructions are most likely to be found.

With electricity, power without limit can be concentrated, train speeds maintained, and the heavy grades cease to be a limiting factor on the line. Many other things can be said in favor of the electric locomotive, such, for example, as its ability to stay in service and make long runs. Its one drawback is cost of installation, which is many times more than is required for steam; so that at present, and perhaps for many years to come, it will best justify itself on mountain grades, tunnels, and terminals.

Sidings, Switches and Signals

Improvements in the capacity and economy of the power are of comparatively little avail unless there are also corresponding improvements in other portions of the whole mechanism of the railroad. Long, heavy trains can not be sent over single or double track lines unless sidings are supplied in sufficient quantity and size to take care of them, and provision made for their speedy operation.

Thousands of miles of railway are without block signals. These were first introduced purely as a safety device but have now become necessary for the expedition of traffic over congested lines. In the pioneer days, when trains were few and small, there was no great loss if the train came to a full stop when taking the siding, giving the brakeman opportunity to run ahead and turn the switch, and for the train to pull into the siding and move out again after the meeting had been made, making a third stop for the brakeman to close the switch and catch the rear end of the train. But when it is a congested line with 5,000 tons of freight and a modern power unit, it becomes a matter of very great importance and can only be handled to the best advantage as regards economy, expedition, and safety, by interlocking switches and signals in control of an operator near the siding or several miles from it. In other words, the time is at hand when trunk-line railways must cease hand operation and adopt machine operation for economy and quantity, sending trains from one track to another, or in and out of sidings by the push of a button in place of the slow methods of the past.

These are only a few of the outstanding improvements that are possible of being applied to the task of greater and more economic transportation.

Developments in operation will lead to the placing of Chicago, Pittsburgh, Kansas City, and other restricted gateways on stub tracks, the main line passing them by.

One of the greatest economies in railway operation is to keep the equipment in use the greatest possible amount of time. In our own business we recognize the value in reduced overhead when our equipment can be used full time, or better still with more than one shift. The same is true of railway equipment. In order to bring this about, there must be facilities for taking care of locomotives at the terminals so that they will be the least possible time out of service. This means better and larger round-house facilities, sanding and coaling devices, boiler washing equipment, and last, but certainly not least, modern machine tools for both the round-house shop where temporary and emergency repairs are made, and for the general shop where thorough overhauling is done.

Is Management Incompetent?

It has been shown that there are improvements in equipment actually tested and to a limited extent in use to warrant the conclusion that there are no engineering obstacles to more, better, and relatively cheaper transportation. Reference is frequently made in certain quarters to the incompetency of railroad management. Let us see as to that. Since taking back the

roads from the government on March 1, 1920, the number of employees has been reduced by 150,000, while the amount of traffic being moved at the present moment is the largest in history, with a steadily rising car surplus for the October peak. This hardly looks like incompetence.

The only thing that stands in the way of growth of transportation facilities is lack of capital. No arguments are necessary to convince you that the capital will be forthcoming if there is prospect of security for the investment and a continued return satisfactory compared with what can be obtained in other industries. The selling methods of our political leaders have not improved as rapidly as have those of the makers of some less important commodities, with the result that the people are misinformed and led to believe false economic doctrines. When any considerable class is adversely affected, such for example, as the wheat growers or the coal consumers, what is the first suggestion for relief? Take it out of the railroads.

In the Transportation Act of 1920, Congress places the regulation of the railroads in the hands of the Interstate Commerce Commission with instructions to see that no injustice is done any shipper; also charges them with an equally important duty of seeing that the railroads receive a return, which will attract capital sufficient for adequate growth and development.

Mechanically the railroads are on the way to handle the ever-increasing volume of traffic and to do it so much more economically as to give promise of ultimate freight rate reductions. Our opportunity is in using our influence with those in authority to promote and maintain a government policy favorable to the development of transportation, the master key to progress. Vital to mechanical progress by the railway is the investment of vast capital. Underlying such investment is confidence in the stability of railway income. Behind this in turn is stability of government policy. Efforts are being made to repeal the Act or so to amend it that the revival of railroad credit will be impossible and public interest suffer irreparable damage. Some men in public life do not seem to know that one dry bearing will be just as disastrous to the operation of the whole machine as if no oil were used at any point. The immediate objective is a further trial of the Transportation Act without experimental amendments. In future years the objective is so to guide the progress of perfecting the law that always embedded in it will remain the principle of net income adequate for the attraction of capital.

Can you not picture a shrinking map with the Missouri Valley products only 48 hours from Atlantic harbors? Can you not visualize with the prosperity incident to these developments an enormous increase in the use of mechanical equipment on the farm, in the home, on the railway, in the air—wherever there are tasks for human hands to perform? Does this not mean that the manufacture of machine tools will become a more stabilized industry depending less on the activities of any one line and more on the general prosperity of all the people?

Progress of the Investigation of Phosphorus and Sulphur in Steel

The Joint Committee on the Investigation of the Effect of Phosphorus and Sulphur in Steel has just issued a statement regarding the progress of its work. This statement is the fourth that has been issued by the committee, and gives some of the details regarding the work that has been performed and that is contemplated.

The work of the Joint Committee is being carried on largely under the direction of the United States Bureau of Standards, in whose reports the final results will be broadcasted. Besides the United States Departments of War and of the Navy, there are eight national engineering societies interested in the standardization work, and co-operating in it.

The work which the committee is doing has been planned to cover a broad field, and to supply data for the use of both the makers and the users of steel. There are two general series of tests, the first one, Series A, dealing with the effects of sulphur and phosphorus upon steel when sulphur is residual, meaning that it is present in the steel through the fuel or from the pig iron or scrap that enters into it. The second, or Series B steel, is that in which sulphur has been added during the later stages of manufacture before the metal reaches the mold.

In addition, there are six groups of tests, each for a different grade of material. The carbon content in per cent in the different groups is as follows: (1) Rivet steel, tubes, etc., 0.06 to 0.12; (2) plate and structural shapes, 0.16 to 0.22; (3) forgings, 0.45 to 0.55; (4) wheel, tire and rail steels, 0.65 to 0.75; (5) spring steels, 0.95 to 1.05; (6) castings, carbon content to be determined.

In all of the groups, when determining the effect of sulphur, the sulphur content ranges in general from 0.03 to 0.08 per cent, with the phosphorus and other elements normal and as nearly constant as possible. When determining the effect of phosphorus, the phosphorus content ranges from 0.02 to 0.08 per cent, while sulphur and the other elements are held normal and as nearly constant as possible. The use of Series B is to provide for higher sulphur contents than are usually obtainable with residual sulphur only, thus making it possible to compare the effects upon steel of residual and added sulphur.

So far, the investigation has been confined to a study of the effect of sulphur upon steel. Material has been secured in Series A for the first three groups, and in Series B for the second, third and fourth groups. The test programs for Series A Group (1) and for Series B, Group (2), (3) and (4) have been practically completed. Tests are well under way now for Series A, Group (2), and those for Series A, Group (3) have just been started. Plans are now in progress to secure the material for Series A, Group (4). It might be noted that considerable thought is being given to the plans for the tests and that all contingencies are, if possible, cared for in advance. Every step of the program must be acceptable to all parties in the committee that represent different organizations.

The tests are being carried on at various points best suited for the work, and in most cases are being made in duplicate, so that a good check may be obtainable. At present, of course, no results nor indications from the tests can be given. The statement made by the committee at present tells only the details of the tests and the conditions surrounding them. The complete information, regarding both the tests and the results, will later be published in technologic papers of the Bureau.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Sharpening a Large Cutter

By Milton Wright

Inserted tooth milling cutters of large size are difficult things to handle in resharpening operations unless a machine specially designed for the purpose is available. The illustrations herewith show how one such

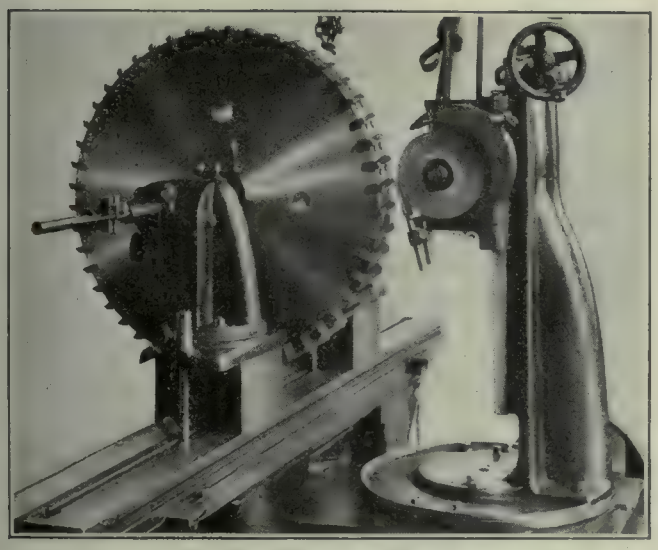


FIG. 1—GRINDING THE TEETH ON THE PERIPHERY

job was accomplished in the shops of the Brown & Sharpe Manufacturing Co., Providence, R.I., using a standard machine supplemented with a part from another machine of the same type.

The cutter is 24 in. in diameter by 3 in. face. It is shown in Fig. 1, set up for grinding the teeth on the periphery, on an N-13 Brown & Sharpe grinding machine with high column; being supported on centers that are clamped in the V's of two universal heads, one belonging to the same machine and the other borrowed from an adjacent machine.

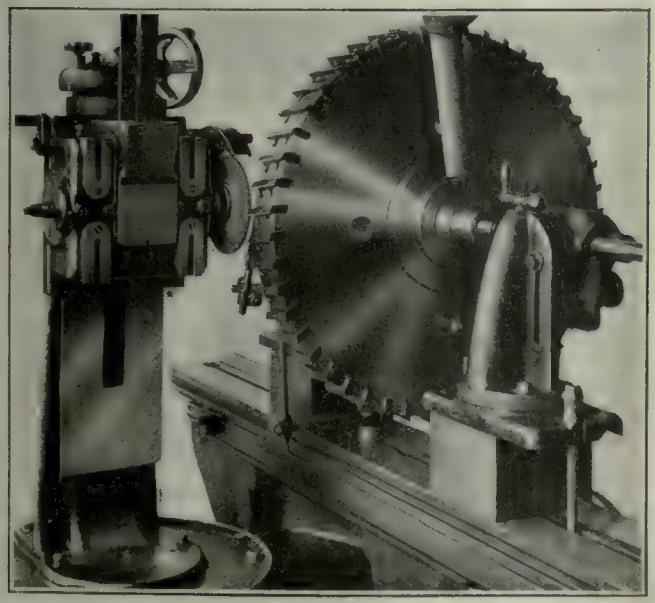


FIG. 2—GRINDING THE TEETH ON THE SIDE

The heads were not high enough of themselves, and it was necessary to insert 4-in. raising blocks under each in order to swing the cutter clear of the table. Fig. 2 shows the set-up for grinding the teeth on the side; all the change necessary being to swivel the column of the machine 90 deg. and alter the position of the finger rest.

The time for setting up and grinding the cutter complete was 5 hr. The wheel used was a Norton Alundum, 3860-I, 6 in. diameter by ¼ in. face.

Large Work on a Medium Size Machine

By Harold Brown

The accompanying illustration shows a boring job set up on a 54-in. horizontal boring machine using a surface plate to help support the casting being machined. Screws in the legs of the surface plate were used for leveling and, by means of an indicator, it was set to the height of, and level with, the table of the boring mill. This arrangement has worked out successfully on more than one occasion.

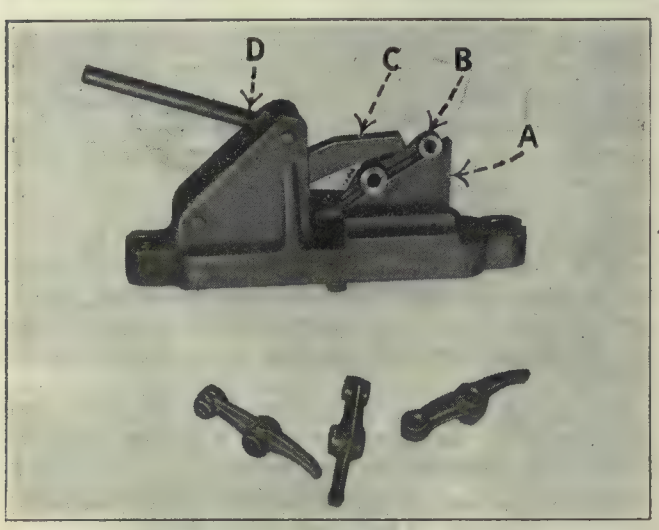


SUPPORTING LARGE WORK ON A MEDIUM SIZE MACHINE

Milling Valve Lifters

By Edgar Allen

An order for a large number of drop-forged valve lifters was obtained by our shop management not long ago. We were a little puzzled at first just how to mill the bosses, but finally made the holding fixture shown. The body of the device is made of cast iron and the



VALVE-LIFTER MILLING FIXTURE

work holder *A* is made of machine steel and the parts on which the valve lifter *B* comes in contact, case-hardened. This work holder is just a milled block, channeled to receive the lifter and has rounded hollows on its upper surfaces for the bosses to rest in. The channel and recesses are all the locating points needed. The lifter is held down by means of the clamp *C*, which is operated by the eccentric lever *D*. Straddle mills are used and both ends of the two lifter bosses are finished at one pass. Owing to the ease with which the work may be inserted and removed, we have obtained an unusually high output considering the equipment we have.

Railroad Shop Repair Work

By I. B. Rich

On a recent visit to the shops of the Union Pacific Railroad in Portland, Ore., I ran across several interesting methods of handling work. One is the method of planing the tongue and groove on the eccentrics so as to insure fitting together, and to prevent side motion when they are assembled on the driving axle.

The method of planing these is shown in Fig. 1, where very simple fixtures, *A* and *B*, are used for holding the two parts on the planer table. The fixtures consist practically of substantial bases with tongues fitting the planer table slot, and provided with steel uprights which act as jaws for holding the eccentrics. Suitable setscrews provide means for clamping the eccentrics in the jaws shown. With the halves of the eccentrics held in this manner, it is an easy matter to plane the joints at one setting.

The crown brasses used in the driving boxes are provided with two strips of babbitt, as in *A*, Fig. 2, and in addition have the center of the bearing relieved, as at *B*, for the purpose of permitting the lubricant to flow freely along the length of the bearing. Also the sharp corners at *C* are cut out with a view of preventing them from acting as scrapers and removing the lubricant.

The method of boring these brasses is shown in Fig.

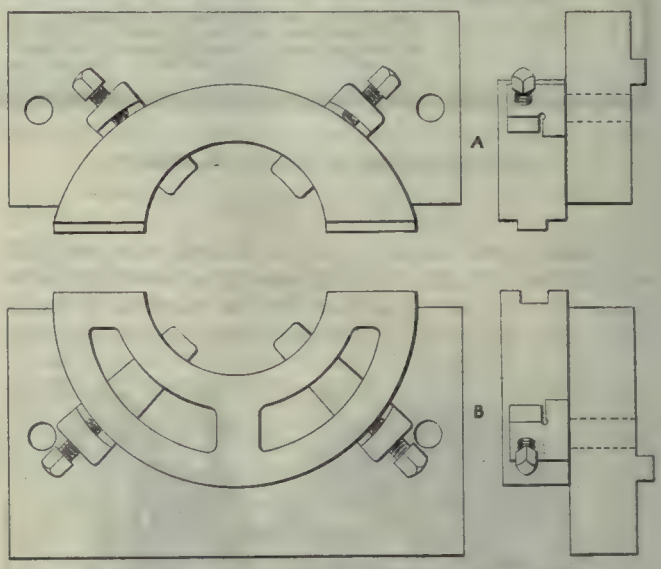


FIG. 1—FIXTURES FOR PLANING ECCENTRICES

3, a horizontal boring machine of the type having a table with vertical adjustment being used. The relief at the top of the bearing is secured by putting a short radius cutter in the boring bar and lowering the table until the desired relief has been secured. The relief

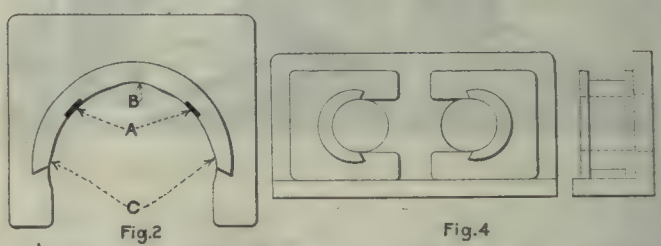


FIG. 2—RELIEVING DRIVING BOX BEARINGS. FIG. 4—LAYOUT OF NEW FIXTURE

at the corners is also cut at the same setting by raising the table and using a cutter with sufficient radius to relieve both corners.

New fixtures are under way which will accommodate two driving boxes, as indicated in Fig. 4. This arrange-

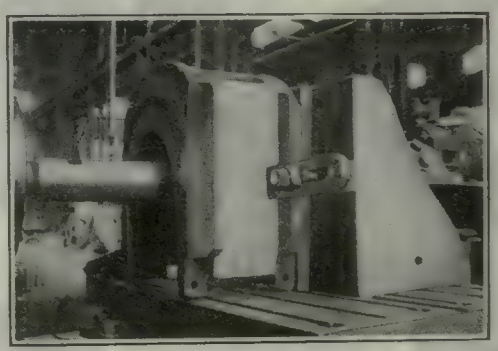


FIG. 3—BORING THE DRIVING BOXES

ment will permit the setting of one driving box while the other is being bored, and in that way practically eliminate the idle time of the boring machine.

Hub liners are a little out of the ordinary, having babbitt inserts as shown in Fig. 5. These inserts are staggered as shown.

When it came to removing a driving wheel from an

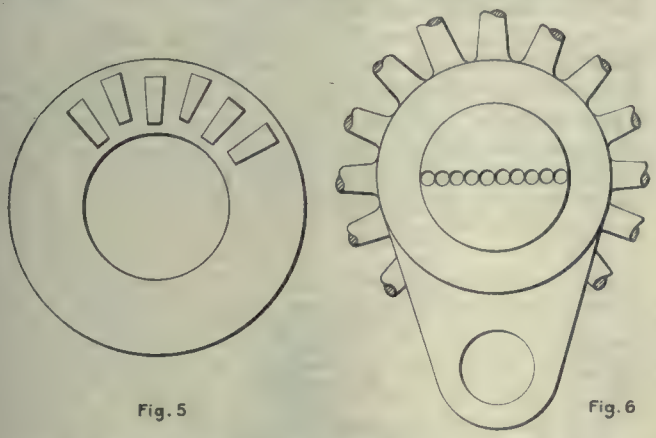


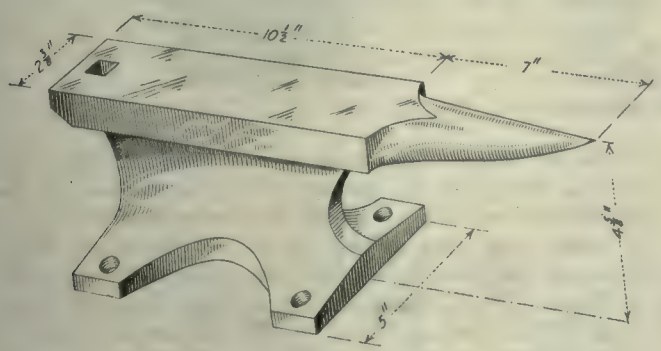
FIG. 5—STAGGERED BABBITT INSERTS IN HUB LINER.
FIG. 6—REMOVING A TIGHT DRIVING WHEEL

old axle, it was found that the normal maximum pressure of the press would not start the wheel from its seat. In order to make it possible to remove the wheel without danger of breaking the press, a row of 1-in. holes was drilled across the center of the axle, as in Fig. 6. This made it an easy job to remove the wheel.

Making Anvils from Old Rails—Discussion

By Wm. T. Guenther
Machine Shop Instructor, Eveleth, Minn.

On page 742, Vol. 58, of the *American Machinist* is a sketch presented by Frank C. Hudson of an anvil made from an old rail by students at the University of California. The students of our Manual Training School have not only made several anvils, but have



USEFUL ANVIL MADE BY STUDENTS FROM OLD RAIL

made them as per the accompanying sketch, with a regularly tapered horn, hardy hole, and such points.

The rail was roughed out in the machine shop, the horn shaped in the forge shop, and then it was brought back to the machine shop for finishing. The shaper was used on the top, sides and bottom, the rest being done with a file.

This anvil not only provides a very fine problem for the students, but it is a most useful tool in the private garage or around the average home where the man of the house does some tinkering.

Trimming a Metal Box Cover

By Paul A. Bard

Having a quantity of sheet steel box covers to trim, and lacking better facilities for doing the job, the Co-operative Machine & Tool Co., Minneapolis, Minn., performed the operation with the tools shown in Fig. 1. The fixture *A*, which is screwed on to the spindle nose, is a casting having a four lobed cam on the spindle end and a square section on the opposite end, the latter

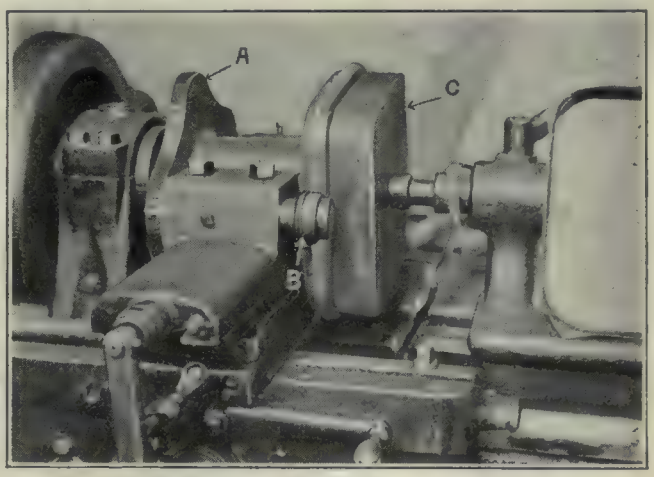


FIG. 1—THE TRIMMING TOOL SET UP

being machined to fit the box cover. Clearance was allowed for the edge of the cutter *B* as shown in Fig. 2. The cutter, which is of highspeed steel, has a section that acts as a cam roller and keeps the cutting edge in the proper relation to the work. The cutter is located on a stud having a large head, the stud being screwed into the side of a block on the compound rest as shown. A cam roller is attached to the rear end of

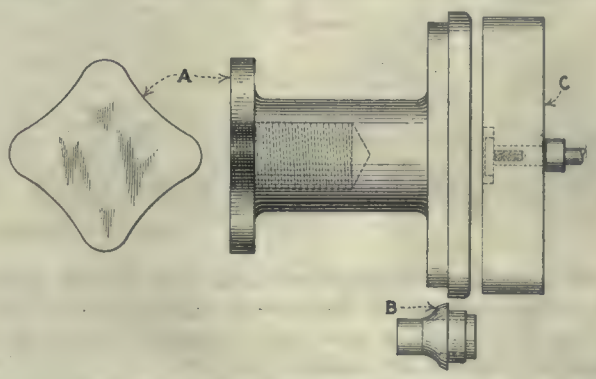


FIG. 2—DETAILS OF TRIMMING TOOL

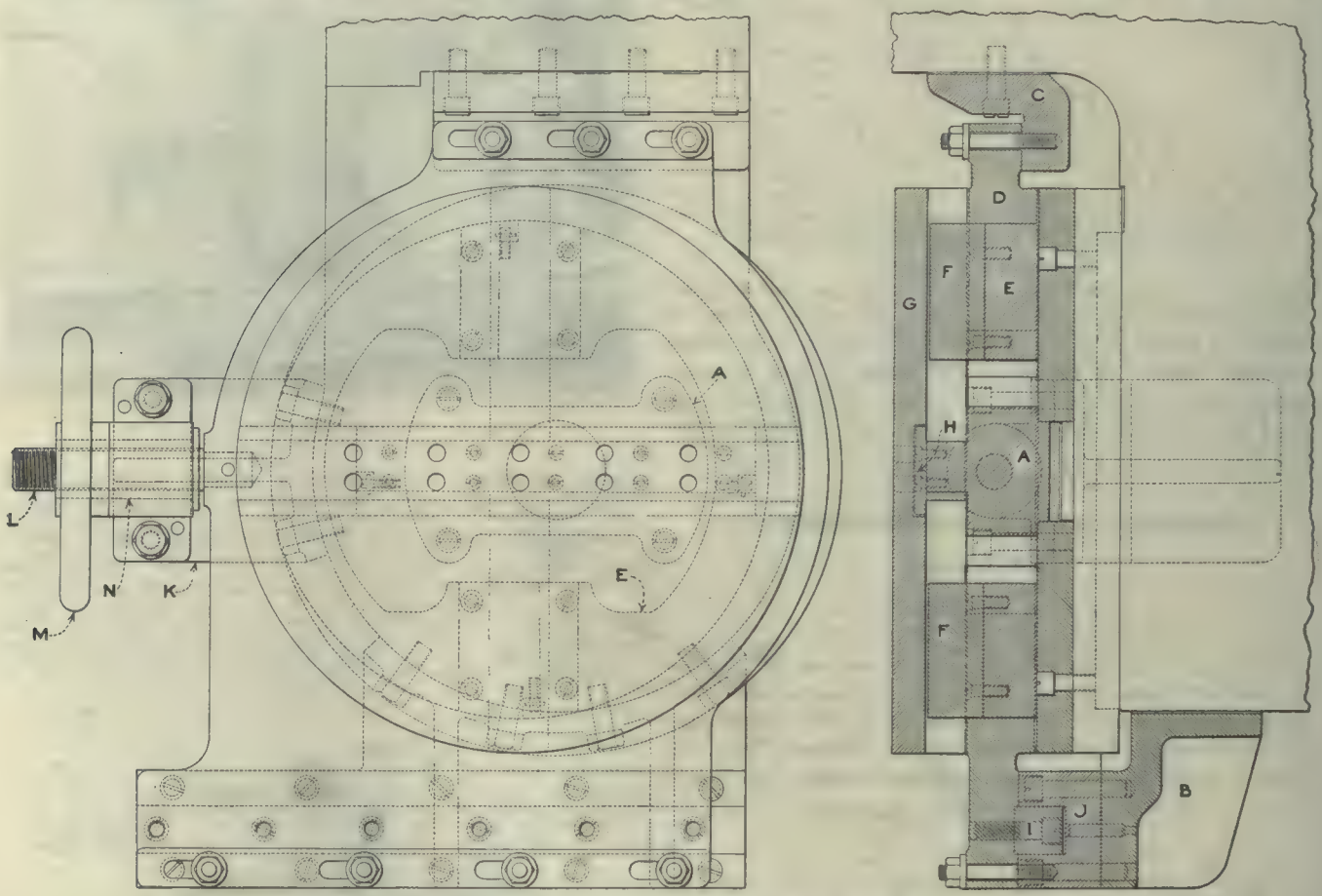
the base of the compound rest, at the left side, where it contacts with the cam *A*. The cast-iron block *C* is rotatably attached to a taper shank fitting into the tailstock spindle, and is forced against the work to hold it in place while in process.

The nut having been released from the cross-feed screw, the compound rest is fed in until the cutter is in contact with the work, then the piece is revolved and the cutter trims the cover. The cam action of the cutter on the work moves the tool slide in one direction and the cam *A* and its roller moves it in the opposite direction. The relation of the cam *A* to the fixture is such that the high points on the cam alternate with the corners of the piece and thus keep the cutter against the work.

Vertical Turret Lathe Elliptic Chuck

By F. E. Bardrof

Many of the dishes included in the line of Pyrex baking ware manufactured by the Corning Glass Works are elliptic in shape and, in making the molds for this glassware, it is necessary to hold the parts to be machined in an elliptic chuck. The Bullard vertical turret lathe was adopted some time ago by the shop for turning glass mold parts and its use proved so successful in the machining of round molds that its use for the manufacture of elliptic molds was also considered. Since no elliptic chucks now on the market could be adapted for use on the vertical turret lathe, a chuck embodying some novel features was designed and built into a new lathe.



VERTICAL TURRET LATHE ELLIPTIC CHUCK

The main features of the chuck are shown on the drawing herewith. The standard chuck was removed from the lathe spindle and the tongued guide *A* was securely fastened and doweled to the spindle plate. A bracket *B* for the bullring guide *J* was fastened to the front of the frame as shown and a bracket *C* for fastening down the back of the bullring was fastened to the frame below the turret rail. The bullring *D* carries a long heavy key *I* on its front side which fits into the guide *J* and causes the bullring to move parallel to the guide when the holding bolts are loosened. The bullring centers the guide ring *E* which carries lugs *F*. Lugs *A* and *F* slide in right-angled slots in the chuck plate *G* when the spindle turns and these slots are fitted with hardened gibs to take up wear and keep the mechanism in proper alignment. The slot for the lug *A* is also T-shaped to admit the plate *H* which is fastened to the lug block *A* and holds the parts down. Ordinarily there is practically no load on this plate as the weight of the parts keep them down but, in order to prevent any chattering and to allow undercutting by the tool, the plate was added.

The shifting means for the bullring consists of a bearing *K* attached to the frame of the machine and in which the threaded bushing *N* carrying the hand wheel *M* turns. A large screw *L* is fastened to the bullring and threaded into the bushing. By means of a dial on the hand wheel a micrometer adjustment is available. When it is desired to change the throw of the chuck the seven clamp bolts are loosened and the bullring is moved to the proper setting by means of the handwheel and screw. In the final arrangement a piece of sheet steel was drilled to fit on the clamp bolts, covering the slots in the bullring against the entrance of chips. A felt wiper was also attached to the lower edge of the chuck plate *G* to prevent the entrance of chips between it and the bullring. The four-jaw independent chuck, which is a standard equipment on these lathes, was fastened to the chuck plate *G*.

In assembling the chuck on the lathe the bracket *C* was fastened to the frame with its upper face parallel to the turret rail. The bracket *B* was then put on with its upper face also parallel to the rail. The guide *J* was then doweled to the bracket at the proper distance from the center of the spindle and with the slot parallel to the rail. The bearing *K* consists of two halves separate from the bracket. The threaded bushing and the split bearing were, therefore, assembled on the screw and the bullring placed in position with the key *I* in the groove of the guide *J*. The split bearing was

then doweled and fastened to its bracket, and the holes for the bullring clamping bolts were spotted through the bullring. Although the parts were large and heavy and the brackets were fastened to the rough frame castings, no particular trouble was experienced in getting the parts to line up properly.

The guide ring is lubricated by an oil cup attached to the bullring and the chuck plate slots are lubricated through oil holes. By throwing the bullring on the spindle center it is also possible to turn round work on this chuck. The maximum difference between major and minor axes of the ellipse which may be turned on this chuck is 3 in. In other words, the bullring may be thrown 1½ in. off center.

This chuck has some great advantages over the usual type of elliptic chuck as used on the ordinary engine lathe. First, the whole weight of the mechanism rests on the large faces of the guide ring and is constant, while the overhanging chuck throws its weight from side to side of the guiding lugs, as the chuck turns over, causing excessive wear. Second, the bullring carries none of the weight and serves simply to center the guide ring *E*. Third, bearing surfaces are ample and well lubricated. Fourth, the advantage of using the vertical turret lathe on classes of work where it is particularly useful.

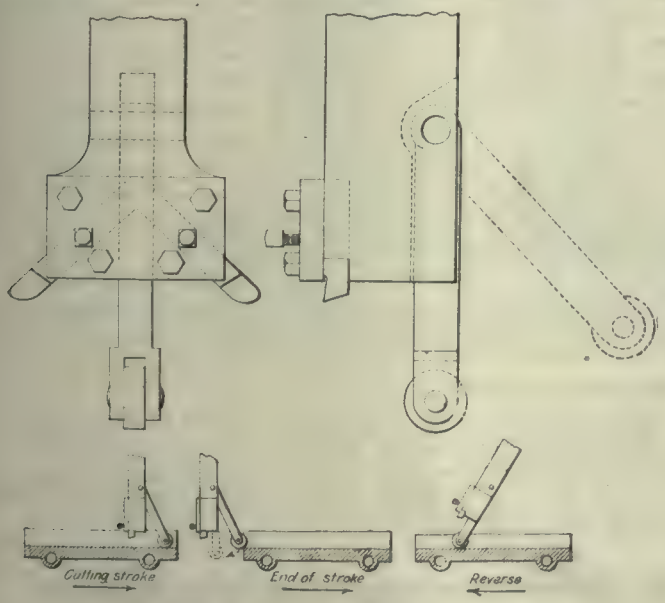
This chuck was designed in the engineering department of the Corning Glass Works and built by the Bullard Machine Tool Co.

Toolholder for Planing Crosshead Shoes

By L. M. Francis

In the article "Repairing Locomotives in a Machine-Tool Shop," on page 11, Vol. 59, of the *American Machinist*, there is illustrated the operation of planing crosshead shoes.

On a job the writer was recently connected with, the toolholder illustrated herewith was developed to facilitate planing of crosshead shoes and might be adapted to other similar work. The design resulted from finding that both sides of the shoes could not be finished at one time with an ordinary type of holder provided with two tools set at the desired width, due to there being no clearance, and resulting in the tools dragging on the return stroke.



TOOL FOR PLANING CROSSHEAD SHOES

As shown, the holder consists of a bar having two square holes at about 45 deg. to take two toolbits, and with setscrews provided to clamp the tools.

In the back of the bar a groove is cut to take the swinging arm shown, which hangs free on a pin at the upper end. The lower end of arm is provided with a roller, the purpose of which is easily seen.

In operation the arm trails behind the holder on the cutting stroke. At end of the cutting stroke the roller drops past the work so that on the return stroke the arm, which is now seated in the holder, lifts the tools clear of the work, allowing them to drop back to normal position at the end of the return stroke.

A Little Detail in Pattern Making

By M. E. Duggan

A sketch of the pattern wanted—a four-sided affair with a rib through the center—is shown in Fig. 1, with the dimensions jotted down that the reader may know its size and weight. A clean casting was wanted; "clean inside and out," said the customer, "not in spots."

How would you make this pattern? Split through the middle on the line *XX* with side draft as indicated by the dotted lines, to be molded one-half in the cope and the other half in the drag?

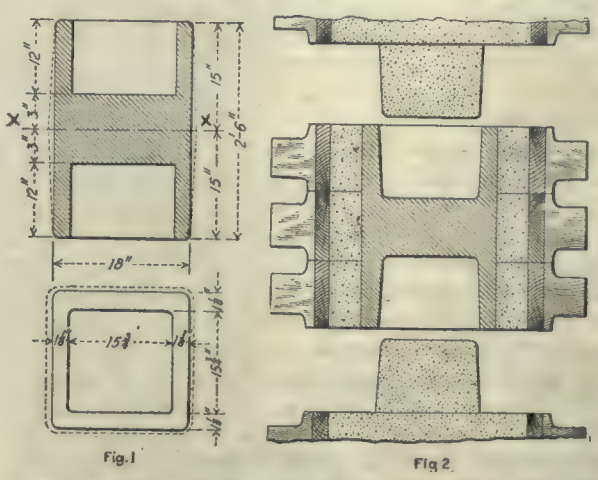


FIG. 1—THE PATTERN. FIG. 2—HOW THE PATTERN WAS MOLDED

"Nothing doing," says the old timer. "If it is molded in this way how am I to reach down into the cavities to mend, slick and black-wash the mold, as is necessary to produce a clean and smooth casting? I'll just change this method of molding," says the old boy, who had seen years of service in the foundry. "I'll use a cope, cheek, and drag, fasten the two halves of the pattern together and mold it in the cheek; lifting out the pocket sections of the mold with the cope and drag. This will leave all parts of the mold easily accessible."

This method, shown in Fig. 2, involves a bit more work for the molder, to be sure, but this is because the order calls for a "clean and smooth" casting. Don't give your hand a bad habit by writing "clean and smooth" on every order that goes to the foundry. This casting was to be buried in concrete six feet under ground, and the demand for a better than the common run of castings only resulted in increased cost to no purpose.

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Editors

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Interest in Technical Research on the Increase

IT IS encouraging to note the recent revival of interest in technical research among the mechanical men of the country. The research committee of the American Society of Mechanical Engineers has existed for some years without much in the way of achievement to point to. The lack of results is undoubtedly due, in large measure, to scarcity of funds.

The funds for research can hardly be provided by engineers. Their job is to direct the expenditure of such funds to the best advantage. They are by nature good at doing things but quite the reverse as accumulators of this world's goods.

After all, the most immediate return made by successful technical research is to the business man who sells the improved product made possible by it. Eventually the consumer profits but hardly to such an extent as to justify a call upon him for aid in financing the research work.

We are glad to see, therefore, that at least a start is to be made by the A. S. M. E. committee which has appropriated a small sum to aid in the financing of some tests instituted for the purpose of revising the famous Lewis formula for the strength of gear teeth. A number of machine tool builders have volunteered to assist in the financing of the tests which may bring out facts of considerable interest to them.

As a result of this small start the topic of technical research became a live issue at the recent meeting of the National Machine Tool Builders' Association and a committee has been appointed to canvass the situation and report back as to what can and should be done by the association in technical research. We hope that their report may mark the beginning of a new era in machine tool design.

Is Your Production Man Popular?

IN TOO many cases the real function of the production man in a shop is not fully appreciated. Of course, it may be covered by saying that his job is to secure maximum production at minimum cost. But much depends on the interpretation of the definition.

There are many places where the production man is the embodiment of a slide rule, a stop watch and a pad of paper, all of which prepare the workers for a cut in piece rates. In such shops he is about as popular as the dog catcher in a shanty town. And it is safe to say that he does not secure maximum output at minimum costs. For, instead of being the best hated man in the shop the production man should be the most popular. Real production methods that secure maximum output should benefit everybody concerned.

Production methods which give the best results from every point of view, must take into consideration more than machine times and piece rates. Workers who believe that they are getting a square deal, who are so treated that they feel a real interest in the firm and its product, have more to do with securing maximum output than many realize.

The best production man is the one who can instill the spirit of confidence and co-operation in the working force. The personnel director cannot do it all—the production man can help more than he realizes, by cultivating tact and human sympathy. For while these may not directly affect suitable production rates, they have a distinct bearing on the way in which rates and schedules are applied.

The production man can do much to assure the men that they will get a square deal. And this is just as important in the long run as setting the proper production schedules.

Attracting Men to the Metal Working Industries

THE almost universal complaint from metal working industries that good men are hard to get ought to receive more thought and study than seems to be the case. It is a serious menace that demands careful consideration.

There seems to be little doubt that the changing conditions of the past decade have made the metal working industry seem less desirable than others to the kind of men which the industry needs. No matter how much we may believe that men are foolish in choosing other fields, the fact remains that they do and no amount of scolding is going to change the situation. The only solution is to study the case carefully, learn the reasons and find a remedy.

Having found the remedy we must make the young men see the advantages of the metal working industry. Mere advertising statements in glowing language will not answer. Good and sound reasons for working in the metal trades must be given and proved. There must be no camouflaging but plain statements of facts. Men have been overfed on propaganda and are very keen at detecting it under various guises.

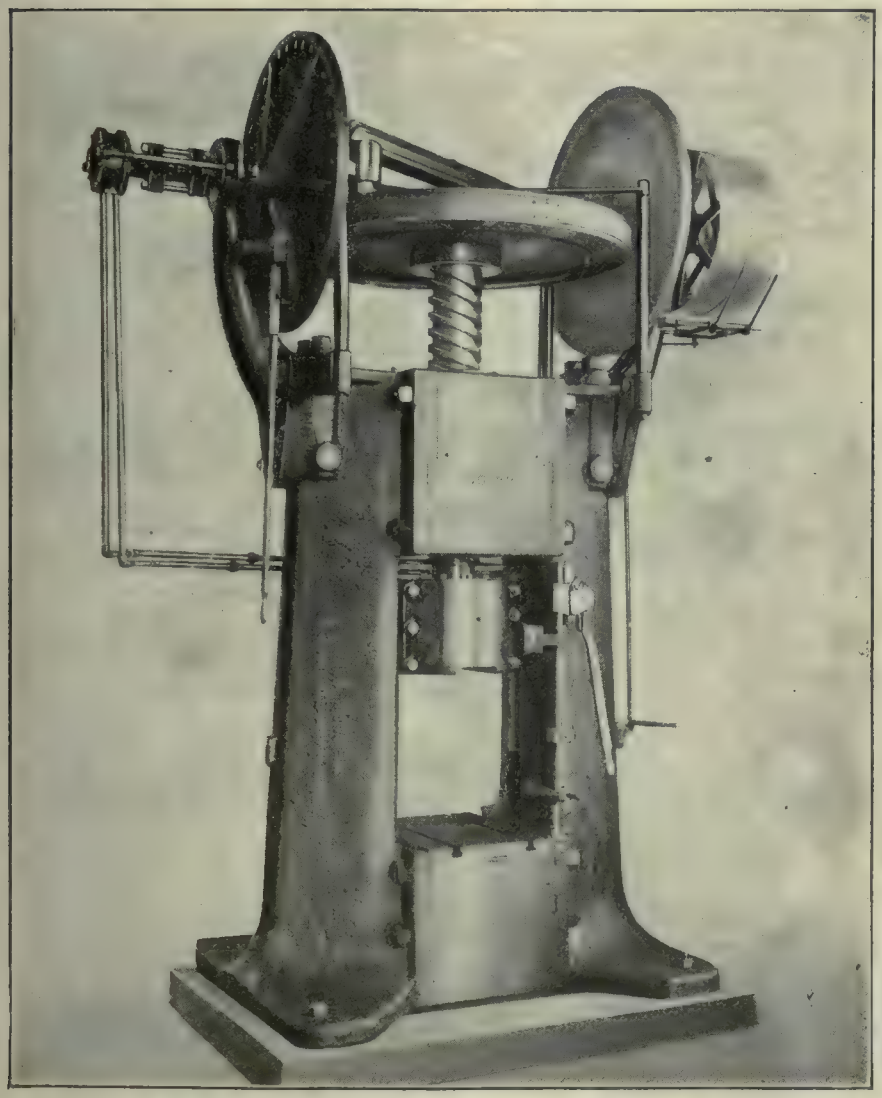
Among the conditions which men consider and criticise are those of wages, hours, working conditions, safety and opportunities of advancement. They do not see the advantages of serving a long apprenticeship to become skilled in various branches only to receive less money than a pieceworker with no special training. They do not understand why a bricklayer whose work requires far less skill than a good machinist, gets double his wages or more. The answer of steady employment does not satisfy as the bricklayer could earn as much per year by working half-time.

This question of attracting desirable men to the metal working industry is a real problem. The sooner it is given careful consideration the quicker will we find the answer. It is a problem which must be approached without prejudice and with an open mind.

Shop Equipment News

Zeh & Hahneman No. 20 Percussion Power Press

The Zeh & Hahneman Co., 182 Vanderpool St., Newark, N. J., has recently added a No. 20 to its line of percussion power presses, the machine being shown in the accompanying illustration. This press is designed to exert a pressure of 400 tons and is suitable for the heaviest class of hot or cold pressed work.



ZEH & HAHNEMAN NO. 20 PERCUSSION POWER PRESS

As will be noted from the illustration, the diehead is driven by means of a large screw, to the upper end of which a heavy flywheel is attached. This flywheel may be brought into contact with either of two friction disks, one for the downstroke and the other for the upstroke. The friction disks are mounted on a shaft which carries tight and loose pulleys for belt driving.

When the press is at the top of its stroke the flywheel is near the center of the friction disk and, when the two are put in contact by operating the press tripping mechanism, the flywheel is gradually accelerated. As the screw descends the flywheel increases its speed rapidly, since the driving radius of the friction disk increases, and energy is stored up. When the dies come together all this energy is available for doing work and is expended on the material between the dies as the flywheel is brought to rest.

The other friction disk then returns the screw to its original position, an automatic stop being provided at the top of the stroke. A brake insures prompt stoppage and holds the flywheel in neutral position. An emergency stop is also provided to prevent damage if the empty press is tripped, so that the flywheel will not strike the frame.

The main screw of this press is 11 in. in diam. and is made of special steel, heat-treated. The length of stroke is 20 in. and the distance between the diehead and the bed at the bottom of the stroke is 14 inches.

The driving pulleys are 36 in. in diam. with a face width of 8 in. and should run at 120 r.p.m. The area of the bed is 27 x 27 in. The press will make 12 strokes per min. and requires 20 hp. to operate. Its weight is 60,000 pounds.

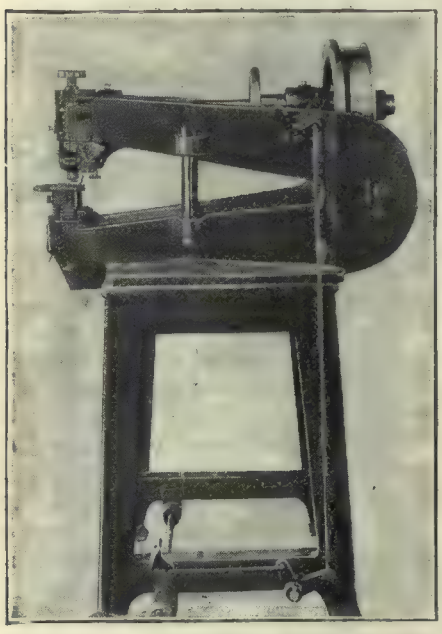
Campbell Nibbling Machines

Andrew C. Campbell, Inc., Bridgeport, Conn., has recently brought out two additional styles of "nibbling" machines for the rapid cutting of irregular outlines in sheet metal. The machines operate on the principle of a punch press, having a small piercing punch with a long pilot, which latter is never entirely withdrawn from the die after starting a cut and thus limits the amount of movement that can be given the sheet in any direction between strokes. Any desired shape may be cut out quickly by following scribed lines on the sheet or, in case of a number of duplicate pieces, a templet may be attached to the sheet to guide the punch.

The No. 1-B machine, shown in the accompanying illustration, is essentially the same as the original machine, described on page 597, Vol. 57, of the *American Machinist*, except that the throat is 24 in. deep,

enabling the machine to cut to the center of a sheet 48 in. wide if necessary. It will cut mild steel up to $\frac{5}{16}$ in. in thickness.

The No. 2 machine has a depth of throat of but 12 in., but is much heavier in proportion and will cut mild steel plate up to a maximum of $\frac{3}{8}$ in. thick. It is especially applicable to the cutting of cam-blanks for automatic screw machines, and for roughing out profile and snap gages, and strippers that must be made of comparatively heavy material. Either



CAMPBELL NO. 1-B NIBBLING MACHINE

machine will cut an internal closed contour as readily as an external one.

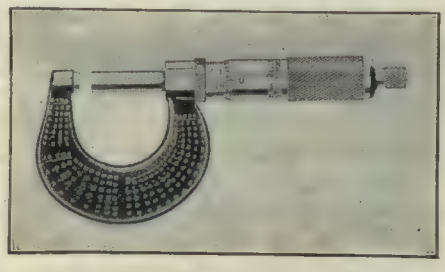
The No. 1-B machine occupies a floor space of 38 x 28 in., stands 55 in. high and weighs 770 pounds. It runs from 450 to 500 r.p.m. and requires a $\frac{1}{2}$-hp. motor to drive it. The No. 2 machine covers a floor space of 33 x 19 in., stands 60 in. high and weighs 950 pounds. It runs at 300 r.p.m. and requires a 1-h.p. motor to cut the maximum thickness of $\frac{3}{8}$ inch.

Reed Improved Micrometer

The Reed Small Tool Works, Cherry & Vine Sts., Worcester, Mass., has recently improved its standard micrometer by the addition of decimal equivalents on the frame.

The feature of the tool as described on page 876, Vol. 47, of the *American Machinist* are retained, and include the deep-throated, concave form of frame, the two-part thimble, the stationary anvil and the rigid lock-joint.

After the frame is drop-forged and treated for special finish, the decimal equivalent figures are raised in finishing dies under high pressure. Decimal equivalents of eights, sixteenths and thirty-seconds appear on



REED IMPROVED MICROMETER

one side with the sixty-fourths on the reverse side.

The decimal equivanent micrometer is made in the 1-in. size only and can be supplied with locknuts and ratchets if desired. The raised figures afford a firm grip of the tool, which is of value when in use on oily work.

Foreign News from the Department of Commerce

Industrial production in Germany is less than at any time since 1919, Commercial Attaché Herring cables the Department of Commerce. Total unemployment was estimated unofficially on Oct. 8 by an expert in the Labor Ministry at 1,200,000 against 800,000 the previous week, and Mr. Herring estimates the number of persons working only part time, 40 per cent of them only 24 to 33 hours a week, at between two and three millions.

Industry now has the disadvantages of a period of real deflation, without a gold currency or any prospect of price and wage stability. Sound currency and basic confidence to offset difficulties of this premature and too abrupt transition to gold prices continue to depend primarily on a workable solution of the Ruhr and Reparations problem.

The unparalleled increased expenditures, without the possibility of materially increasing the tax receipts immediately, imply the inability of the Government to finance the widespread unemployment in the occupied territory, which may prevail indefinitely, considering the transport demoralization and the complete uncertainty of the French intentions respecting the Ruhr industrial control.

The French blast furnaces are active, and some of them are several months behind in filling orders. Export orders for Lorraine pig iron are being received. The disposal through special comptoirs of the stocks seized in the Ruhr and the reselling to the Germans of a portion of the stocks not easily marketable in France, are being considered.

Exports from France in the first eight months of 1923 amounted to 14,900,000 tons, compared with 13,300,000 tons in the same period of 1922. Imports totaled 35,400,000 tons, compared with 33,100,000 tons in 1922. Among the 1923 imports are included 19,860,000 tons of coal, compared with 18,960,000 tons in 1922. The value of imports in the eight months of 1923 was 19,938,000,000 francs, compared with 14,606,000,000 francs in 1922, and the value of exports 19,128,000,000 francs, compared with 13,446,000,000 francs. For the month of August alone, imports amounted to 2,633,000,000 francs and exports to 2,543,000,000 francs, compared with 1,974,000,000 francs and 1,806,000,000 francs respectively, in August, 1922.

Tractors in Australia

Track laying tractors predominate among the types of tractors imported into Australia, according to a statement of the Australian Department of Trade and Customs. Imports of tractors during the 11 months ended May 31, 1923, were valued at £355,242. Tracklaying tractors imported were valued at £196,677; cable type tractors at £31,256; other types, not steam, at $109,415; and steam tractors at £17,892. Seventy per cent of these imports, amounting to £250,844 came from the United States.

The annual sales of typewriters in the Canary Islands have increased 100 per cent in the last four years, Vice Consul J. C. Greenup, Las Palmas, reports to the Department of Commerce. Of these at least four-fifths are of American make, which is to say that of the 3,000 typewriters in use about 2,400 are of American origin. The other 600 supply the foreign competition. But in 1922, even though the rate of exchange was greatly in their favor, the combined sales of foreign makes did not exceed the proportion of previous years. The average price of these foreign makes is about 500 pesetas, reckoning the exchange value of the peseta at about fifteen cents.

The immediate outlook for typewriters in the Canary Islands is considered good.

Brazilian Steel Plants

A recent Brazilian federal decree granted the Companhia Siderurgica Belgo Mineiro, Sabara, State of Minas Geraes, special concessions for a period of forty years provided it complies with certain federal laws with reference to subsidy of steel plants, Assistant Trade Commissioners Cremer and Connell report to the Department of Commerce. This company at present has operating one blast furnace and plans to erect another as well as an open hearth furnace and two rolling mills.

The Companhia Electro-Metallurgica of Ribeirao Preto, State of São Paulo, reports a production for the first half of 1923 of 1,382 metric tons of electric furnace pig iron and 2,561 tons of steel from bessemer converter and electric furnaces.

It is reported from both Rio de Janeiro and São Paulo that the iron and steel import market is quiet. Existing stocks at the end of August were low and buying for future deliveries from foreign sources light.

It is reported that from January to May, 1923, the Broken Hill Proprietary Co.'s steel works at Newcastle, N. S. W., produced 40,070 long tons of steel products including 27,691 tons of rails.

News Section

Dean Cooley Resigns as President of American Engineering Council

Resignation of Mortimer E. Cooley, dean of the College of Engineering and Architecture of the University of Michigan, as president of the American Engineering Council of the Federated American Engineering Societies was announced at the opening session of a two-day meeting of the Executive Board of the Council held in Rochester, N. Y., Oct. 12.

Dean Cooley, in presenting his resignation to the Board, said that he retires on account of ill health. He also made it known that he has been granted leave of absence by the University of Michigan for the second half of the academic year of 1923-1924 which commences in February.

Succeeding Herbert Hoover as president of the Federated American Engineering Societies, two years ago, Dean Cooley, now in his sixty-ninth year, has been identified with numerous national undertakings in the public service, notably the investigation into the two-shift system in continuous industry, and the study of coal storage now in progress throughout the country. During his term the federation has become the spokesman of the engineering profession of America in public affairs and foreign relations, in both of which fields extensive activity is at present being carried on.

The executive board, it was announced, would call for nominations for the presidency of the federation. Dean Cooley's successor will be formally chosen at the annual meeting of the American Engineering Council, executive organ of the federation, to be held in Washington, D. C., early in January.

The secretary's report reviewed the activities of the federation since the last meeting. The committee on public affairs presented a letter in which the discussion regarding the dismissal from the reclamation service of A. P. Davis by Secretary of Interior Work was taken up.

The patent committee asked permission to further investigate the needs of the patent office which was granted, no expenditure of money being involved. Various other committees also reported on the different phases of the work being done by the federation.

A resolution was introduced and passed appointing a special committee to draft and have introduced into Congress a bill calling for a reorganization of the Department of the Interior into a department of public works.

Approve of Training for Apprentices

The following resolution was passed by the Board of Governors of the American Construction Council at the annual meeting held in New York City in September:

"With the desire of furthering a sound and adequate program on apprentice training for the construction industry and of co-operating in every way possible with the present bodies who are directing their efforts in this field, and who are or in the future may be, inaugurating and conducting agencies for such training, the Board of Governors of the American Construction Council hereby requests the officers of the Council operating especially through its committee on apprenticeship, vocational guidance, and craftsmanship, to co-operate with employees' and employers' organizations, building congresses, and all other elements in the construction industry, and with the educational bodies, local and national, in providing for apprenticeship which will be attractive to young men and will afford the fullest means for the employment and training of efficient workers as apprentices, and will produce the skilled workmen needed in the construction industry; and the Board further authorizes as the first essential step in this program the making of a national survey on apprenticeship nedes and conditions of labor supply throughout the construction industry through the appropriate agencies of the Council co-operating with all organizations within the industry."

Ford Buys Johannson Gauge Co.

The Ford Motor Co., Detroit, has purchased the holdings of the Johannson Gauge Co., of Sweden with an American branch at Poughkeepsie, N. Y., according to dispatches from Detroit. The Johannson company makes precision instruments and gages and many of these are in use at automobile plants in all parts of the country as well as in other factories where precision is required. It could not be learned whether it is the intention of the Ford company to move the plant to Detroit or to still manufacture at Poughkeepsie.

Locomotives Are in Good Condition

Railroad locomotive equipment in the United States is now in the best condition for years, according to the American Railway Association. On Oct. 1 only 9,823 locomotives, or 15.3 per cent of the total number on line, were in need of repairs. This is the smallest percentage since records were kept by the American Railway Association.

On Oct. 1 the railroads had 54,159 serviceable locomotives, an increase of 892 since Sept. 15.

Howard E. Adt Dies Suddenly

Howard E. Adt, president of the Geometric Tool Co., New Haven, Conn., died suddenly Sunday evening, Oct. 14, at his home in that city. A complete obituary will be published next week.

Hoover Proposes Super-Power Plan for Eastern Territory

Promises of co-operation were given by the chairmen of Public Service Commissions of the New England and Middle Atlantic States to Secretary of Commerce Herbert Hoover at a joint meeting held Saturday Oct. 13 at the Engineering Societies Building, 25 West 39th St., New York City, for his plan of establishing a comprehensive super-power system covering eleven states and extending from Maine to the District of Columbia. The proposed development would cost approximately $1,250,000,000 and would mean the electrification of many miles of railroad systems, the building of new and more powerful central stations, a wider distribution from super-generators and extensive hydro-electric developments in all of the states included in the project.

The results from this program would be an annual saving of more than $500,000,000 and approximately 50,000,000 tons of coal to industries using electric power and when perfected a more satisfactory form of distribution of power. Another feature pointed out by Secretary Hoover would be the insurance against prolonged coal strikes or railroad difficulties.

The vast amount of work involved and the tons of new machinery and machine tools needed to undertake such a project would more than be compensated for by the economies which would result, it was shown, and the representatives of the various Public Service Commissions have pledged themselves to explaining fully the virtues of the proposition to the state legislative bodies upon their return.

Will Invite Industrialists

Another meeting, when it is expected representatives of industries will be present, will be called within a month or six weeks, it was announced.

The preliminary work to be done is to convince state legislators of the wisdom of the plan and arrange for the burden to be carried by each state involved to the satisfaction of all of the eleven. Little difficulty, however, is anticipated on either of these problems once the benefits are fully explained to those concerned.

South Is Optimistic Over Prospects For Machine Tool Trade

Regarded as a whole, machine tool sales in the Atlanta territory during the first ten days of October fell off to some extent as compared with the volume of business during the same period in September, though in individual cases the condition of business seems to have been unusually spotty. For instance, one of the largest dealers states his business the first ten days of this month has been very slack, while another large dealer expresses exactly an opposite view, stating that the volume has held up on a par with the good business enjoyed in September, with excellent promise for the rest of the month; a third large dealer states sales have been satisfactory, all things considered, but are slightly less than last month. Collectively, however, it is safe to assume that business in machine tools has been slightly off the first third of the month, as compared with the same period last month, but is somewhat better than it was during the dull Summer period—probably eight to ten per cent better. Conditions in the district right now are such as to indicate that October business will be close to the total maintained during September, and probably twelve to fourteen per cent above the sales during the Summer months of May, June, July and August.

Financially the section is in fine shape, with the foundry and machinery trades very active, though steel mills are reported slack. There has been marked improvement the past three weeks in textiles, with the industry operating in the South now on a better basis than at any time since the early part of the year; the lumber industries also are considerably more active than they have been, with most of the furniture factories and woodworking plants running at close to capacity. These industries, with the smaller machine shops, have been the principal buyers of machine tools in this section, and being more active now than they have been at any time since early this year, most dealers regard the outlook as exceptionally good.

Cotton continues to maintain a high price level at the principal markets, and this year's crop should sell for around $1,400,000,000, which is very much above the usual total for the South's principal commodity. So in spite of a slight decline the early part of this month, the trade is optimistic regarding the outlook for business during the rest of this year and the early part of 1924.

Slight Improvement in Chicago

Chicago dealers report a slight improvement in business this week. The Illinois Central R.R. has entered the market for the following: one motor-driven 2½-in. double bolt cutter complete with standard equipment; one 20-in. motor-driven upright high-speed drill with power feed; one 300-lb. helve-type power hammer suitable for general, medium and light blacksmith work; one 20-in. x 10-ft. heavy duty engine lathe with taper attachment and with 16-in. 4-jaw independent steel chuck fitted, and with motor drive, including motor arranged for 40-volt, 50-cycle, three-phase, alternating current. The Chicago, Burlington & Quincy R.R. is seeking a Universal grinding machine. The Pullman Co. is in the market for a small lot of machine tools. The Illinois Steel Co. purchased tools last week. The Chesapeake & Ohio R.R. placed an order with the Industrial Works for six 150-ton self-propelling steam wrecking cranes. The Southern Pacific R.R. placed an order with the Shaw Electric Crane Co. for a 10-ton, 33-ft. span electric traveling crane. The Elgin, Joliet & Eastern ordered a planer and a boring mill.

Used Machinery

The used machinery market continues only fair. The Chicago market in both iron and steel is quiet, and railroad buying of standard steel rails featured an otherwise dull week in iron and steel. Chicago mills were awarded 26,000 tons of a total of 80,000 tons placed by the Baltimore & Ohio R.R. and the Chesapeake & Ohio R.R. It was estimated that up to this time railroads have placed orders for from 225,000 to 250,000 tons of rails for delivery in 1924.

Basing their calculations on the building permits being issued, material dealers are predicting a Fall and Winter season of unusual activity and most of them are putting stocks in storage to meet a continued heavy demand for all the more staple items. Structural steel demand continues active in the West with awards of the last week more numerous than in some time.

Much interest is shown in reports that railroads are about to enter the car market.

Business Improves in Cleveland

Improvement in the general industrial situation in the Cleveland district, since the first of October, has been noted in various angles. The machine tool status has had a reflection of this in more inquiries for equipment from manufacturing interests, but it is still too early to feel the influence in bona fide orders, so operators here are not too optimistic until they actually receive the anticipated orders.

The far seeing tool interests, however, are more interested in the economics of business, rather than the spotty condition that alternately raises and lowers hopes for better business. In this connection the labor movement is significant. During the last few weeks a paradox has occurred, in that wages have increased in industry as a whole while a certain amount of lay-off is seen in different plants. Briefly, one man in every two hundred has been laid off in Cleveland, while wages have increased an average of three cents an hour.

Steel manufacturers in Cleveland report that they probably will continue operating at the present rate for the rest of the Fall season. This attitude is sponsored by the revival of buying of semi-finished materials by the railroads, and a revival of general industrial need after the Summer dullness. Among those mills specializing in sheet products, new furnaces have been started, and others are expected to open up soon. In tin plate practically the entire output of the mills of this district has been sold, and consumers are beginning to place their business for the first half of 1924. Of those mills producing heavy duty material in this district that are not operating to capacity, they are working at not less than 75 per cent of their output, executives report. And of the twelve blast furnaces in Cleveland, ten are operating.

Of course individual orders from consumers in this division are small, but the aggregate volume is surprisingly heavy at the end of the fortnight or month, operators assert.

Skilled Men Scarce in Philadelphia

Machine tool shops are operating from 60 to 70 per cent of normal conditions, in the Philadelphia district. Railroad companies which were rather heavy purchasers a month or so ago, have apparently bought up to their requirements and replacements are not great. One of the largest manufacturers in Philadelphia said a reduction in his force may be necessary.

Automobile manufacturers are the best purchasers at this time. The future is uncertain, but hopes of some manufacturers for an increase in orders may be justified within a few weeks, it was reported.

Dealers in machinery of all kinds report sales of smaller volume this week. Practically all of the demand is limited to replacement and repairs to existing equipment.

In the woodworking machinery line there is reported a shortage of skilled workers. Car building plants report the need of additional men. A large automobile body building company, which is making additions to its force, is in need of bench hands, die makers, jig and fixture men.

The State employment office in Philadelphia reports a demand for millwrights, belt repairmen and stationery engineers in several places in the state. Electricians and maintenance men also have been called for.

The Remington-Burnelli Aircraft Corp. of New York, plans to erect a plant in Philadelphia, according to an announcement this week. A four-acre tract has been acquired in the Southeastern section of the city.

New York Market Is Quiet

Single tools and a few special tools of the heavier type are the only sales reported in the New York district this week. Railroad buying has been slight and general industrials are buying only small machines for immediate needs. The Pennsylvania R.R. and the Southern Pacific R.R. both have lists out in the New York district and sales are expected in both cases within the next few weeks.

Buying by automotive houses in the East has not been heavy during the

past week, but there has been some activity and much more is anticipated within the next month. Automobile production has been improved within the last month and dealers state that requirements will force the automotive men into the market before December.

There has been a good market for used tools during the past week, but dealers report that it has been difficult to pick up anything in good condition lately. A receiver's sale has been announced in Rochester for the Davis Machine Tool Co. and from a perusal of the list sent out a wide variety of tools will be offered.

Business with Japan has not as yet developed beyond necessary road making and building machinery such as concrete mixers, small hoists and rock crushers. But every Japanese export and import house in New York is of the opinion that business will develop within from two to three months and the demand will be heavy at that time. Catalogs have been requested and partial lists of the probable requirements have been received by some of the representatives. Other exporting business has been fair during the week with no especial activity featured.

Improvement Noted in Cincinnati

The machine tool houses in Cincinnati have shown evidence of increasing activity during the past two weeks, although business at best can only be said to be fair. The decrease in production and orders which affected the local market rather seriously in the last month has brought about curtailed operation in many of the Cincinnati plants, but signs of improvement in the coming weeks are apparent in the number of inquiries which are being received and which should develop into actual business before long. Production of lathes has been stimulated in several local factories by orders placed recently by railroads. Railroad inquiries in general are somewhat slow at present and only necessary purchases are being made. Several large machine tool plants state that there has been a number of inquiries received from the automobile manufacturing industry, this being an indication that the manufacturers in the Detroit district will place some business within the next month or so. Orders for lathes and other machinery have been coming in from various sources and no particular industry has been contributing more than its share of business.

Electrical Tools Active

An encouraging feature of the local situation is the amount of business being done by the electrical tool houses. Several of the large manufacturers of electric drills and grinders say that their production has been holding up well for the past few months. The last week of September and the early days of October witnessed a reduction in the volume of business of the electrical tool companies, but officials believe that this period of reduced orders is merely temporary. They are firmly of the belief that the rest of the year will bring a normal amount of business.

Conveying machinery concerns have been experiencing a good season and orders are holding up to a good standard. Here again the outlook is very encouraging and manufacturers of conveying machinery think that the next three months should be prosperous. Both orders and inquiries are sufficiently numerous to indicate a healthy condition in the conveying machinery field.

A fair amount of activity features the used machinery trade. Although the volume of sales on used machinery has not held up to that of 1922 at this time of the year, the outlook is for increased sales during the rest of October and the several months to follow.

The outlook for the immediate future in the machine tool houses of Cincinnati is decidedly uncertain. From present indications the best that can be expected during the coming weeks is a fair amount of business.

Vermont Engineers Propose "Green Mountain Section" of A.S.M.E.

The joint meeting of the Vermont Society of Engineers and the local membership of the American Society of Mechanical Engineers which was held at mechanically historic Windsor, Vt., on Friday and Saturday, Oct. 5 and 6, was successful beyond expectations. Inspection trips were made through the machine tool plants of the National Acme Co. and the Cone Automatic Machine Co.

The meeting formally opened with a dinner at the Windsor House at 6:30 p.m. on Friday, at which about sixty society members and guests were present. The business meeting following the dinner was opened by C. A. Slayton of Morrisville, president of the Vermont Society of Engineers, with a short and vigorous speech.

President Slayton introduced Edward Robinson, professor of Mechanical Engineering at the University of Vermont who explained clearly the proposed plan of affiliation between the Vermont Society of Engineers, which is a local society with about two hundred and fifty members, and the American Society of Mechanical Engineers which is a national organization having over 18,000 members. Professor Robinson sketched out the advantages of such an affiliation, and then introduced Charles Penrose of Philadelphia, past president of the Philadelphia Section of the A.S.M.E., the largest section in the United States.

Guy Hubbard Presents Petition

A form of petition to the A. S. M. E. for the recognition of a local section covering Vermont and eastern New Hampshire was then read by Guy Hubbard of Windsor. This was favorably received and was immediately signed by all the A.S.M.E. members present. After considerable discussion the name "Green Mountain Section" was chosen as most suitable for the proposed new branch.

The officers of this proposed Green Mountain Section are: Chairman, Professor Edward Robinson of the University of Vermont; vice-chairman, Guy Hubbard of the Engineering Department of the National Acme Co.; secretary and treasurer, Daniel H. Parker, office manager of the National Acme Co.; executive committee for two years, Joseph B. Johnson of the Jones & Lamson Co.; executive committee for one year, Frederick Holdsworth, mechanical engineer of the Sullivan Machinery Co.

Upon the conclusion of this business meeting, the gathering moved to the Namco Club, where the guest of honor of the evening was introduced by Professor Robinson. This gentleman was Dean Dexter S. Kimball, head of the Engineering Schools of Cornell University, past president of the American Society of Mechanical Engineers, and an author and lecturer of note upon matters mechanical. Dean Kimball delivered an illustrated lecture on "The Effect of the Machine Tool Industry Upon Civilization."

Detroit Expects Record Automotive Output in Last Quarter

An unexpected increase in orders for closed cars which Detroit automobile plants were hardly in a position to anticipate was the outstanding development of the past week in this automotive center.

Not only has the closed car show in progress eight days helped in making this demand, but a nation-wide realization that the closed car type is the best for all-year service has convinced motor executives here that their plans for increasing production of closed car types are not in error.

Machine tools appear to be finding a better market than in some little time, according to all advices. The speeding of additions to factories is creating a larger demand for machinery of all kinds.

Symposiums of the business outlook for the automobile industry in the Fall and Winter as they have appeared in the press show a wide-spread optimism pervading executives, managers and salesmen. All production figures for a month were broken in September by some of the plants, while practically every manufacturer is preparing for record figures for the last three months of the year.

Building construction continues to set a high record, and Detroit this year will exceed its former high mark by several millions. Banks report a healthy condition in industry. The city's credit was further shown with the issuance of a new $2,000,000 loan during the week to the city.

Hearings will be resumed Oct. 15 before the Interstate Commerce Commission and the Michigan Public Utilities Commission on the proposed increase in switching charges on the Michigan Central Railroad. The Detroit Board of Commerce, the Michigan Manufacturers' Association and the Milwaukee Junction Manufacturers' Association are uniting in opposing the charges.

Employment decreased slightly during the week, falling from 214,590 to 214,071, a decline of 519 in those firms of the Employers' Association.

Car loadings for the week showed material increase, and all railroads report a large volume of business.

Business Items

The Maryland Bolt & Nut Co. has been organized to operate the plant formerly operated by the Maryland Bolt & Forge Co., Mount Washington, Baltimore. S. Forry Laucks, president of the York Safe & Lock Co., York, Pa., is president of the new company. Linus Keating, president of the Harrison Bolt & Nut Co., Harrison, N. J., is vice-president and treasurer. Additional machinery is being installed.

The Sacramento Engineering & Machine Works, a new concern headed by L. C. Brosemer, former superintendent of the Stockton Iron Works, will commence operations shortly in the plant formerly occupied by the Big Four Truck Co. in Riverside Road, Sacramento, Calif.

The Mond Nickel Co., Ltd., of London, Eng., has purchased the minority stock previously held by Charles T. Hennig and G. P. Bassett, Jr., and is now the sole owner of the American Nickel Corp., Clearfield, Pa.

For the fiscal year ending July 31, the Ford Motor Co. of Canada, reports profits of $5,106,197 which is an increase of two per cent over the $5,006,-521, of profits for the preceding year, though the figures fall somewhat short of the estimates by some of those who have been watching the company's progress.

The Link-Belt Co., Chicago, has purchased the Meese & Gottfried Co., San Francisco, Los Angeles, Seattle (Wash.) and Portland, Ore. The new organization will be known as the Link-Belt Meese & Gottfried Co. and its headquarters will be in San Francisco.

The Charles W. Fish Lumber Co., Elcho, Wis., is buying a round lot of sawmill equipment in the Chicago market for a $100,000, mill and woodworking factory replacement occasioned by the partial destruction of the plant by fire late in September.

Officials of the Florida East Coast Railroad Co. have announced that the company is planning the establishment of a large terminal and shops at Bowden, Fla., probably during the next year, an investment of approximately $1,500,000 being planned. The announcement emanates from the company's offices at Jacksonville, Fla.

A petition of Harry G. Fisk and Frank H. Shaw, receivers for Stevens-Duryea, Inc., for authority to sell the company's plant and assets for $450,000 to a group composed of Ray M. Owen of New York City and others has been granted by the Superior Court at Springfield, Mass. It is stated that the sale will be carried through promptly and that Owen, who formerly built the Owen Magnetic car, will continue to build the Stevens-Duryea automobile at the plant. The present Stevens-Duryea plant, built in 1920 at Chicopee Falls, Mass., to replace the plant sold by the original company to the Westinghouse Electric & Manufacturing Co. for the manufacture of guns for war use, cost about $1,000,000. The concern went into the hands of receivers in May, 1922, since which time it has been operated by the receivers on a limited scale. When fully equipped the plant has a capacity of from 1,500 to 2,000 cars a year.

Federal Judge John M. Hazel has signed an order authorizing the receivers in equity to issue certificates for $50,000 to continue the operation of the Silzer Steel Corp., Buffalo and Syracuse, until Dec. 31. John G. Dillon of Buffalo was named as co-receiver at the request of stockholders, creditors and the receivers, C. B. Porter, formerly president of the corporation, and S. F. Hancock.

Obituary

RALPH PETERS, president of the Long Island R.R. since April 5, 1905, died suddenly at his home in Garden City, L. I., recently of a heart weakness that unexpectedly developed. Death occurred before the arrival of a physician. A few days ago he caught a cold, which, however, is not thought to have influenced seriously his condition. For a year or more his health had been failing and he had been gradually lessening his activities. On the nineteenth of next month he would have been 70 years old, and thus automatically retired by a rule of the Pennsylvania system.

ROBERT KERR, president of the Kerr Engine Co., Windsor, Ontario, Can., died recently at his home in Walkerville, Ontario.

Personals

E. C. MORSE has joined the organizations of the Triumph Electric Co., and the Triumph Ice Machine Co., Cincinnati, Ohio, as vice-president in charge of sales and as a member of the board of directors.

GENERAL GUY TRIPP, chairman of the board of directors of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., and LOYALL A. OSBORNE, president of the Westinghouse International Co., sailed for Japan Oct. 10 on the S.S. Shinyo Muru in response to urgent cablegrams from the stricken areas of that country.

N. H. NORRIS, works manager for the Renfrew Machinery Co. of Renfrew, Ontario, for seven and a half years, is shortly to leave Renfrew and go into another line of business.

HENRY DRESES, formerly president of the Dreses Machine Tool Co., Cincinnati, Ohio, returned Oct. 9 from a trip to Europe.

BRIGADIER GENERAL SMEDLEY D. BUTLER, of the United States Marine Corps, will resign soon as commandant of the Marine Post at Quantico, Va., to become associated with the Packard Motor Car Co. in Detroit in an executive capacity.

WILLIAM G. STEBBINS, purchasing agent and employment manager for the Millers' Falls Tool Co., Millers' Falls, Mass., has been given a gold watch by the board of directors in honor of his completion of 50 years' service for the company.

WALTER V. HOUCK has been appointed sales engineer for Crane-Schiefer-Owens, Inc., Buffalo, N. Y.

NEWMAN M. MARSILIUS has been appointed works manager of the Bilton Machine Tool Co., Bridgeport, Conn.

A. W. GREGG has been appointed foundry superintendent of the Bucyrus Co., South Milwaukee, Wis. He was formerly foundry superintendent of the Whiting Corp., Harvey, Ill.

RICHARD W. YERKES, formerly general manager of the Link-Belt Co., Chicago, at the Philadelphia plant, has been appointed treasurer of the Link-Belt Co., succeeding B. A. Gayman.

FRANK R. TAYLOR, formerly with the Addressograph Co., has joined the sales organization in Chicago of the Stocker-Rumely-Wachs Co.

B. A. GAYMAN, formerly treasurer of the Link-Belt Co., Chicago, has been selected to head the Link-Belt Meese & Gottfried Co., San Francisco.

JAMES L. GOUGH has been appointed sales manager of the Stocker-Rumely-Wachs Co., Chicago.

L. WECHSLAR has taken over the supervision of the New York office of the Canton Foundry & Machine Co., Canton, Ohio. His headquarters are at 203 East 15th St.

E. C. KIRK has been named sales representative in West Virginia for the United American Metals Corp., Brooklyn.

MR. BERGERE has been appointed in charge of the New England district for the Canton Foundry & Machine Co., Canton, Ohio, with headquarters at 261 Broadway, New York City.

HARRY S. STERNBERG has been appointed sales manager with charge of distribution by the Blakely Manufacturing Co., Detroit, Mich. Mr. Sternberg has been with the Signal Motor Truck Co. for the past four years in charge of the engineering, production, purchasing and service with title of vice-president.

CHARLES A. GOODSPEED will continue as factory manager in charge of manufacturing at the Blakely Manufacturing Co., Detroit, Mich.

EDWARD J. SCHRIEVER, for the last four years secretary of the Pollak Steel Co., Cincinnati, Ohio, has submitted his resignation. Mr. Schriever will engage in the real estate business in Cincinnati. Prior to becoming secretary to the Pollak company, Mr. Schriever was general auditor of the company a number of years.

J. P. OLIVEAU, formerly mechanical engineer for Mercer Motors, Trenton, N. J., has opened an office in Cleveland for the design and development of special machinery.

Southern Exports Show Increase

Export trade in iron products, machinery and machine tools in the past few months has been quite active, with some improvement noted in shipments out of Southeastern ports during the past four or five weeks as compared with Summer volume. Considerable shipments of machinery have been made to the sugar industries of Cuba, with fairly good trade in Latin-America. The outlook is for one of the largest exports years for the metal trades industries of the South.

Steel Treaters Convene in Steel City

"On to Pittsburgh," the slogan for the fifth annual convention of the American Society for Steel Treating, seemed to hit everybody just right. They were all there, more than 1,600 strong, and how they managed to squeeze into the hotels will always remain a mystery.

With the hotel question settled some way or other, there were only two things to worry about—the business side of the convention and the pleasure side. Smoker, dance and banquet were more than well-attended, the first-named producing several high spots that indicated how well the steel-treaters realize the value of play. Governor Pinchot, of Pennsylvania, spoke at the banquet. Emmanuel J. Jenitzky, metallurgical engineer of the Illinois Steel Co., was presented with the Howe medal for the best technical paper on steel treating during the past year.

Plant visits were accorded the usual popularity given them in Pittsburgh, a city that need not feel at all bashful about what it has to show. The scheduled trips were to the plants of the Westinghouse Electric & Manufacturing Co., the Carnegie Steel Co. (Homestead Works), and the National Tube Works.

Exposition Well Attended

In the International Steel Exposition, which has become a recognized part of the convention, approximately 150 exhibitors took part. It is estimated that nearly 50,000 people visited the exhibitions in Motor Square Garden during the five days. Many types of machines, devices and apparatus were shown, including welding apparatus; gas, oil and electric furnaces; furnace materials and accessories; machine tools and other machinery; steels; instruments; chemicals and heat-treating compounds; testing apparatus and machines; cutters, drills and other small tools; gages; balls and ball bearings; oils. About 50,000 square feet of exhibit space were used.

Many Excellent Papers

Technical sessions were arranged to interfere as little as possible with the exhibit, a practice to be highly recommended. Of the many good papers only a few can be mentioned: "The Tempering of Tool Steels," by J. P. Gill and L. D. Bowman of the Vanadium Alloys Steel Co., Latrobe, Pa.; "Case Hardening and Other Heat Treatments as Applied to Gray Cast Iron," by H. B. Knowlton, Instructor, Central Continuation School, Milwaukee, Wis.; "Effect of Heat Treatment on Lathe Tool Performance and Some Other Properties of High-Speed Steels," by H. J. French, Physicist, Bureau of Standards, Jerome Strauss, Materials Engineer, U. S. Naval Gun Factory, Washington, and T. G. Digges, Assistant Physicist, Bureau of Standards; "Testing of Steel for Hardness," by H. M. German, Metallurgist, Henry Disston & Sons, Inc., Philadelphia; and "Salt Baths and Containers," by Sam Tour, Metallurgist, the Doehler Die Castings Co., Brooklyn, N. Y. The papers are being printed in the *Transactions* of the society and some of them will be abstracted in the *American Machinist*.

Officers elected for the ensuing year are: President, George K. Burgess, director of the United States Bureau of Standards at Washington; vice-president, R. M. Bird of the Bethlehem Steel Co.; treasurer, Zay Jefferies of the Aluminum Co. of America, of Cleveland; director, J. F. Harper of the Allis-Chalmers Co., of Cleveland; and secretary, W. H. Eisenman, of Cleveland.

The city for the next annual meeting will be selected and announced within a few weeks.

Industrial Specialists Needed Abroad

Industry is becoming convinced more and more, judging from communications reaching Washington, that commodity specialists should be employed abroad to a greater extent than is the case at present. With a very few exceptions, the Government's representatives abroad, who deal with industrial matters, are expected to report on all commodities and all lines of endeavor in which this country is interested. While there is no expression of feeling that the maintenance of such men is not more than justified by the value of material which they submit, the need for specialists, particularly in those countries offering promising markets for machinery, chemicals, and electrical equipment nevertheless exists. Specialized knowledge of these lines is almost essential to a comprehensive analysis of the trade possibilities.

There is reason to think that Congress will consider, at the forthcoming session, the granting of an appropriation for a limited experiment along those lines.

Car Loading Record Again Broken

Car loadings of 1,097,274 for the week ended Sept. 29, reported by the American Railway Association, were the largest in the history of the railroads. The previous high record of 1,092,567 was made in the last week of August this year. The merchandise and miscellaneous loadings of 646,185 cars were 21,425 more than the previous week, and an increase of 65,380 cars over the same week of last year.

Increases were shown in the loadings of coal, forest products and grain, while decreases were registered in ore, live stock and coke.

The high record for 1922 was made in the week of Oct. 28, when 1,014,480 cars were loaded. The high record for all time previous to this year was made in the week of Oct. 14, 1920, when 1,018,539 cars were loaded.

New Freight Station Opens in Detroit

On Oct. 15 the Pennsylvania R.R. opened its new Detroit freight station and team tracks located on Third St. between Congress and Larned Sts. Unexcelled service will be installed for the handling of less than carload and carload freight to and from all points reached by the Pennsylvania R.R. and its connections.

These facilities include the most modern and best equipped freight house in Detroit. The tracks serving the freight house enter the second floor. Freight is handled between the track level and street level by five automatic electric elevators of 10,000 lb. capacity each. The ground floor being entirely free from tracks is exceptionally well adapted for the prompt handling of freight between any point on the floor and the trucks at the doorways.

Improved Service

With the opening of the freight station there will be inaugurated through package cars moving in fast freight service between Detroit and the principal cities and freight transfer points on the Pennsylvania system.

Adjacent to the freight station are six team tracks having a capacity of 102 cars served by concrete driveways entered from Third St. In addition to the team tracks at Third St. there are team tracks having a capacity of 100 cars of similar construction at West Fort and Summit Sts. At Summit St. there is a 25 ton crane, making the Pennsylvania the only railroad in the city with this facility.

Will Help Welding Instructors

The Gas Products Association, with headquarters at 140 S. Dearborn St., Chicago, recently appointed an educational committee to co-operate with trade and technical schools all over the country in supplying a practical and standard course in welding procedure. The users of oxy-acetylene welding equipment have never been thoroughly satisfied with the work done by welding school graduates, and at the same time the application for the welding processes has been extended to so many new fields that the demand for skilled operators is constantly increasing. It is thought that by making a thorough investigation of the needs of the industry and then making recommendations to welding school instructors, the instruction programs can be revised and standardized so as to more fully meet the requirements of the employers. The plan has been already submitted to some schools and has met with their enthusiastic response, so it is felt that the instructors are honestly desirous of giving the students such training as will guarantee them the very best earning power.

Fred R. Low Is Elected A.S.M.E. President

As a result of the recent election of the American Society of Mechanical Engineers, the following were chosen for offices: Fred R. Low, New York, president; H. Birchard Taylor, Philadelphia, George I. Rockwood, Worcester, Mass., and W. J. Sando, Milwaukee, vice-presidents; E. O. Eastwood, Seattle, E. R. Fish, St. Louis, and F. A. Scott, managers; William H. Wiley, treasurer. The delegates to the American Engineering Council will be: F. K. Copeland, Chicago, J. T. Faig, Cincinnati, R. E. Flanders, Springfield, Vt., Dexter S. Kimball, Ithaca, N. Y., W. B. Powell, Buffalo, William Schwanhausser, New York, S. W. Stratton, Cambridge, Mass., C. C. Thomas, Los Angeles, and P. F. Walker, Lawrence, Kan.

The Industrial Review

Japan entering automotive and electrical markets with machine tool catalogs requested—Bus transportation becoming important source of orders

FROM different parts of the country come different reports as to business conditions in the machine tool industry. Detroit reports normal automotive production resumed, while New York holds out hopes that the long expected business will actually commence during October. Taken together, however, October is proving to be an average month, better in most respects than any month since May and with brighter prospects than the other months of 1923. "Good but spotty," characterizes the recent reports from St. Louis, Indianapolis, Chicago, and Philadelphia, while Cincinnati, Milwaukee and New England all report production fairly active, but sales below normal. Since Oct. 1, Buffalo machine tool business has improved to a considerable extent.

The disaster in Japan was looked upon at first as an opportunity for the United States to sell the stricken country much material for rebuilding. Later it seemed as if lumber and steel would be the only requirements for some time to come. Machine tool manufacturers did not see any sales prospects for at least six months as housing facilities were needed more urgently.

But now the Japanese situation has taken another turn and the machine tool people find themselves indirectly benefited through the purchasing of other necessities for the devastated area. Motor trucks and light automobiles are in demand in both Tokio and Yokohama, thereby giving impetus to the machine tool industry. Makers of heavy electrical machinery have recently received two large orders, one for a million dollars and another for three-quarters of a million which will also help the machine tool builder indirectly. Electric railways are reported as needed in the two cities visited by the earthquake, again bringing into demand machine tools. The orders for structural steel from Japan have thus far been disappointing and not up to the amounts expected.

Japan Buying

Japanese interests have been inquiring in this country for textile machinery, cement mixing machinery (an order was placed for 27 cement mixers recently) and road building machinery. Machine tools used either by American companies or Americanized companies in Japan will not be in demand for some months yet, according to the general opinion, so that builders will have to be content with the indirect outlet for their products.

That machine tools will be purchased to replace those that were destroyed by either the earthquake or the resultant fire is evidenced by the fact that exporters to that country are requesting all sorts of machine tool catalogs. Mitsui & Co., American Express Building, New York City, has sent out a request to all machine tool builders for their latest catalogs and price lists and other well-known Japanese firms will undoubtedly do the same.

In the Electrical Field

Better business is reported from the electric lamp manufacturers and there have been several improvements made in the manufacture of lamps that may call for new machinery, it is stated. Expansion work is going on at the Hawthorne works of the Western Electric Co. in Chicago, and in other parts of the country come reports of minor expansions which show the electrical industry generally to be in a healthy condition. The Packard Electric Co., Warren, Ohio, is issuing bonds for a big expansion program that it has contemplated.

Another good indication of the improvement in the electrical business is the report of the Westinghouse Electric & Manufacturing Co. which shows a 28 per cent gain during the first half of its fiscal year that started April 1. Most of this increase is credited to the small lines of equipment that the company makes.

Other important manufacturers of electrical goods also report that business is in excellent shape and that further improvement is looked for during the last two months of the year, bringing the year's totals up to records in their respective histories.

Electric Railways

Electric railways are reported as being steady and here and there throughout the country expansion programs are rumored. However, two recommendations recently made would indicate that there is every chance of increases in railway lines within the next few months. Daniel L. Turner, engineer for the New York State Transit Commission, recommended the construction of a system through Queens County, New York, at a cost of $100,000,000 and it is understood that the commission is favorably inclined toward such a program. In Los Angeles, engineers have submitted plans to the city council for a proposed subway and here, too, favorable action is expected.

Bus Transportation

But on the other hand, at Everett, Wash., the street car company has abandoned most of its lines and installed buses in place of street cars. This was a good move for the machine tool builders as in each case car barns and electrical railway repair shops had to be converted into automotive repair shops of an extensive nature. In fact, bus lines are being operated in many parts of the country by railway companies. During the last year the number of buses owned by traction companies nearly doubled.

Industrial Building

Building figures are exceptionally favorable at the present time. During September contracts awarded on large engineering construction projects reached $173,072,000 as compared with $141,599,000 in August and $138,648,000 in September, 1922. One power plant to be constructed at Florence, Ala., will cost $3,472,487.

Mines Expanding

In the mining districts of the country things are going along in a rather even and satisfactory manner. Expansions are noted in the Coeur d'Alene region, and in the Butte and Anaconda regions the mines are re-opening. The Calumet & Arizona Mining Co. is installing three new pumps of the Prescott type geared to Westinghouse motors. A new crushing plant will be built at Mayer, Ariz. The Central Copper Co. in Arizona is to install a milling plant, power house and tramway and from other parts of the country improvements are noted.

The production of bituminous coal has declined in almost an equal ratio to the price drops of the last few weeks. Demand is slight and stocks seem to be ample for the present in most manufacturing districts. However, both the anthracite and the bituminous mines are in the market for new equipment and it is understood that lists have been sent out by some of the larger operating companies on important machinery for delivery within the next 60 to 90 days.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb....	$0.0337	$0 0337	$0.0292
Cold finished shafting.....	per lb....	0.0433	0.0433	0.0378
Brass rods.....	per lb....	0.165	0.17	0.171
Solder (½ and ½)	per lb....	0.262	0.276	0.2283
Cotton waste...	per lb....	0.1225	0.1225	0.1458
Washers, cast iron (½ in.)...	per 100 lb.	4.66	4.66	4.33
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100...	3.08	3.08	2.96
Lard cutting oil	per gal...	0.575	0.575	0.575
Machine oil....	per gal...	0.349	0.349	0.36
Belting, leather, medium.....	off list....	37%	37%	44½%
Machine bolts up to 1x30 in.	off list....	49½%	49½%	49%

Steel Production in September

The American Iron and Steel Institute recently issued its report of steel ingot production for September, placing it at 3,313,354 tons, a daily average production by all companies of 132,534 tons. This compares with total production in August of 3,677,771 tons, or 136,214 tons daily production.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THE propaganda of prosperity originating at Washington and the strength of the grain markets were the outstanding features of the business news last week. A White House statement is quoted as indicating that "the President was very optimistic over the general business outlook." It was added that while he did not consider himself a prophet he was constantly in receipt of reports that led him to believe that business was good throughout the country except in Oklahoma, where some depression is felt as a result of the excessive production of oil on the West coast, and certain districts in the wheat belt where a crop failure and low prices had caused some distress.

The President's hopeful attitude was endorsed by Secretary Hoover, who expressed himself as taking a very optimistic view of the situation, as well as by Secretary Mellon, who is quoted as believing that too much pessimism exists, particularly in Wall Street, over the business situation.

As bearing upon the price of wheat, the President let it be known that he was much encouraged by the efforts that the War Finance corporation is making to assist the farmers and that he had asked ex-Governor Lowden to take the chairmanship of a committee to aid in stimulating the organization of wheat producers.

Some facetious observers assert that in making this appointment the President has found a new way of "passing the buck" of the farmers' dissatisfaction on to a political rival, as in the case of Governor Pinchot. But if any strategy of this sort was intended the grain markets may confute it, for wheat has advanced to $1.14 for May delivery and corn is strong and higher at over a dollar for the cash article and 77 cents for December delivery. The advance in corn is the more remarkable in that it has followed the issuance of a government report indicating a crop of over 3,000,000,000 bushels, which will be the fourth largest in the history of the country.

The cotton market has also been somewhat paradoxical, for it has advanced notwithstanding the shut downs reported from New England. These shut downs are, however, in part explained by the state wide referendum that is to be held in Maine on Monday to determine whether the present 54-hour week shall be superseded by the 48-hour week as the legal minimum in the textile industry. The cotton manufacturers of New England are naturally opposed to a curtailment in the hours of labor, and their ostentatious pessimism is partially explained by their fear that the adoption of a 48-hour week in Maine would probably be followed by the enactment of similar legislation in Rhode Island and New Hampshire.

In the South the cotton mills are running at their full capacity and the dry goods markets are generally satisfactory, although their tone is perhaps a little subnormal as a result of the somewhat gloomy reports that emanate from New England.

In nearly all of its other aspects the outlook seems to be satisfactory. The car loadings for the week ended Sept. 29 show a new record for all time. The Federal Reserve Banks report a satisfactory trade turnover. Bidding at the fur auction held in St. Louis last week is described as spirited, with prices well above those of last year.

> "The President's optimism is endorsed by Secretary Hoover, who expressed himself as taking a very optimistic view of the situation, as well as by Secretary Mellon, who is quoted as believing that too much pessimism exists, particularly in Wall Street, over the business situation.....It is, however, evident that the condition of private business in Europe, Great Britain alone excepted, is better than most Americans, have been led to believe. ..... The investment demand for bonds and high class securities not actively traded in on the exchange is already improving."

A better demand in the steel industry is admitted. It is said to be due to larger orders from the railroads. Sugar and coffee have been steady at the advance in prices recently established, and the only commodities of importance that are lower are copper, oil and rubber. The decline in rubber is apparently due to a break in the Eastern plantation prices. The decline in oil, as the President points out, is attributable to the California production, and the best judges are coming to the conclusion that the persistent weakness of copper reflects the ability of the big companies to produce cheaply rather than to any contraction in the demand, which is suprisingly good. A well known trade authority points out that the inevitable result will be the elimination of the smaller producers and the practical control of the market by the large interests who own the more important mines in this country and South America.

Raw wool is firm and higher, both here and abroad, and no little surprise is expressed at the unusual export demand for American wool. The exports for the week ended Oct. 6 were over 1,000,000 pounds. The quantity is not large, but the fact that Europe is buying wool here is construed to indicate that the purchasing power of Europe is greater than was generally supposed. A similar conclusion is drawn from a report issued by the Department of Commerce which shows that during the eight months ended Aug. 31 our exports to Germany included 509,000 bales of cotton and 108,000,000 pounds of copper.

It is, however, a mistake to assume that all this cotton and copper were for consumption in Germany. Much of it represents transit goods shipped via Hamburg and Bremen for ultimate consumption in Czechoslovakia, Poland, Switzerland and even Russia. It is, however, evident that the condition of private business in Europe, Great Britain alone excepted, is better than most Americans have been led to believe, and as inflation seems to be bringing a certain sort of prosperity to most of the continental nations it is not surprising to read that a considerable party in Great Britain is now urging the government to resort to a policy of inflation there by way of relieving the depression and unemployment.

It is unlikely that any such policy will be adopted as long as the Conservatives are in power, but it is quite possible that a continuance of the present depression in British trade may force a resort to it. If this occurs America may be called upon to consider what will happen to trade on this side of the Atlantic if all the monetary gold in the world is sent here.

The weekly statement of the Federal Reserve System shows an increase of nearly $7,000,000 in the gold held and a memorandum issued by the Federal Reserve Board during the week points out that the gold in circulation has increased by $228,000,000 during the 12 months ended Sept. 30. The result is that the loan expansion now in progress has failed to work any reduction in the reserve ratio, which still stands at 76.1, and the ultimate effect may be a condition of gold inflation on this side of the Atlantic which political considerations would make it difficult to arrest before the Presidential elections of next year are held.

This possibility, though remote, is one that should not be lost sight of, and if it becomes an actuality then the lethargic stock market, which is now neglected, could hardly fail to reflect such a compelling influence in favor of higher prices.

The investment demand for bonds and high-class securities not actively traded in on the exchange is already improving and there are many who believe that the better tone apparent must soon find expression in a revival of speculation in the general list.

Plans for Meeting of Gear Manufacturers

The American Gear Manufacturers' Association will hold its seventh semi-annual meeting at the Mountain House, Lake Mohonk, N. Y., Oct. 25, 26 and 27.

A meeting of the executive committee is called for 10:30 on the morning of Oct. 25, but the first general session of the meeting will be at 1:45 p.m. when the new president of the Association, George L. Markland, Jr., of the Philadelphia Gear Works, will preside at the meeting.

Major Buckingham Will Speak

The routine business of the association, consisting of committee reports, election of new members, and other items of importance will occupy a good portion of the afternoon, followed by an address on "Analysis of Milled Gears" by Major Earl Buckingham, of the Niles-Bement-Pond Co., New York City.

No formal meeting of the association will be held on the evening of the opening day, this time being reserved for committee meetings.

The second general session will convene at 9:30 Friday, Oct. 26. In addition to reports from important committees, an address will be given by John Kottcamp, on "Training of Shop Executives."

At 12:00 noon, A. W. Copeland, of the Detroit Gear & Machine Co., will preside over a special meeting of the automotive group for the discussion of conditions in that industry.

The regular informal dinner of the association has been planned as a surprise and while no speaker has been announced, assurance is given that this event will equal if not surpass previous efforts. This dinner is scheduled for 6:30 p.m. Friday evening.

Evening Session

At 8:30 p.m. Friday the third general session will convene for an address by R. M. Hudson, Division of Simplified Practice, Chamber of Commerce of the United States, which will be followed by important committee reports.

The fourth and last general session of the meeting will be held at 9:30 Saturday morning, the principal address being on "New Applications for Gears," by E. W. Miller, of the Fellows Gear Shaper Co. of Springfield, Vt.

At noon George L. Markland, Jr., president of the association, and chairman of the industrial group, will discuss conditions of the industry with members of that group.

No program has been announced for Saturday afternoon, this time being at the disposal of the members for visitation, sight-seeing and play.

Many members of the association have signified their intention of bringing their wives and other members of their families to Lake Mohonk for this meeting.

Many Exhibitors at Power Show

The number, diversity and interest of the exhibits of the second exposition of Power and Mechanical Engineering promise to far excel those of the first exposition held in December, 1922. The 1923 exposition is to be held in the Grand Central Palace, New York City, from Monday, Dec. 3, through Saturday, Dec. 8.

The exhibits will be supplemented by an extensive program of moving picture films to be presented in co-operation with manufacturers. Last year the picture program was found to interest the layman who was not informed about technical processes and the engineer whose close application to one field of his work had not enabled him to keep up with progress in the rest of the profession.

About two hundred exhibitors have signed contracts for space at the exposition. The devices and apparatus to be exhibited cover the field of power and mechanical engineering from the handling of the coal at the power plant until power is turned into work in the factory.

Trade Catalogs

Grinding Machines. The Cincinnati Grinder Co., Cincinnati, Ohio. Cincinnati Universal grinding machines are minutely described and illustrated in this booklet which also contains blue print reproductions and interesting data on these machines.

Insulation. The Mitchell-Rand Manufacturing Co., 18 Vesey St., New York City. A well bound book of 160 pages entitled "Everything in Insulation" has been recently issued by this concern. It contains various styles of insulation for various jobs, has many tables of specifications and is altogether a valuable handbook for the shop.

Chain Hoists. The Motorbloc Corp., Summerdale, Philadelphia, Pa. Motor-driven chain hoists as used in the automobile repair shop, the body building factories, for use in lifting rolls of heavy paper, in machine shops, foundries and other places where the lifting of heavy materials is required are advocated in this folder. Details of design and construction as well as specifications are contained in the folder.

Welding and Cutting Apparatus. The Bastian-Blessing Co., 125-131 West Austin Ave., Chicago, Ill. The Rego line of cutting and welding tools as well as regulators, gages, cylinder manifolds, acetylene generators and accessories, are shown in this catalog.

Annular Ball Bearings. The Schatz Manufacturing Co., Poughkeepsie, N. Y. Diagrams of bearings and rollers, tables of r.p.m., various specifications and the uses of ball bearings are contained in this booklet. It is catalog No. 8 and the concern's product is trade named "Commercial."

Tool Holders. The Armstrong Bros. Tool Co., 317-357 North Francisco Ave., Chicago, Ill. A handy little booklet described as catalog B-23 containing descriptions, illustrations and specifications for all of the large line of tools made by this company has been issued.

Electric Furnaces with Internal Heaters. Automatic and Electric Furnaces, Ltd., 173-175 Farrington Road, London, E.C.1. This folder tells of the superiority of electric furnaces for industrial heat treatments.

Pulverized Fuel Systems. The Combustion Engineering Corp., Broad St., New York City. This is catalog L-1 in which is described the theory and the mechanical features of the powdered coal system. It is printed on dull coated stock in duo-tone ink and contains many illustrations.

Chucks. The Cushman Chuck Co., Hartford, Conn. Different types of chucks for various types of work are illustrated and described in a new booklet issued by this company.

Controller Valves. The Bristol Co., Waterbury, Conn. This is Bulletin No. 319, containing descriptions and illustrations of Bristol-Fuller controller valves for different uses.

Electric Hoists. The Detroit Hoist & Machine Co., Detroit, Mich. The large number of uses of electric hoists are detailed in this booklet and there are many illustrations both of parts of the machine and of the assembled machine in use.

Drill Sharpeners. The Sullivan Machinery Co., Chicago, Ill. This is bulletin No. 72-H issued in August by this company in which is described the processes of the machines made and the many advantages of using them.

Locomotive Hoists. The Whiting Corp., Harvey, Ill. Hoists for lifting locomotives and railroad cars are shown and described in a six-page folder that has been issued by this corporation.

Flexible Couplings. The Falk Corp., Milwaukee, Wis. The advantages of these Falk-Bibby flexible couplings together with diagrams and charts of specifications are to be found in the recent folder issued by this corporation.

Die-Castings. The Doehler Die-Casting Co., Brooklyn, N. Y. Data sheets, illustrations of the various uses of die casting, and a history of the process are to be found in this booklet.

Polyphase Induction Motors. The Burke Electric Co., Erie, Pa. This is bulletin 128 profusely illustrated and the details of construction told in the text.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Turbine, 110 volts, with complete switchboard, and also rheostat. Basse-Terre, Guadeloupe. Purchase. Reference No. 7917.

Machine for the manufacture of buckets from iron sheets by pressing, and the necessary driving unit. Benoni, Transvaal. Purchase. Reference No. 7921.

Power concrete mixers. Auckland, New Zealand. Agency. Reference No. 7936.

Builders' hoists or cranes. Auckland. Agency. Reference No. 7936.

General engineering supply lines. Durban, South Africa. Agency. Reference No. 7920.

Railway-workshop machinery. Adelaide, Australia. Purchase. Reference No. 7887.

Machine for manufacturing wire products. Bilbao, Spain. Purchase. Reference No. 7932.

Scientific apparatus for engineers, architects and others. Lille, France. Purchase and agency. Reference No. 7896.

Forthcoming Meetings

American Welding Society. Fall meeting. Oct. 24, 25 and 26. Fort Pitt Hotel, Pittsburgh, Pa.

Society of Automotive Engineers. Production meeting at Cleveland, Ohio. Oct. 25 and 26. Headquarters, 29 West 39th St., New York City.

American Gear Manufacturers Association. Fall meeting. Mountain House, Lake Mohonk, N. Y. Oct. 25, 26 and 27. T. W. Owen, secretary, 2,443 Prospect Ave., Cleveland, Ohio.

American Management Association. October 29, 30, and 31, Hotel Astor, New York City.

American Society of Mechanical Engineers. Annual meeting, Dec. 3 to 6, in New York City. Calvin W. Rice, 29 W. 39th St., New York City, secretary.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8. Headquarters, Grand Central Palace, New York City.

Society of Automotive Engineers. Annual meeting, Jan. 22 to 25, at the General Motors Building, Detroit, Mich. Coker F. Clarkson, 29 W. 39th St., secretary.

Foreign Trade Council. Eleventh annual convention at Boston, June 4, 5 and 6. O. K. Davis, India House, Hanover Square, New York City, secretary.

New and Enlarged Shops

Machine Tools Wanted

Ark., Brinkley—Dykes & Kelt—drill press and lathe for garage.

Fla., Ocala—E. Tucker—lathe and drill press for automobile repair shop.

Fla., Tampa—R. Moore, 412 East Michigan Ave.—bench tools, also pipe threading and cutting machine.

Ill., Chicago — Chicago, Burlington & Quincy R.R., 547 West Jackson Blvd., L. N. Hopkins, Purch. Agt.—one motor driven grinding machine.

Kan., Lawrence—Knowles Bicycle Shop, E. Knowles, Purch. Agt.—8 in. lathe.

Kan., Lawrence—C. W. Smith Motor Co.—8 in. lathe.

Mass., Boston—Boston Gear Wks., 256 Franklin St., address the purchasing agent—machine tools, etc., for proposed addition to plant.

Mass., East Walpole—Bird & Son Co.—equipment for proposed machine shop.

Mass., New Bedford—New Bedford Welding & Machine Co., 1 Rodman St.—machine shop equipment.

Mass., Worcester—Hyde Machine Co., 13 Hope Ave., address manager—equipment for proposed machine shop.

Mo., Cape Girardeau — F. A. Groves — lathe and drill press for automobile repair work.

Mo., Henley—O. S. Reaves—lathe for garage (used).

Mo., Kansas City—H. B. Vining, 1405 Waldheim St.—two drill presses, etc., for repair shop.

Mo., Russellville—Eberhardt's Garage, A. V. Eberhart, Purch. Agt.—drill press.

Mo., St. Louis—Miltons-Elkins Co., 2622 South 3rd St. (woodwork)—lathe, 20 in., short bed.

N. Y., Buffalo—S. Memel, 349 William St.—equipment for garage and repair shop at 35 Randall St.

N. Y., Buffalo—M. Williams, 405 Amherst St.—equipment for automobile and wagon repair shop.

N. Y., Mount Morris—Mount Morris Garage, State St.—small tools and equipment for garage and service station.

N. Y., New York—Pollack Conduit Co., 467 Greenwich St., A. Kipnis, Purch. Agt.—one No. 18 and two No. 19 Bliss presses.

O., Columbus—Shaffer Roofing Co., 272 West Broad St., W. A. Shaffer, Mgr.—metal working machinery for proposed $40,000 factory.

O., Kent—Doe Electric Device Co., 403 South Water St., W. S. Doe, Mgr.—machine tools, including two lathes, three drill presses and two grinders.

O., Youngstown—Republic Iron & Steel Co., Republic Bldg.—blacksmith shop equipment, also special machine shop machinery and equipment, to replace that which was destroyed by fire.

Okla., Cardin—Cardin Motor Co.—drill press and air tank for air compressor outfit.

Okla., Cardin—Tar River Mchy. Co.—large lathe.

Pa., Pittsburgh—Fawcus Machine Co., 2818 Smallman St.—one 24 in. internal grinder and one 24 in. automatic bevel gear.

Pa., Pittsburgh—Pittsburgh & Lake Erie R.R., Pittsburgh & Lake Erie Terminal Bldg., C. M. Yohe, Purch. Agt.—600 ton wheel press and 24 in. shaper.

Pa., Waynesboro—Frick Co. (manufacturer of ice machinery)—one 12 in. and one 60 in. throat punch.

Tex., Forth Worth—P. Garrett Motor Co., 13th and Burnett Sts.—lathe and drill press.

Tex., Rockdale—W. E. Gaither—lathe, drill press and burning in machine.

Va., Portsmouth—Southern Brake Shoe Wks.—drill press.

Va., Richmond—J. E. Stone, 608 East Clay St.—drill press for automobile repair work.

W. Va., Huntington—Hupmobile Garage—drill press and lathe.

Wis., Milwaukee—Stewart-Warner Products Service Sta., 582 Jefferson St.—automobile repair shop equipment, grinder, drill press, etc., for proposed $100,000 service station.

Ont., Bonnechere—Harturg & McIntyre—repair machinery, compressor, etc., for garage.

Ont., Moose Creek—C. Julliau—equipment for garage and repair shop.

Ont., Oshawa—Oshawa Ry., H. W. Cooper, Gananoque, Mgr. and Purch. Agt.—equipment for proposed car barn and repair shop, here.

Ont., Renfrew—McGarvey & Demarce, R. McGarvey, Purch. Agt.—automobile repair equipment, gasoline tanks and pumps.

Que., Lachute—T. McQuat & Son—hammers and shop equipment for foundry.

Que., St. Telesphore—O. Bourgon—lathe, etc., for blacksmith shop.

Que., Shawville—J. P. Wilson—automobile repair machinery.

Machinery Wanted

Ala., York—Rumley Planing Mill—circular saw, planer and mortising machine.

Calif., Los Angeles—Gonzales Townsite Co., Bank of Italy Bldg.—newspaper press, linotype, newspaper folder, belting, hangers and pulleys.

Calif., Millbrae — West Coast Porcelain Co., R. L. Dunn, 815 Battery St., San Francisco, Secy.—machinery and equipment for proposed $1,000,000 plant.

Conn., Hartford—Belemose Corp., Rocky Hill Section (manufacturer of artificial silk)—special machinery, looms and equipment for new plant.

D. C., Wash.—J. L. Kolb, 923 New York Ave., N. W.—equipment for steam laundry.

D. C., Wash.—Purchasing Clerk, Bureau of Engraving & Printing—receiving bids until Oct. 25 for four transfer presses and two automatic feeders.

Fla., West Palm Beach — H. Sharp—newspaper press, linotype and other equipment.

Ill., Chicago—Illinois Central R.R. Co., 135 East 11th Pl., J. J. Bennett, Purch. Agt.—one 300 lb. helve type power hammer.

Ill., Sparta—P. W. Randolph, Box 216—job printing press.

Ind., Jeffersonville—Quartermaster, United States Army—electric spot welding machine and rotating type sand blast barrel.

Ind., Marion—Elam Paper Co.—paper making machinery and equipment for proposed plant.

Ind., Sullivan—P. Poynter (newspaper)—intertype machine.

Kan., Lawrence—Hamilton Motor Co., J. Hamilton, Purch. Agt.—valve grinding machine.

Kan., Lawrence—Modern Shoe Shop, R. A. Beck, Purch. Agt.—power splitting gage.

Kan., Wichita—Missouri Central Type Fdry., 705 East Murdock St.—two diamond presses.

Ky., Louisville—Office of United States Engineer, P. O. Box 72—one pneumatic drift bolt driver for bolts up to 1¼ in. diameter and 10 ft. long.

Ky., Pikeville—Cumberland Publishing Co.—pony cylinder press.

Ky., Tompkinsville—Palmore & Emmert—sawmill and planer knives, etc.

Me., Belfast—Bd. Educ.—machinery for manual training department of high school.

Mass., Boston—Jennison Extract Co., 2 Central Wharf—sifting, grinding and mixing machinery.

Mass., Boston—J. J. Smith, 15 School St.—concrete block machine and mixer (used).

Mass., Cambridge—Lally Column Co., Erie St. (iron and steel products)—gate shear to handle material up to 1½ x 16 in. (used).

Mass., Canton—Massachusetts Hospital School—complete laundry machinery and equipment.

Mass., Franklin — Bd. Educ. — manual training equipment, including lathes, planer, matchers, mortisers, saws, tables, small tools, pulleys, belting and shafting, for new high school.

Mass., Northampton—Bd. Educ.—manual training equipment, including, lathe, planer, matcher, saws, tables, belting, pulleys and shafting, for new grammar school.

Mass., Oxford—Bernon Mill, address the manager—several looms for woolen mill.

Mass., Palmer—Palmer Journal Co.—folder for circular work.

Mass., Shirley—Shirley Mills, address the manager—four or five wool pickers.

Mass., Stoneham (Boston P. O.)—School Com.—machinery for manual training department of proposed $275,000 high school.

Mass., Woburn—Tribble Cordage Co., Union St.—machinery for the manufacture of rope, to replace that which was destroyed by fire.

Mass., Worcester — Rice-Barton-Fales Co., Taintor St.—machine for bending brass, copper and aluminum sheets.

Mich., Detroit — J. F. Lamb Co., 1938 Franklin St.—two crank shapers (used).

Mich., Detroit—Michigan Stamping Co., 11631 Mack Ave.—miscellaneous equipment for proposed $75,000 addition to factory for making metal stampings.

Mo., Caruthersville—J. R. Hutchinson—complete equipment for excelsior mill.

Mo., Fair Play—E. C. Hadley & Son—newspaper press and job press.

Mo., Jefferson City—Daily Post—paper cutter.

Mo., Joplin—E. E. Skelton, 108 Main St. (cabinet maker)—bandsaw.

Mo., Joplin—Walker's Gospel Messenger, 926 Main St., C. C. Walker, Purch. Agt.—linotype, Miller feeder and printing press.

Mo., Kansas City — M. A. Nevins, 1250 Tracy Ave.—combination woodworker.

Mo., Russellville — Central Missouri Leader, R. H. Parks, Purch. Agt.—8 x 12 in. job printing press.

Mo., St. Louis—B. Field, P. O. Box 1469 buffing machine and leather cutting wheel.

Mo., St. Louis—Schmidt Bros., 4371 Laclede Ave. (automobile repairs, etc.)—welding and cutting outfit.

Mo., St. Louis — F. E. Vrooman, 1122 Hickory St.—two tanks and pumps, air outfit, etc., for oil filling station.

N. H., Newmarket—School Com.—manual training equipment for new high school.

N. M., Portales—L. J. Whiteman—job printing press.

N. Y., Bergen—G. R. Erlwin, Lake St.—ovens and equipment for bakery, to replace that which was destroyed by fire.

N. Y., Bliss—Bliss Printing Plate Co., Inc., L. F. Uttley, Purch. Agt.—machinery and equipment for printing, engraving and lithographing plant.

N. Y., Buffalo—C. & C. Candy Co., 331 14th St.—candy making equipment.

N. Y., Buffalo—J. O. Guercio, 312 Front Ave.—equipment for macaroni factory.

N. Y., Geneva—W. L. Packard, Border City—linotype, perfecting, 2 revolution and job printing presses.

N. Y., Horseheads—Dairymen's League, address manager — equipment, including shafting, hangers, pulleys, milk cooling machines, evaporators, etc., for proposed station.

N. Y., Jewettville—Jewettville Clay Products Co.—machinery and equipment for the manufacture of brick and clay products, to replace that which was destroyed by fire.

N. Y., Niagara Falls—Union Carbide Co., Union St.—special machinery and equipment for addition to plant.

N. Y., Niagara Falls — Wicker Lumber Co., Main and Lockport Sts., G. M. Wicker, Purch. Agt.—lumber mill and dry kiln machinery and equipment.

N. Y., Whitehall—Whitehall Times—7 or 8 column flat bed press.

N. C., Reidsville—F. P. Turner—machinery for the manufacture of name and automobile plates.

O., Ashtabula—Star-Beacon (newspaper)—stereotype saw for electric motor attachment.

O., Columbiana—Columbia Tire & Rubber Co., P. Schultz, Mgr.—machinery and equipment, including shafting, hangers, belting, etc., for plant at Mansfield.

O., Columbus — Columbus Woodworking Co., 2034 Leonard Ave., W. A. Slatter, Pres.—machinery to enlarge plant.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Iron and Steel—Pig-iron sales dropped to half of usual volume. Consumers purchasing on basis of month to month requirements. Japan will need about 60,000 tons of galvanized steel sheets; Japanese buying on strictly competitive basis, hence, several large steel orders placed in Germany. Steel plates firm at $2.50 per 100 lb., Pittsburgh, with reports of shading to $2.40 in certain instances. Structural market quiet but with no evidence of weakness; quotations holding firmly at $2.50. Bars firm at $2.40 base. Rest of steel list firm with exception of shading in black sheets and decline in iron and steel scrap.

Declines—Copper at lowest price reached in more than a year; dropped ⅝c. per lb. in week. Tin down 1½c. per lb. in New York; antimony, ¼c., since last week. Copper sheets declined ½c. per lb. in Cleveland; old metals (non-ferrous) also lower. Drop of about 25c. per ton on furnace coke at Connellsville.

No advances reported.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$26.05
Northern Basic	25.00
Southern Ohio No. 2	25.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	29.00
BIRMINGHAM	
No. 2 Foundry	23.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	25.25
Virginia No. 2	29.17
Basic	25.00
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	25.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	28.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	26.77
Basic	26.77
Bessemer	27.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.95	4.45	5.05
Nos. 22 and 24.	3.75	5.00	4.50	5.05
Nos. 25 and 26.	3.80	5.05	4.55	5.10
No. 28	3.85	5.15	4.65	5.20
Galvanized	**Pittsburgh**	**New York**	**Cleveland**	**Chicago**
Nos. 10 and 11.	4.00	5.15	4.70	5.35
Nos. 12 and 14.	4.10	5.25	4.80	5.45
Nos. 17 and 21.	4.40	5.55	5.10	5.75
Nos. 22 and 24.	4.55	5.70	5.25	5.90
No. 26	4.70	5.85	5.50	6.05
No. 28	5.00	6.15	5.80	6.35

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	62	50½	¾ to 1½	30	13
LAP WELD					
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	28	13
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	60	49½	¾	28	12
2 and 3	61	50½	1 to 1½	30	14
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold drawn shafting or screw	4.65	3.90	4.55
Cold drawn flats, squares	5.15	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 5/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			13.37½
Tin, 5-ton lots, New York			42.00
Lead (up to carlots), St. Louis	6.60	New York	7.37½
Zinc (up to carlots), St. Louis	6.20	New York	6.70

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.50	27.00	25.50
Antimony (Chinese), ton spot	8.50	10.50	.....
Copper sheets, base	21.25	21.50	23.00
Copper wire, base	15.50	18.75	16.25
Copper bars, base	19.75	22.00	19.50
Copper tubing, base	24.00	27.00	23.00
Brass sheets, base	17.50	21.75	18.75
Brass tubing, base	22.50	27.00	20.50
Brass rods, base	15.25	17.75	15.75
Brass wire, base	18.00	21.75	.....
Zinc sheets (casks)	10.25	10.45	.....
Solder (½ and ½), (case lots)	29.50	29.00	.....
Babbitt metal (83% tin)	52.00	53.50	.....
Babbitt metal (35% tin)	25.00	17.50	.....
Nickel (ingot and shot)	29.00	.....	.....
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.75	11.50	12.00
Copper, heavy, and wire	10.75	11.00	11.25
Copper, light, and bottoms	9.50	9.00	10.25
Lead, heavy	5.75	5.25	5.75
Lead, tea	4.75	4.00	4.75
Brass, heavy, yellow	7.00	....	7.25
Brass, heavy, red	8.75	9.25	9.00
Brass, light	6.25	5.00	6.50
No. 1 yellow brass turnings	7.00	5.75	7.00
Zinc	3.75	2.75	4.00

TIN PLATES—American Charcoal—Bright—Per box.

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 20x28, 112 sheets	$25.10	$22.85	$18.50
"A" Grade:			
IC, 20x28, 112 sheets	21.40	18.00	17.00
Coke Plates—Primes, 20x28 in.			
100-lb., 112 sheets	14 00	13.00	14.50
Terne Plates—Small lots, 8-lb. Coating			
IC, 14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13¼x13¼, per lb.	11.00	56.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	.98	1.02	1.14
White lead, dry or in oil	100 lb. kegs.	New York, 14.00	
Red lead, dry	100 lb. kegs.	New York, 14.00	
Red lead, in oil	100 lb. kegs.	New York, 15.50	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.00@4.25	
Coke, prompt foundry, Connellsville	per net ton	5.00@5.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40-10%	50-10%	45-5%
1½ and 1¼x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	25-10%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30-10%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	40-10%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30-10%	45%	40-5%
Bolt ends, with hot pressed nuts	40-10%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 9/16 and smaller	60%	.....	....
Semi-finished nuts, ⅝ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.. ....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	3 50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	0.50	2.75	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	50-10%	50-10%	60%
Rivets, tinned	50-10%	50-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1½ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30-10%	30-10%	30-10%
Heavy grade	20-5-2½	30%	20-5-2½%
Rubber and duck:			
First grade	.50-10-5%	50-10%	40-10%
Second grade	60-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20

O., St. Clairsville—Amer. Zinc Co.—machinery for proposed addition to sulphuric acid plant for the manufacture of paint and linoleum.

O., Sidney—Carothers Candy Co., W. R. Carothers, Purch. Agt.—machinery and equipment for new plant.

O., Wellston—Wellston Mfg. Co.—5 ton electric hoist, 220 volt, 60 cycle, 2 phase.

Okla., Cardin—Coyne Lumber Co.—wood lathe, Universal combination saw and belt sander.

Okla., Picher—G. W. Fuller—tire shrinker for blacksmith shop.

Okla., Tulsa—J. Bradford, 818 South Columbia St.—gasoline pump, tube pump and air compressor.

Pa., Pittsburgh—W. J. Early Sons Co., 812 Sarah St. (iron foundry), J. W. Early, Genl. Mgr.—two 15 ton cranes, 70 ft. span.

Pa., Pittsburgh — Seldon Chemical Co., McCartney and Independence Sts.—compressors and equipment to replace that which was destroyed by fire.

Pa., Wayne Junction (Phila. P. O.)—J. Dyson, Cope's Mill—forty or fifty Clipper revolving box looms.

R. I., Central Falls (Pawtucket P. O.)—Bd. Educ.—machinery for manual training department of proposed high school.

S. C., Chester—T. L. Eberhardt, R. F. D. 3—complete brick making machinery.

S. C., Gaffney—Globe Mfg. Co., address manager—about 200 looms for cotton mill.

S. C., Greenville—Hunt & McKnight—cylinder press, job press and paper cutter.

S. D., Ipswich—W. L. Johnson—job printing press.

Tenn., Nashville—Turner, Day & Woolworth Handle Co., Inc., 1404 Adams St.—equipment for proposed $100,000 factory, to replace that which was destroyed by fire.

Tex., Dallas—Egan Printing Co., 912-14 Ross Ave.—combination woodworking machine.

Tex., Dallas—First Texas Chemical Mfg. Co., 1814 North Lamar St., W. H. Madden, Purch. Agt.—job press and Miller feeder.

Tex., Dallas—The Printer, 130 West 9th St.—job printing press with electric motor.

Tex., Dallas—A. Steinhaus, 4702 Worth St.—newspaper and job presses.

Tex., Tyler—Tyler Printing Calendar Co.—wire stitcher and multiple punch.

Va., Ashland—Hanover Promoter—one linotype machine.

Va., Purcellville—Blue Ridge Herald—cylinder press, job press and paper cutter.

Va., Richmond—Hackley Morrison Co., 1708 Lewis St.—mounted gasoline air compressor, 150 ft. capacity; coal elevator for unloading cars.

Wash., Spokane—A. R. Gross, 807 Ash St.—newspaper press.

W. Va., Harrisville—Gazette— 7 column newspaper press.

Wis., Appleton—Fox River Tractor Co., Rankin St.—machinery for the manufacture of silo filling devices.

Wis., Barton—Bd. Educ., R. Kocher, Secy.—woodworking and manual training equipment for proposed high school.

Wis., Doylestown—Wuetrich Bros.—special machinery and equipment for proposed $40,000 factory for the manufacture of milk products at Astico.

Wis., Horicon—Davies Shoe Mfg. Co.—shoe making machinery, cutters, etc., for proposed $50,000 factory.

Wis., Kenosha—Kenosha Fruit Co., 452 Pearl St.—refrigeration machinery for proposed $50,000 warehouse.

Wis., La Crosse—Lehmann's Tire Service, 127 North 3rd St.—large tire press.

Wis., La Crosse—Mashak & Schwalbe, 326 South 5th St.—air compressor, emery wheel, stand, gasoline storage tank and pump for proposed $45,000 garage.

Wis., La Crosse—L. McCarty, 6th and Cass St. (automobile repairs)—emery wheel, stand, electric drill and chain hoist.

Wis., Ladysmith—W. E. Thompson (sawmill)—large band saw, re-saw, belting and shafting.

Wis., Merrill—Gerke Concrete Block Co.—miscellaneous machinery and equipment for the manufacture of blocks.

Wis., Milwaukee—Koehring Co., 31st St. and Concordia Ave.—electric crane.

Wis., Milwaukee — W. C. Maronn, 724 Muskego Ave.—candy making machinery, including dippers, beaters, mixers and coating machines, all equipped with individual motors.

Wis., Milwaukee—Milwaukee Electric Ry. & Light Co., Public Service Bldg.—chain hoist for proposed garage.

Wis., Milwaukee — Milwaukee Woodwork Mfg. Co., 3320 Fond du Lac Ave., F. Groose, Purch. Agt.—matcher and planer.

Wis., Milwaukee—Raab Motor Co., 3701 Lisbon Ave., F. Raab, Purch. Agt.—one 2 ton hoisting crane for garage.

Wis., Milwaukee—Schmitt-Orlow Co., 256 South Water St.—20 to 30 in. bandsaw.

Wis., Milwaukee—Thorner Heat Treating Co., 126 Ferry St.—special furnaces for proposed $40,000 plant.

Wis., Milwaukee—H. Weisner, 1433 Prairie St.—air compressor, gasoline storage tank and pumps for proposed $40,000 garage.

Wis., Plymouth—Plymouth Phonograph Co.—glueing machinery and dovetailers for proposed $45,000 factory.

Wis., Spring Green—Spring Green Canning Co., c/o W. P. McDonnell—canning machinery, sealers, testers, etc., for proposed $50,000 factory.

Wis., Stanley—Stanley Baggage Co., P. A. Fein, Pres.—machinery for the manufacture of leather bags, suit cases, etc.; also metal working, stamping machinery, etc.

Wis., Wauwatosa — Economy Block Co., 7th and East North Aves. (manufacturer of concrete building blocks), A. Schwalke, Purch. Agt.—tamping machine, electrically driven.

Ont., Alexandria—R. MacDonald—portable drilling machine, etc., for garage.

Ont., Alexandria—A. Marleau—chain hoist, bench tools, etc., for garage.

Ont., Cobden — A. F. Buttle — emery grinder, small tools, etc., for garage.

Ont., Green Valley — J. Emburg — tire shrinker, etc., for blacksmith shop.

Ont., London—Carling Export Brewing Co., Talbot St., H. Low, Mgr.—equipment for the manufacture of soda water, ginger ale and soft drinks.

Ont., Niagara Falls—Christie Co., Murray St.—special machinery, shafting, hangers, pulleys, etc., for new $60,000 plant.

Ont., Ottawa—Calders Canada, Ltd., A. McDougall, Purch. Agt.—complete equipment for tie creosoting plants at Cochrane and Quebec.

Ont., Ottawa—Dept. of Public Wks., R. C. Desrochers, Secy.—equipment for ore dressing laboratory.

Ont., Peterboro—Canadian Watercraft, Ltd., J. E. Grivell, Purch. Agt.—complete equipment for building boats, scows, barges, etc.

Ont., Toronto—Canadian Packing Co., 3 Bathurst St.—cold storage equipment, etc., for proposed $1,000,000 meat packing house.

Ont., Vankleek Hill—Taylors Bros.—foundry equipment, presses, etc.

Que., L'Islet—N. Leclerc—circular saw, etc., for sash and door factory.

Que., Montreal—Mount Royal Metal Co., Ltd., J. E. Grivell, 3311 Lanorie St., Purch. Agt.—brass and iron foundry equipment.

Que., Montreal—A. Racine, 1990 St. Dominique St. (manufacturer of automobile bodies and carriages)—vulcanizing and welding equipment.

Que., Pont Rouge—Supreme Fdrys., Ltd.—squaring shear with open gap for 12 gage sheet; 63 in. folder for 20 gage; one slip form roller 60 in. for 24 gage.

Que., St. Jerome—T. Larose—saws, planers, etc., for sash and door factory.

Que., St. Malachie—L. Bissonnette—gasoline tank, pump and free air equipment for garage.

Que., Shawbridge—Foisy & Hotte—equipment for sash and door factory.

Sask., Swift Current—Van-Kel Cleansers, Ltd., J. A. Caulder, Moose Jaw, Purch. Agt.—machinery for the manufacture of artificial stone and articles made from Kisselguhr clay and tripolite.

Metal Working Shops

Conn., Hartford — The Hanson Whitney Mfg. Co., 169 Bartholomew Ave., awarded the contract for the construction of a 2 story, 50 x 80 ft. factory for the manufacture of machinery. Estimated cost $40,000.

Conn., South Manchester — H. Stephens awarded the contract for the construction of a 1 story (ultimately 3 story), 60 x 90 ft. garage on Center and Knox Sts. Estimated cost $40,000.

Conn., Stamford—H. H. Noack, Forest St., awarded the contract for the construction of a 2 story, 40 x 125 ft. garage on East Main St. Estimated cost $60,000.

Ill., Chicago—The Hudson Motor Co. of Illinois, 2220 South Michigan Ave., awarded the contract for the construction of a 1 story, 100 x 125 ft. garage on Ogden St. near Harding St. Estimated cost $50,000.

Ill., Chicago—The Madison Realty Co., 123 West Madison St., awarded the contract for the construction of a 1 story, 75 x 110 ft. automobile sales and service station at 2482-86 Milwaukee St. Estimated cost $100,000.

Ill., Chicago—H. P. Reger, 128 North La Salle St., is having plans prepared for the construction of a 1 story, 100 x 200 ft. garage at 1939-47 South Chicago Ave. Estimated cost $80,000. Hall, Lawrence, Rippel & Ratcliffe, 123 West Madison St., Archts.

Ind., Indianapolis — S. Bingham's Sons Co., 151 Kentucky Ave., manufacturer of printers' rollers, awarded the contract for the construction of a 2 story, 50 x 200 ft. factory on Alabama and Merrill Sts. Estimated cost $100,000.

La., Monroe—The Magnolia Carbon Co. is building a gasoline and carbon manufacturing plant, including machine shops, etc. Estimated cost $750,000. V. M. Davis, Ruston, Pres.

Mich., Detroit—The Columbia Motor Co., 6501 Mack Ave., is having plans prepared for the construction of a 1 story addition to its automobile factory on Charlevoix Ave. Estimated cost $100,000. Private plans.

Mich., Detroit—The Great Western Smelting & Refining Co., Russell St., awarded the contract for the construction of a 1 story, 193 x 208 ft. foundry and warehouse. Noted Sept. 27.

Mich., River Rouge (Detroit P. O.)—The Ford Motor Co., Highland Park, will soon award the contract for the construction of 1 story, 94 x 1,320 ft., 100 x 420 ft., 100 x 420 ft. and 100 x 620 ft. steel mill buildings, here. A. Kahn, 1000 Marquette Bldg., Detroit, Archt. Noted June 14.

Minn., St. Paul—The Ford Motor Co., Highland Park (Detroit P. O.), is having plans prepared for the construction of a 1 story, 606 x 1,726 ft. automobile assembly plant and factory, here. A. Kahn, 1000 Marquette Bldg., Detroit, and Stone & Webster Co., 147 Milk St., Boston, Mass., Archts.

N. J., Kearny—The Western Electric Co., 195 Bway, New York, will build a plant for the manufacture of telephone cables, here.

N. Y., Astoria (Long Island City P. O.)—The Polachek Bronze & Iron Co., 480 Hancock St., will soon award the contract for the construction of an addition to its plant. Estimated cost $120,000. J. M. Berlinger, 469 7th Ave., New York, Engr. and Archt.

N. Y., Brooklyn—The Sanlif Realty Co., c/o E. M. Adelsohn, Engr. and Archt., 1778 Pitkin Ave., will build a garage on Van Sinderen Ave. Estimated cost $50,000.

N. Y., Long Island City—The W. F. Kenny Co., 44 East 23rd St., New York, will build a 2 story, 75 x 200 ft. garage on Lawson St., here. Estimated cost $80,000.

N. Y., Rochester — The R. J. Strasenburgh Co., Exchange and Troup Sts., manufacturer of chemical and surgical instruments, plans to build a 4 story, 60 x 80 ft. addition to its plant. Estimated cost $50,000. Engineer or architect not announced.

O., Cleveland—The Miller-Becker Co., c/o I. Miller, 6411 Central Ave., awarded the contract for the construction of a 2 story, 50 x 135 ft. garage on Central Ave. and East 65th St. Estimated cost $60,000.

O., Cleveland—H. F. Neighbors, Bulkley Bldg., awarded the contract for the construction of a 1 story, 100 x 200 ft. garage at 1826 East 24th St. Estimated cost $50,000.

O., Cleveland — C. W. Schaefer, Society for Savings Bldg., awarded the contract for the construction of a 1 story, 62 x 103 ft. garage at 1410 West 55th Pl. Estimated cost $40,000.

O., Rocky River—The River Garage Co., 1183 Cook Ave., awarded the contract for the construction of a 1 story, 15 x 225 ft. garage on Blount St. Estimated cost $40,000.

Pa., Johnstown—The Penn Overland Co., 713 Railroad St., plans to build a 3 story, 85 x 120 ft. garage, service station and show room on Central Ave. Estimated cost $100,000. N. K. Gougeon, Mgr.

Pa., Parkview (Pittsburgh P. O.)—The Bd. of County Comrs., Court House, Pittsburgh, is having plans prepared for the construction of a 2 story, 70 x 330 ft. work shop, here. Estimated cost $200,000. Private plans.

Pa., Phila.—The Ford Motor Co., Highland Park (Detroit P. O.), will soon award the contract for the construction of a 1 story, 400 x 920 ft. automobile assembly plant on 63rd St., here. A. Kahn, 1000 Marquette Bldg., Detroit, Archt.

Wis., Elkhorn—G. A. Van Velzer, Williams Bay, plans to build a 2 story garage and repair shop on Wisconsin St., here. Estimated cost $40,000. Engineer or architect not selected.

Wis., Milwaukee — R. Plapinski, 614 Mitchell St., awarded the contract for the construction of a 1 story, 47 x 120 ft. garage on 8th Ave. Estimated cost $40,000.

Wis., Neillsville—O. Lerverenz will build a 50 x 60 ft. garage, repair shop and filling station. Estimated cost $40,000.

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Recent Developments in Precision Bench Tools

By B. A. BEHREND
Consulting Engineer, Boston, Mass.

More extensive use of bench machines advisable—Tools described here are in use in the author's mechanical laboratory — First article of a short series

THE rapid development of large machine tools, stimulated tremendously by the necessities and requirements of the great war, has overshadowed the interest in small machine tools, usually mounted on benches, which twenty years ago held a most prominent part in the tool room and in the workshop. The great perfection in the development of the large tools has led to their installation and use where formerly bench tools might have been used, and thus it is not surprising that little improvement has been effected in the bench tools within the last twenty years. We still find the identical designs which were so ably worked out by the pioneers in the field, among whom must be mentioned particularly Ambrose Webster and John Whitcomb, George F. Ballou, Edward Rivett, F. W. Derbyshire, John Stark, E. L. Sanderson, B. C. Ames and Franklin Hardinge. Surely, there are not now as many bench tools in use as there should be, considering their broad applicability.

In connection with precision laboratory work, the writer felt long ago the need of tools better adapted to modern requirements unless recourse was to be had to the large and heavy tools, which have been so admirably developed. Perhaps no finer tools have been devised than the high-grade universal milling machines and tool room lathes, but they are large and heavy tools, and frequently it is impracticable for the experimenter and designer to avail himself of these machines. Furthermore, for small work they are out of proportion to the size of the work which can be done to better advantage on bench tools. To increase the utility of the bench tools the writer proceeded to develop new attachments and improvements for three lines of machines, viz.:

The bench lathe
The screw-cutting bench lathe
The bench milling machine

In the order cited, there will be given a description of the new tools as illustrated by the halftones.

The bench lathe is essentially a speed lathe. Thus, it is particularly well adapted to small work where a large number of revolutions of the spindle is desirable. It is equally well adapted to grinding purposes on account of the ease with which the spindle can be turned over rapidly.

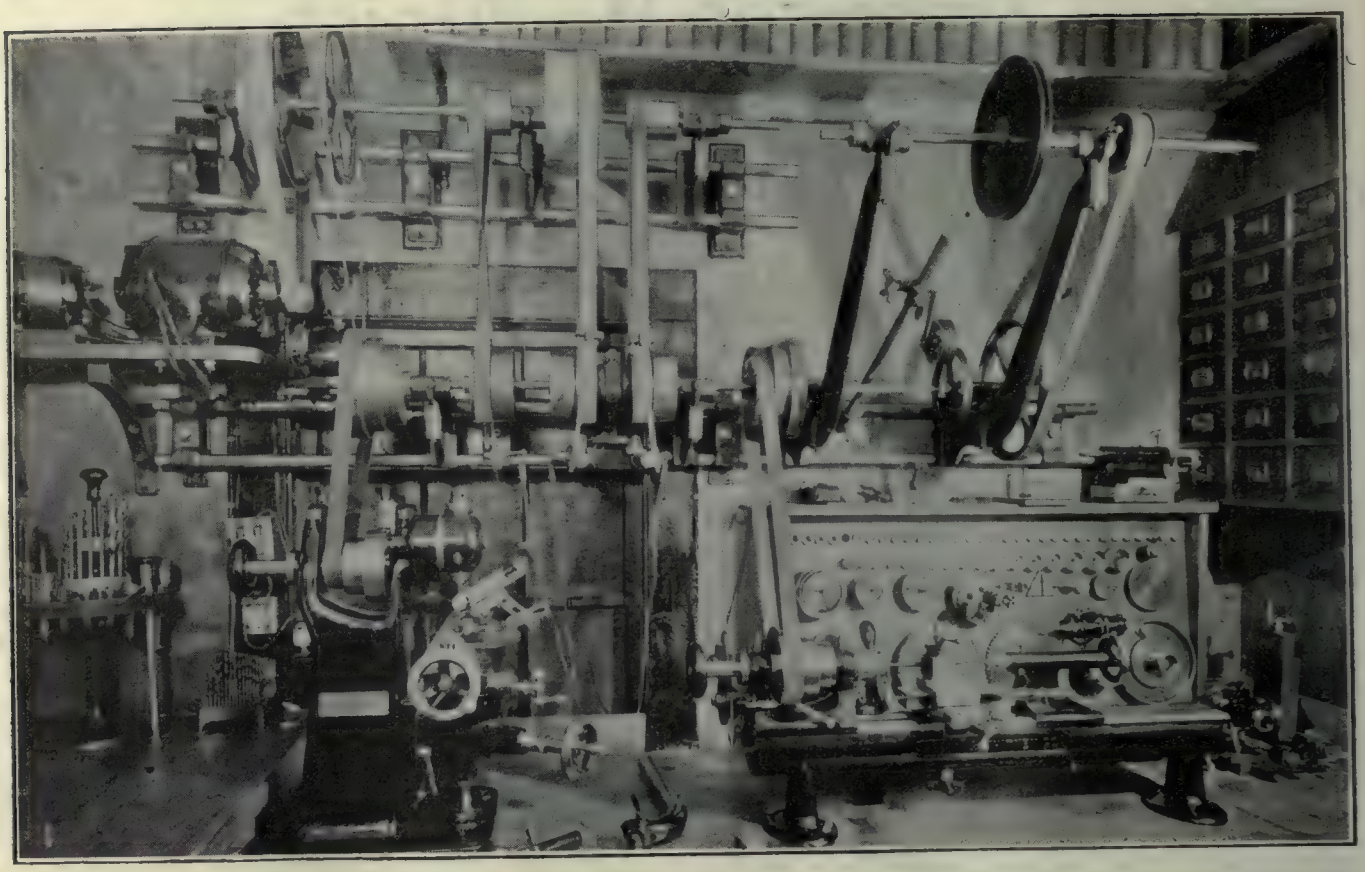
But it would be an error to assume that a great advantage may not be derived from the ability to turn the spindle over slowly, if this could be effected, especially for work of large diameter.

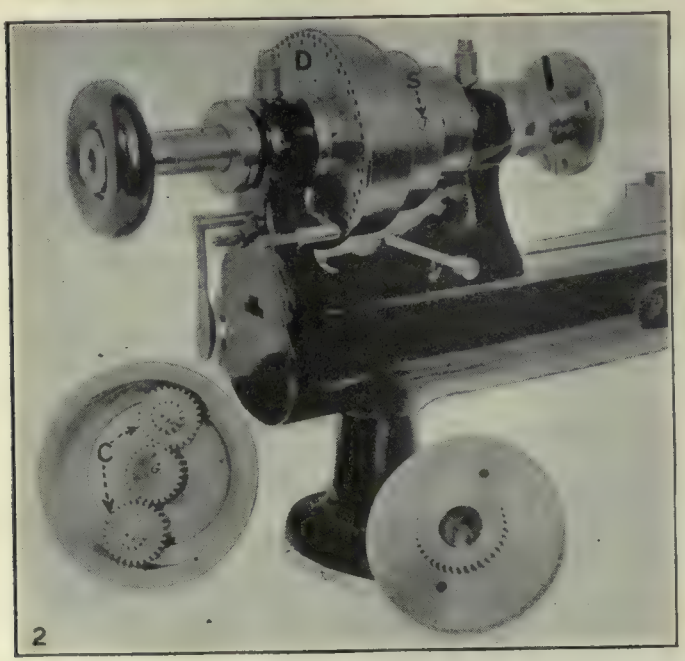
In Fig. 1 there is illustrated the setting-up on a bench in the writer's laboratory of a bench milling machine, with swivel table and over-arm and a bench lathe. Both the milling machine and the lathe were built by the Pratt & Whitney Co. The photograph shows the different chuck-stands for holding the collets and arbors, and particular attention is called to the neat arrangement of the collets and attachments on a chuck-board, mounted against the wall, an idea of E. L. Sanderson, of the Waltham Machine Works.

Details of Bench Milling Machine

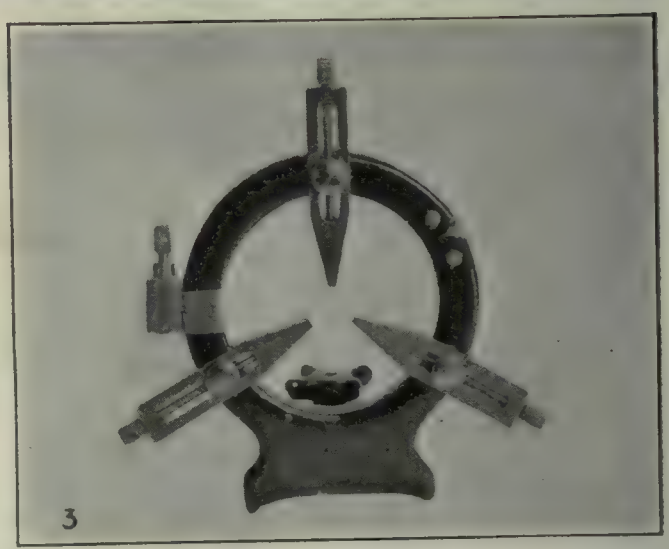
The drive consists of one single-phase motor, belted to the jackshaft, and from it to a countershaft, as is clearly shown. There are supplied two speeds forward, and one speed reverse, in addition to the three-step cones. The bearings are mounted on Pratt & Whitney wall rods, and can be shifted into any position desired. A wooden disk pulley for driving the grinding attachment and other attachments requiring a separate overhead drive, like the Elgin slotting attachment shown in the picture, and to be described later, is supplied with an ingenious self-locking scheme, devised by the Stark Tool Co. It consists of a small steel roller in a groove, which locks the pulley when turned in a forward direction. If the pulley is turned backward, it is unlocked, and can be shifted easily along its shaft, so as to be in the position required for driving the attachment on the bench lathe.

The speed reduction of the main spindle is accomplished by means of a set of compound gears, as shown in Fig. 2, built directly into the cone pulley. These back gears, executed by the Waltham Machine Works,

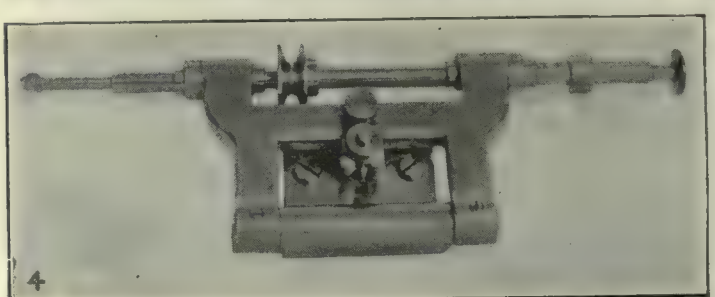




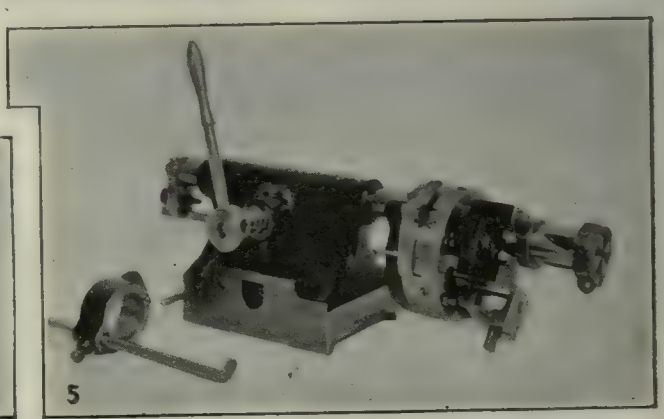
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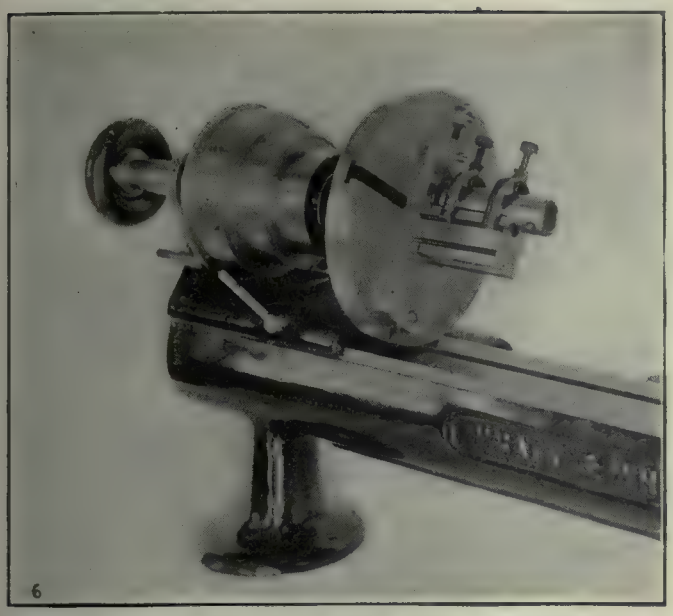


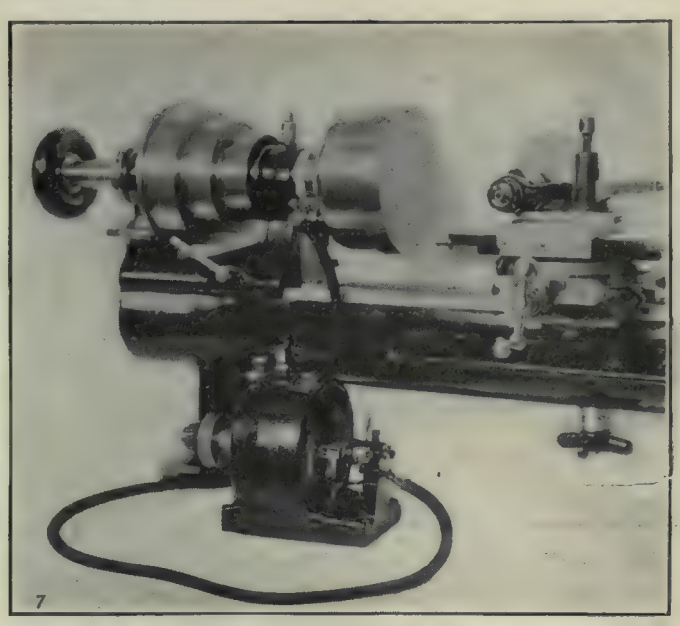
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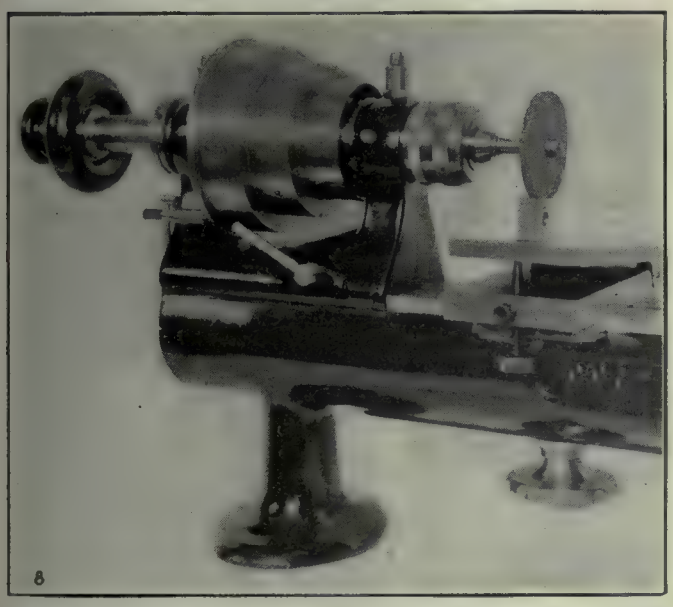


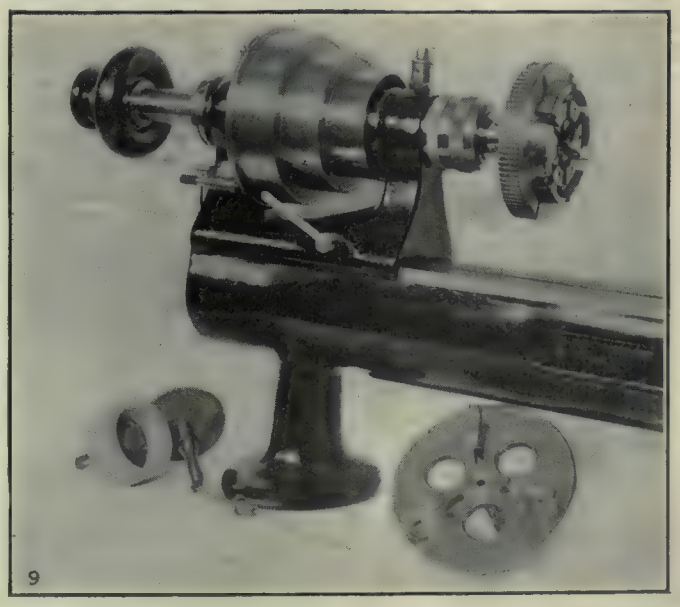
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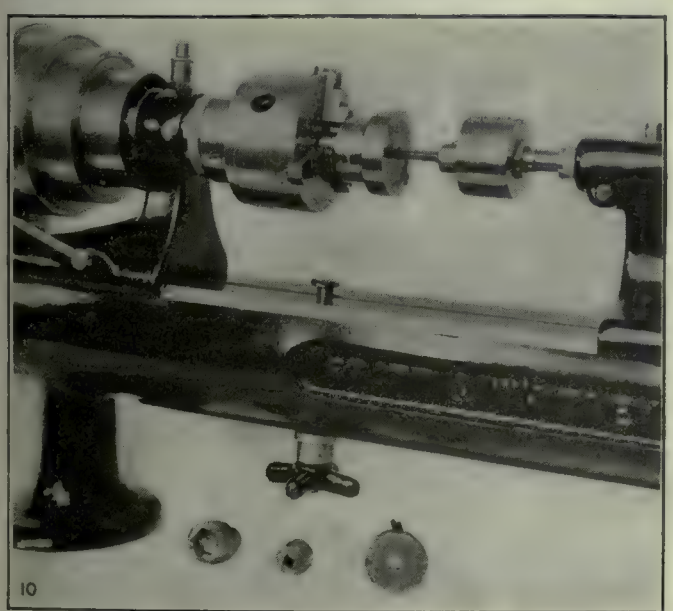
FIG. 1—PRATT & WHITNEY UNIVERSAL MILLING MACHINE AND BENCH LATHE. FIG. 2—BACK-GEARED HEAD OF BENCH LATHE. FIG. 3—IMPROVED STYLE OF BACK-REST FOR BENCH LATHE. FIG. 4—SLIDE REST GRINDING ATTACHMENT OF WALTHAM MACHINE WORKS. FIG. 5—PRATT & WHITNEY RACK AND PINION TAILSTOCK. WITH AMES TURRET FIXTURE AND INDIVIDUAL STOPS


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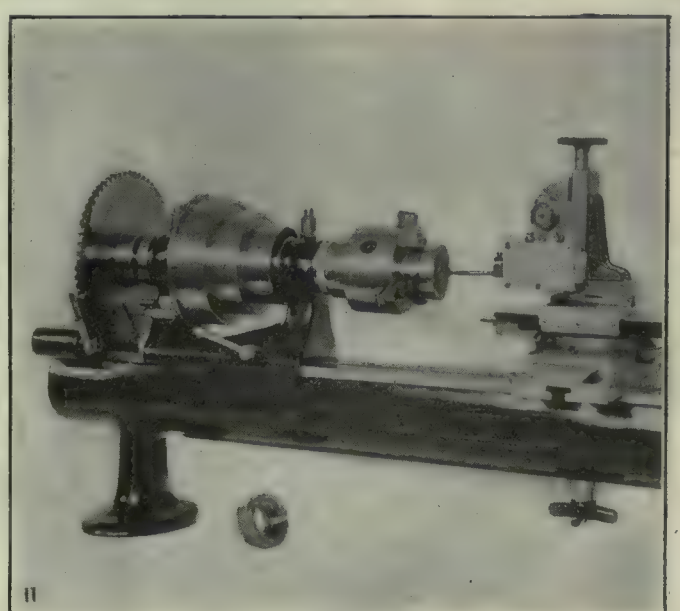
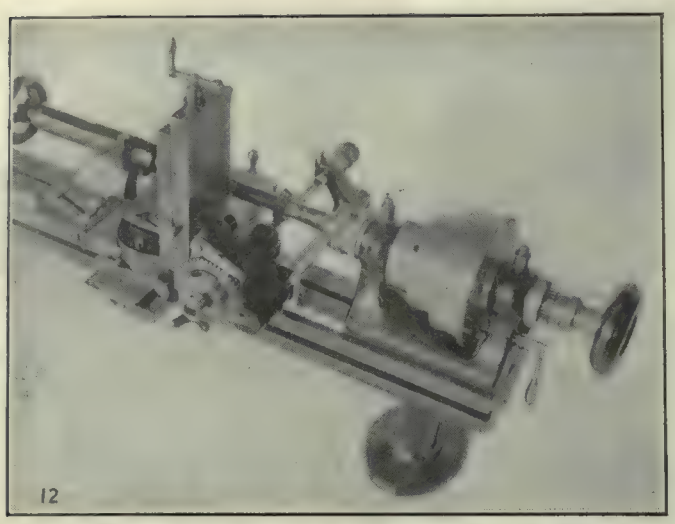

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FIG. 6—ECCENTRIC TURNING FIXTURE. FIG. 7—MAGNETIC CHUCK AND EXCITING DYNAMO. FIG. 8—TABLE FOR GRINDING PARALLEL SURFACES. FIG. 9—BEZEL CHUCK AND UNIVERSAL WATCH-TOOL FACE PLATE MADE BY F. W. DERBYSHIRE. FIG. 10—DRILLING SQUARE AND HEXAGONAL HOLES WITH WATTS TOOLS. FIG. 11—ELGIN SLOTTING ATTACHMENT MOUNTED ON PRATT & WHITNEY BENCH LATHE



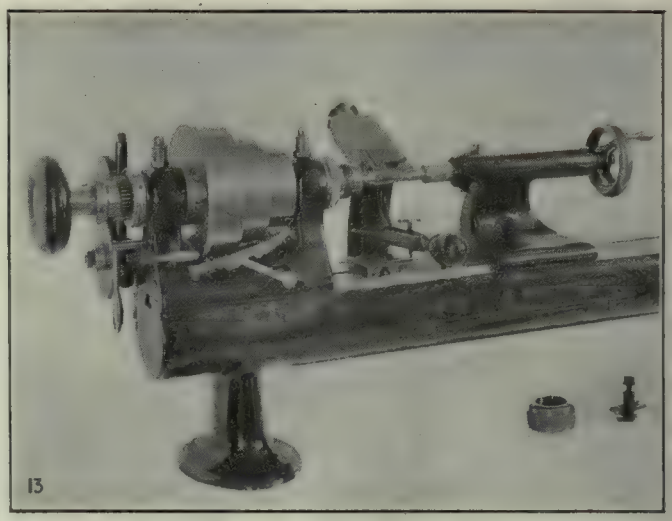


FIG. 12—MILLING ATTACHMENT SET-UP ON PRATT & WHITNEY LATHE. FIG. 13—NEW CHASING ATTACHMENT FOR PRATT & WHITNEY BENCH LATHE

secure a speed reduction of approximately four to one. As the picture shows, the two compound pinions are mounted on a disk *D*, which in turn can be locked with the lever *L*, so that the drive proceeds from a small gear *G* to the large gear *F* mounted on the spindle proper, through the medium of the compound pinions *C*. The photograph also shows the usual series of holes for indexing the spindle. When indexing is done, a setscrew *S* is screwed in, so as to hold the cone pulley with the index holes rigidly to the spindle. In addition, special index plates, supplied with notches, or holes, can be mounted on the back of the spindle, as shown in a later photograph, Fig. 11.

In connection with the use of a back-rest, it may be noted that the advantages which are secured on the engine lathe with the conventionally designed back-rest have never been secured for the bench lathe. It was, therefore, found desirable to take the standard back-rest, as ordinarily supplied, and to modify it as shown in Fig. 3. A description of this attachment is unnecessary. Its convenience in operation has been found very valuable.

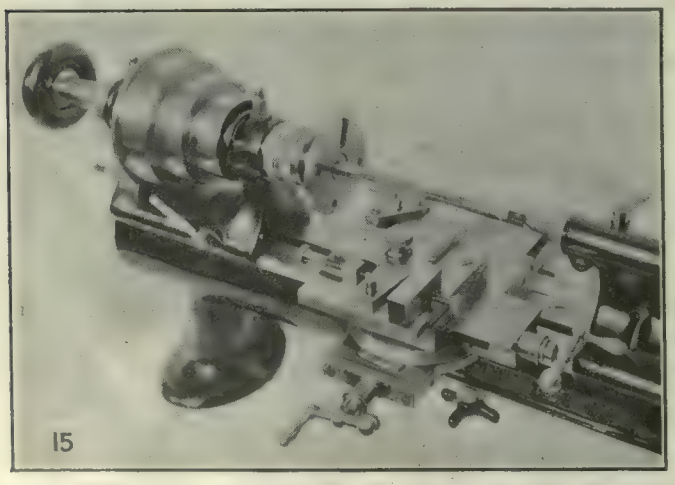
An improvement in the slide-rest grinding fixture is shown in Fig. 4, which shows a type of slide-rest grinding fixture for internal and external work, as designed by the Waltham Machine Works. After withdrawing the spindle from the work, the entire attachment can be swung out of the way for access to measuring or calipering the work.

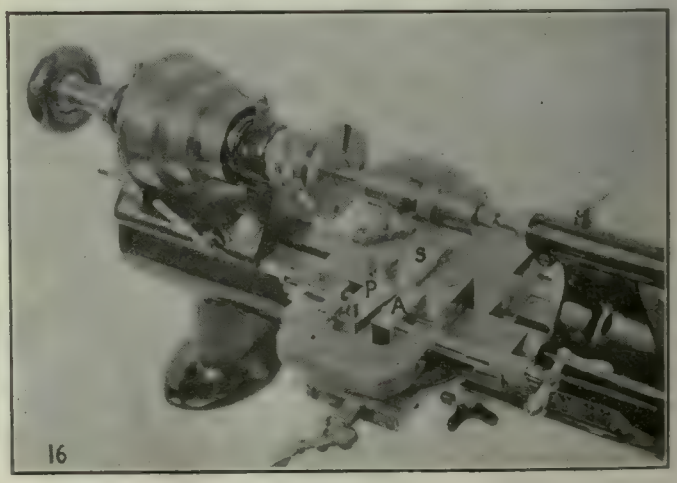
In Fig. 5 is shown a type of rack and pinion tailstock made by the Pratt & Whitney Co. with a lateral screw adjustment, and equipped with a small 6-hole turret, made by the B. C. Ames Co. This turret has standard $\frac{5}{8}$-in. holes, and will therefore take the standard Brown & Sharpe turret tools. It is one of the most useful attachments for the bench lathe, and it is supplied with individual stops.

Our device for strapping work to the faceplate for eccentric turning and for boring operations is illustrated in Fig. 6. There is a measuring button placed in the slot of the faceplate, an idea taken from an eccentric turning fixture devised by the Elgin Tool Works. This fixture has proved of great use, and it also takes the place of an angle-plate.

A very powerful revolving magnetic chuck, which has been built by the Waltham Machine Works for the writer, is shown in Fig. 7. The shell of this chuck is made of brass, thus diminishing magnetic leakage and securing extremely powerful magnetic action. A small 6-volt dynamo, made by the Kendrick & Davis Co., is used by us, and with an energy expenditure of only 36 watts, work can be held firmly against this magnetic chuck.

Another exceedingly useful grinding fixture is shown in Fig. 8. This is a tilting table, devised by the Elgin Tool Works, which is convenient for flat grinding. The wheel shown is mounted on an arbor, which belongs to a Derbyshire watch tool lathe, and it is here shown





FIGS. 15 AND 16—PRATT & WHITNEY ANGLE MEASURING FIXTURE

held in place by means of a special draw-in spindle, which goes through the main spindle.

In Fig. 9 is shown the use of a Snyder bezel chuck, and a universal faceplate, as used in watch tool work, both made by F. W. Derbyshire, adapted to the standard bench lathe.

Fig. 10 shows the method by Watts Brothers for drilling square and hexagonal holes. By using a triangular drill for square holes, and a quintangular drill for hexagonal holes, in other words, by using a drill with one cutting edge less than the number of equal angles of the hole to be drilled, and holding these drills in a chuck which permits of lateral motion, at right angles to the direction of the feed of the drill, it is possible to make the drill travel along a contour described by the outline of a hole in a bushing, the dimensions of which are such that a square hole of a certain size, or an hexagonal hole of a certain size, is determined thereby. The drill thus rolls along these contours, and broaches out a square or hexagonal hole,

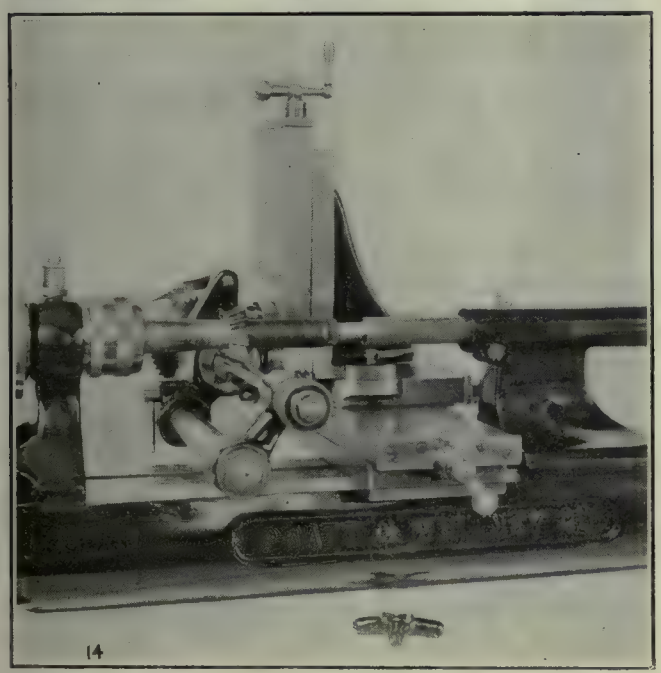


FIG. 14—MILLING ATTACHMENT FOR PRATT & WHITNEY LATHE

according to the drill used and the shape of the opening in the bushing. In our illustration the chuck holding the drill is shown mounted in the tailstock spindle, and the feed is obtained through the handwheel on the spindle.

A very ingenious device is the slotting attachment of the Elgin Tool Works, Fig. 11, which is here shown mounted in position for the internal slotting of a die. The index plate used for this work is also shown on the back of the lathe spindle.

Improvements in the usual milling attachments are shown in Figs. 12 and 14. The main point in these devices is the rigid over-arc, which enables slim work to be held firmly. All slides on the milling attachment can be clamped. This attachment was made by the Pratt & Whitney Co.

An improvement in the chasing attachment, enabling the making of taper threads, executed by the Pratt & Whitney Co., is shown in Fig. 13. There is mounted on the bed of the lathe a straight-edge, permitting such angular adjustment as is required for standard pipe threads or other taper threads. On this edge slides the hardened setscrew, mounted in the fixture carrying the toolpost.

For checking the angles of thread-gages and also for measuring accurately the taper of reamers and other tools, the Pratt & Whitney Co. has devised a sine-bar fixture, which is shown in Figs. 15 and 16. The fixture swivels about the pivot *S* and when the straight-edge is brought in contact with the taper, the distance between the plug *P* and the straight surface *A* is measured with a micrometer. The distance from the pivot *S* to the plug *P* is known, and therefore the angle of the taper held between the lathe centers can readily be calculated. The fixture is shown in Fig. 16 in contact with a gage, especially made to check the 60-deg. angle, used in U. S. standard threads. This fixture is most useful for angular measurements of all kinds, and it can readily be adapted to checking the lead with the aid of a dial gage and standard blocks.

The headstock and tailstock in our bench lathes are supplied with No. 1 Morse tapers, so that standard drill chucks, drills, or reamers can be held without the need of adapters. This is an important point frequently overlooked. The tailstock on our bench lathe is of the off-set or "goose-neck" variety which makes it more adaptable than the straight type.

With these devices and attachments, the bench lathe has proved its extraordinary usefulness in our laboratory, and it has been felt worth while to present a description of these features, partly novel, partly little known, to the engineering public.

Accurate Measuring by the Bureau of Standards

A micrometer of unusual accuracy and stated to be capable of determining measurements of one one-hundred-thousandth of an inch (0.00001 in.) has been perfected by the Bureau of Standards for measuring the diameters of some 12-in. porcelain cylinders to be used in electrical measurements. The accuracy of the instrument does not depend upon the care exerted by the observer.

In order to obtain the high degree of accuracy required, it is necessary to operate the micrometer from a distance and to take readings from it through a telescope, lest the heat of the observer's body warp the thick steel ring sufficiently to cause an error. Both the instrument and the cylinder must be kept in a constant-temperature box during the measurement.

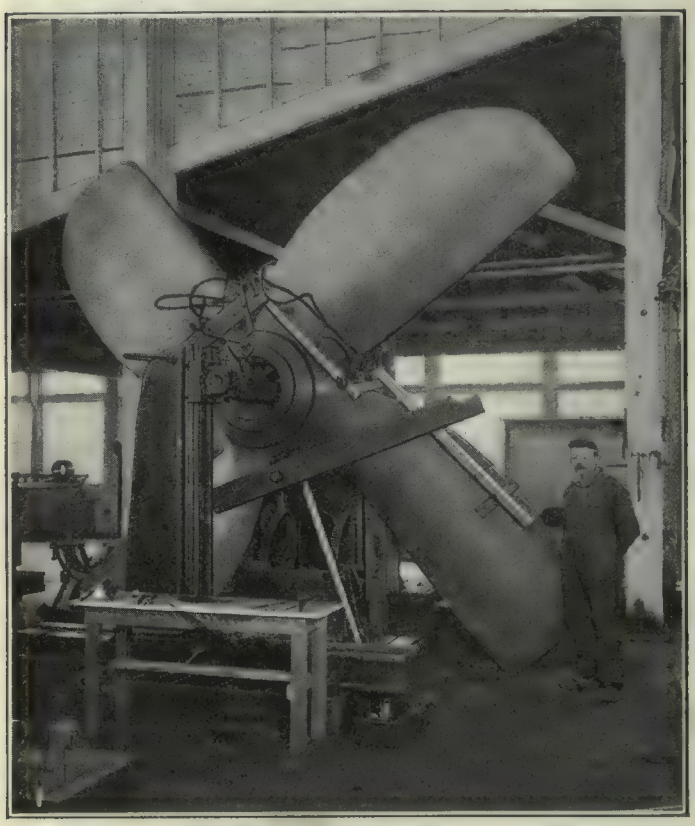
The micrometer consists of a cast-iron ring large enough to pass easily over the 12-inch cylinders. On opposite sides are the micrometer screw and the contact pin, while at right angles are adjustable lugs for centering the device on the cylinder. The micrometer screw is driven by a very small electric motor, and when it has pushed the cylinder against the contact pin the latter breaks the motor circuit and stops the screw. The whole device when in use is suspended by three light rods and can move freely the short distance required.

The cylinders which are to be measured will be wound with wire on a precision lathe and will form inductance coils of very accurate construction whose inductance can be calculated from th dimensions. This research is a part of a program for standardization of all of the electrical units in terms of the fundamental standards of length, mass, and time.

Some Large Propeller Work

By Frank C. Hudson

SEACOAST cities have to handle a lot of unusual jobs connected with the building and maintenance of the merchant marine. This is particularly true of Seattle, Wash., and the accompanying illustrations show some of the work done by the H. R. L. Motor Company, formerly known as the Hendricks Manufacturing Co., of that city. Fig. 1 shows the boring of the hub of a 17-ft. four-bladed propeller, on a Landis horizontal boring machine. This is about as awkward a piece of work as can be found and the way in which it is held is quite a study in itself. The propeller must be so positioned that the hub will be level and that the bar will bore at right angles to the blades. As can be seen by the illustration, this job took nearly the full capacity of machine.



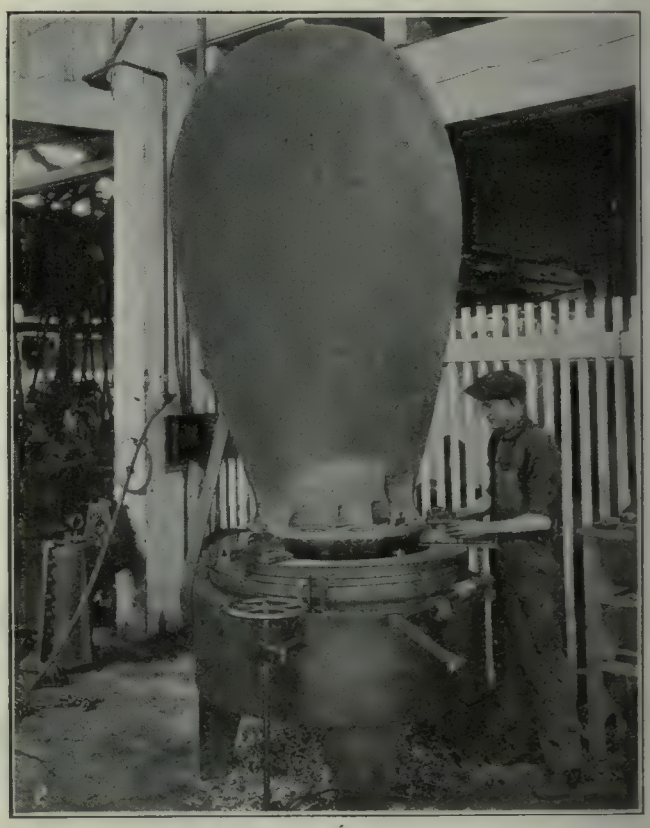


FIG. 1—BORING A 17-FT. PROPELLER. FIG. 2—MACHINE FOR BORING AND FACING STUD HOLES IN BLADES

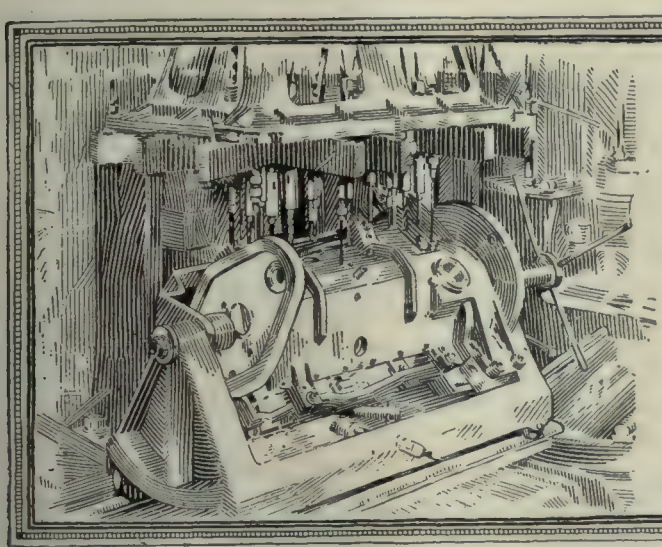
Built Up Propellers

Some of the propellers, however, have separate hubs and the blades are bolted to them. This means fitting the blades to the hubs in some way. The type of blade shown in Fig. 2 has the inner end turned to fit the recess in the hub itself, which is shown in Fig. 3. This operation is comparatively easy, being done in the lathe. For boring the bolt holes, however, the machine shown in Fig. 2 was devised to facilitate the delivery of a large order of propeller wheels on time. The size of the machine can be judged from the fact that the completed propeller was 17 ft. 6 in. in diameter. The holes are for 3¼-in. studs, there being seven in each blade, spaced as shown in the hub, in Fig. 3. The seven holes in the blades are rough cored and are bored and back faced in 50 min. from floor to floor. The chuck holding the blade, Fig. 2, revolves through the full circle, the collar on the worm shaft being graduated to minutes so that each hole can be accurately located. The machine is shown at work back facing one of the holes.

Another machine was designed for setting the studs and is shown in Fig. 3. This machine is worm driven from the belt shown, two flexible joints being employed. The driving bar is supported by the double hook hanging from the chain hoist. Slippage to prevent breakage or undue strain is secured by mounting the wormwheel on a spool and clamping it between fiber washers. The driving spindle has a thread of the same pitch as that on the studs and is driven by means of a feather key in the spool. It will be noted that the studs have collars which bottom in the counterbores in the tapped holes in the hub. With this machine one man can set the seven studs in each of the four faces, twenty-eight in all, in about three hours.



FIG. 3—SETTING THE STUDS IN HUB



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Cutting lubricants and their application—Principles of coolants—Suitability to material being cut—Factors such as power consumption and removal of chips

THE TOOL engineer is often required to solve problems in machining various parts from which a considerable amount of metal is to be removed. The materials may be castings, forgings or bar stock and they may be soft, medium or hard in their composition. Some metals can be cut dry to good advantage, while others require a cutting lubricant in order to obtain the best results. It is necessary for the designer to understand the functions and applications of lubricants if he wishes to design thoroughly practical and efficient tooling.

It is advisable, primarily, to obtain a clear understanding of the functions of a cutting lubricant and to note the advantages obtained by its use. There are two vital reasons why a cutting compound is used in manufacture. First, it reduces the friction generated by the tool in the removal of stock; and second, it cools the tool and prevents rapid deterioration due to excessive heat. A lubricant which fulfills both of these requirements most nearly approaches the ideal for which we strive.

In considering the matter broadly, we find that there are three factors of importance which affect the use of cutting lubricants: (a) Nature of the material to be cut, (b) composition of the lubricant, and (c) application to the work. The first of these factors affects the second to a considerable extent, while the shape of the work, the type of machine used, and the nature of the cutting action determine the third. We shall discuss these three factors in sequence, pointing out at the same time any other matters of importance which appear pertinent to the subject.

Material to be Cut

The nature of the material and its quality have an important bearing on the use of cutting lubricants. Certain materials can be cut dry, others either wet or dry, and still others only with a suitable lubricant. For example, cast iron is commonly cut dry; brass or soft bronze either dry or wet; aluminum dry or wet; malleable iron, alloy bronzes, steel castings, steel forgings, and bar-stock steel of whatever nature, are all more satisfactorily machined by using lubricant.

Generally speaking, those materials from which the chips break short or crumble into dust can be cut dry, yet some of them can be machined at greater speed and in a more satisfactory manner if a lubricant is used. For example, brass and aluminum are often cut dry, although superior results can be obtained by using a suitable cutting compound properly applied. To the best of our knowledge no cutting lubricant has ever been applied successfully to cast iron.

Composition of Lubricants

We have stated previously that the important functions of a cutting compound are to reduce friction and carry away heat from the cutting tools. These matters have an important bearing also upon the quality of the work produced and the nature of the finish obtained. It would appear that the same kind of lubricant should be suitable for all materials, but this is not the case, for, while some compounds will give good results on certain materials, they are entirely unsuited to others which are of a different composition. We do not wish to set ourselves up as authorities by stating that certain compounds are the best that can be found for a given kind of material, as experiments are continually going on and new developments may reveal other lubricants which are more satisfactory than those mentioned here. We can, however, say with confidence that first-class results can be obtained by using the compositions which we give herewith.

In discussing the matter it is well first to state that there are practically only two kinds of cutting lubricants in general use. One of them is composed entirely of oils, either animal or mineral; the other mixture is a compound of a soapy nature, which is combined with a sufficient amount of grease or oil to provide a certain degree of lubrication. The reason for the adoption of the latter mixture by some manufacturers is two-fold: first, it has a somewhat greater cooling action than plain oil, and second, it is considerably cheaper.

Soda water solutions have been used to some extent as cutting lubricants in the past, but at present there are very few manufacturers who will tolerate them, because they have little value as lubricants although the cooling action on the tools is very good. A great

For the authors' forthcoming book. All rights reserved.

disadvantage when using soda water is the fact that the coolant is likely to get into the bearings of the machine more or less, and "cut" the oil to such an extent that the bearings will soon become overheated as the oil disappears or is dissolved. The same thing applies to the soapy cutting compounds, unless they contain a sufficient amount of oil well mixed with soda or potash. Speaking generally, a properly proportioned mixture is in reality an emulsion of soap, oil and water. The soapy fluid is formed from soda or potash combined

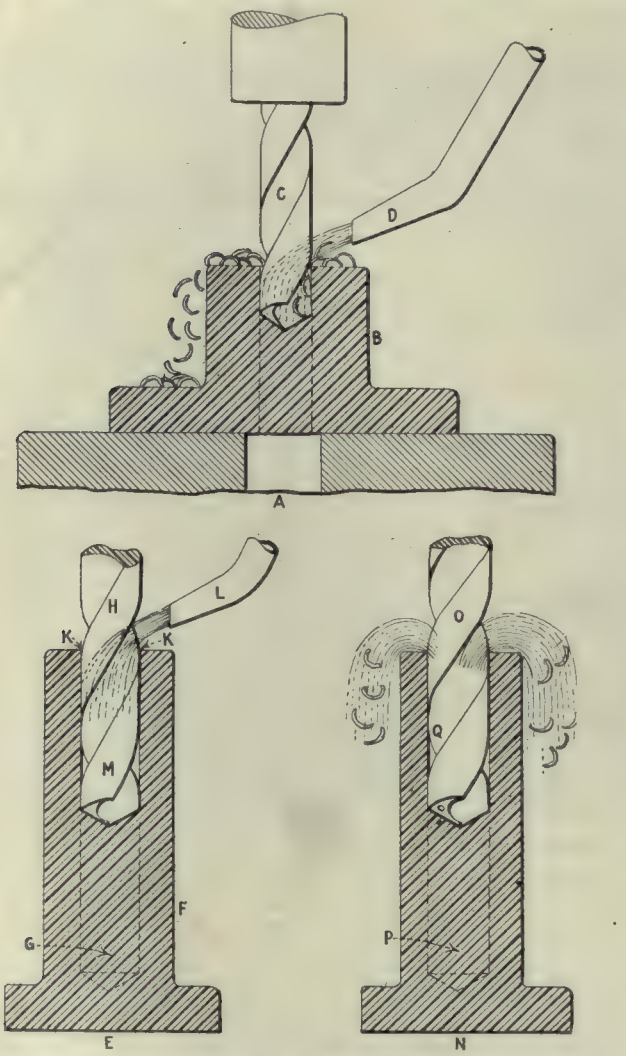


FIG. 565—APPLICATIONS OF LUBRICANT TO DRILLING OPERATIONS

with animal oil, which can be easily dissolved in water.

Great care must be taken when mixing a saponaceous compound to make sure that it does not contain too much soda, because this condition would make the mixture too "sharp," so that it would cut away the oil in the machine bearings as just mentioned. There is some difference between the cutting lubricants used by different manufacturers, although the same ingredients may be in each mixture in slightly different proportions. The method of mixing is usually about the same and the following formulas will generally be found to produce good results, although the quality of the water may make slight differences in the proportions.

Steel castings, forgings, bronze, malleable iron and other materials of a similar character can be cut to advantage by using a mineral oil alone. Bar stock and soft machine-steel forgings may be cut by using either the soapy compound mentioned or mineral oil alone. For aluminum castings, a mixture composed of mineral oil and kerosene in equal parts produces a very smooth quality of work, much better than when kerosene is used alone. Many manufacturers consider that kerosene is better, but it will not usually be found to equal the mixture mentioned. The composition of the alloy makes some difference in the proportion of kerosene and oil, but this point can be determined only by experiment. When forming tools and other tools which have wide faces are used on steel and bronze, mineral oil usually gives a smoother finish to the material. There is an additional advantage also on this class of work, in that the life of the tools is longer than when a soapy compound is used.

Soda and Oil Compounds

For those who desire to mix their own soapy compounds for cutting steel and similar materials, we give the following directions: Take a 50-gal. barrel and place in it 40 gal. of hot water and 7 lb. of borax, making sure that the latter is thoroughly dissolved. After the mixture is cool stir into it 7 gal. of lard oil, which should be added slowly in order to obtain a good emulsion. The amount of borax may vary somewhat, according to the amount of impurities in the water used, and if it is found that there is a tendency to cut away the oil on the machine, the quantity of borax should be diminished accordingly. A composition of this kind will usually cause greater wear on the edges of the tools than if pure mineral oil is used, although the cooling action is considerably greater.

We have stated that there are two important functions of a cutting lubricant, the reduction of friction and the cooling action on the tool. It is evident that a certain amount of judgment must be used when selecting a suitable lubricant for a given piece of work, as the amount of stock to be removed and the nature of the material (whether hard or soft) make a great deal of difference. Of course, this matter is not strictly a concern of the tool engineer, and yet it is much to his advantage to understand the why and wherefore in the use of lubricants.

Let us consider that a heavy steel casting is to be machined and that there is a considerable amount of material to be removed at as high a rate of speed as possible. In heavy cutting such as would be indicated in this case, the friction produced is so much greater than when a light cut is being taken, that it is essential to use the best compound and one which will fulfill all the requirements of both lubrication and cooling. It is apparent, therefore, that for work of this kind there is only one solution advisable and that is mineral oil. On the contrary, for work not requiring a great amount of stock removal, yet which is being cut at high speed, the heating of the tool will be very much greater, so that the soapy solution is here indicated.

Effect of Lubricants on Power Consumption

The power consumed by a machine tool in cutting a certain piece of work is an item well worth considering by the shop management. It is very difficult to obtain comprehensive data in regard to this matter, but it is safe to assume that there is a great saving in power when the lubricant used permits the chips to be removed from the work in the easiest possible manner. It certainly seems like a good argument to lubricate the tool as well as the bearings of the machine. There

have been a number of experiments made along these lines, but the writers have no data of value to present to the reader in this connection. There is so much difference in thickness of chip, feed, speed and quality of material cut that it is difficult to state how great a saving in power consumption can be obtained by the use of suitable lubricants.

Another Function of the Lubricant

On certain kinds of work, the chips removed are sufficiently troublesome to cause spoiled work or that which is inaccurate. When a cutting compound is used it can often be directed onto the work and tools in such a way as to wash away the chips and leave the work clean and bright. Chips will sometimes "load up" on forming tools and milling cutters, so that they cause scratches or grooves in the work. A suitable lubricant can be directed to the right point in such a way that it will wash away the chips as they are formed and thus avoid trouble of this kind.

In the drilling of deep holes, the use of a cutting lubricant under pressure is essential. The drills used are generally provided with oil holes through which the compound is forced under pressure, thus cooling the point of the drill, eliminating friction to some extent, and forcing the chips out along the flutes of the drill as fast as they are formed. Unless some provision of this kind is made in deep-hole drilling, it is difficult to get the chips out of the way as fast as they are removed, as they are inclined to stick in the flutes of the drill, eventually becoming packed so solidly that they groove and tear the inside of the work. The same thing also applies in some cases to boring operations when a cutter head or something of this sort is used in a blind hole.

Nearly all the present-day machines are so designed that a copious supply of lubricant can be pumped on to the work or tools, afterward returning through a sieve to a sump in the base of the machine, from which it is again circulated to the proper point. Ordinarily the cooling stream has sufficient volume to carry away the chips generated, yet in some cases greater pressure may be required to obtain the best results. In gun-barrel drilling machines a pressure pump has been found necessary, and in other machines used for deep-hole drilling, similar arrangements are often an advantage. Sometimes sufficient pressure can be obtained by speeding up the pump, but in other cases an entirely new lubricating system must be devised. It is evident, therefore, that the tool designer who is thoroughly practical must be well posted in the use of cutting lubricants, as well as in their application to different kinds of machine problems.

Application to Drilling Operations

If a drilling machine is to be used for drilling materials which require a lubricant it should be provided with a lubricating system which will supply a stream of sufficient volume to handle any drilling operation within the capacity of the machine. Assuming that a given machine is thus provided, let us note some of the difficulties which are encountered when drilling materials which require a lubricant.

In Fig. 565 is shown at *A* a piece of work *B* which is to be drilled by the standard twist drill *C*. The work is held on the table of the drill press in some suitable manner, and a supply of cutting compound is directed onto the work through a pipe shown at *D*. Now, if the hole which is to be drilled is not too deep and if the drill is correctly ground, the chips should work up through the flutes of the drill and come out very much as indicated in the illustration. They will be assisted to a considerable extent by the flow of the lubricant. If the drill is so ground that the chips come out freely, and unless the material being drilled is of such a nature that the chips tend to pack into the flutes of the drill, an accurate job can usually be expected when ordinary care is used.

In the case of a very much deeper hole, such as that shown in the example *E*, more trouble may be experienced. Assuming that the lubricant is directed onto the work through the pipe *L*, the drill *H* when in about the position shown, *viz.*, two or three times its own diameter in depth, will be likely to commence to clog with chips at *M*. In all probability a few chips will continue to come out with the lubricant at points *K*, but is is very likely that the drill will not operate at maximum efficiency unless it is removed from the work and the chips dug out of the flutes. It is evident that in drilling the work *F* to the depth indicated at *G*, there would not be sufficient pressure to the lubricant to force the chips up through the flutes of the drill. As a consequence, it would doubtless be necessary to stop the machine several times during the process, in order to clean the drill.

Purpose of the Oil Drill

A considerable improvement can be obtained by using an "oil drill" like that shown at *O* in the example *N*. A drill of this kind has two small holes running the entire length of it, and through these holes the lubricant can be pumped under a certain amount of pressure. As a result, the chips are forced out with the lubricant and there is not so great a danger of their packing into the flutes at *Q*. There may be some trouble in reaching the bottom of a very deep hole like that at *P*, particularly if the quality of the material is such that it packs together closely.

When drilling deep holes in a vertical position, even with an "oil drill," the pressure of the lubricant must be sufficient to lift the weight of the chips and carry them out through the flutes readily. It seldom happens that the drill can be fed in to its full depth without removing it at least once for cleaning. If the work is a steel casting having a cored hole through it, the ordinary method of lubrication will usually give good results, as the chips will fall down through the hole as they are being made.

Light Automobiles Find Best Market in Denmark

Sales of passenger cars and motor cycles in Denmark during July, August, and September have been moderately heavy, though probably fewer than in the second quarter of the year, states *Commerce Reports*, published by the Department of Commerce. The market for trucks has been dull and conditions affecting their sale are such that there will be little if any improvement during the last quarter. Owing to the seasonal influences, it is believed that the sales of passenger cars and motor cycles will show a further decline. Sales are expected, however, to be higher this year than in the corresponding period of last year.

Evils of Crankcase-Oil Dilution

By William F. Parish
Consulting Lubrication Engineer

FAILURES of the individual types of machines and parts are shown by the history of mechanics to have been due largely to a lack of proper lubrication. The one important and economic function of a lubricant is to prevent the wear of all machine bearing and rubbing surfaces. Further, when machines and parts cannot be made so they can be lubricated properly, they cease to be of commercial use and they must be replaced with other machines or parts that will accomplish the same work, but that can operate without the waste due to wear. When better machines are provided, their usefulness is determined to a great extent by the factor of lubrication.

Primarily, lubricating oil is used for the purpose of keeping surfaces apart so that actual contact does not occur. The most economical lubrication is provided when the oil is just thick enough to prevent metal-to-metal contact under a certain pressure, speed and temperature, and is not thick enough to cause a drag on the mechanism. Various factors will cause the surfaces to come together, such as overheating of the oil; dirt or hard substances in the oil that break the film or abrade the metal surfaces and cause heat; and dilution of the oil with some lighter liquid, such as with water or with liquid fuels. The greatest economic value of a lubricant can be secured only when it is allowed to work in an uncontaminated condition. Probably all mechanical failures can be traced to lack of proper lubrication because the lubricant was in a contaminated condition and could not function properly.

More Dilution in Winter

It has been determined that crankcase dilution, or contamination of the lubricating oil by the present internal-combustion-engine fuel, is subject to certain general rules. Dilution begins at zero, with new oil, and increases gradually at a somewhat regular rate. The amount of fuel dilution of the oil is greater in cold weather. In summer, the amount of dilution, or contamination, within the same length of time, is less, because the engine is hotter and it boils off the lighter parts of the fuel from the mixture in the crankcase. Apparently, fuel of a certain volatility will dilute the oil to a point where there is a balance, and continued excess leakages of fuel are thrown off as vapor through the breather. When this balance is secured, the mixture of fuel and oil in the engine crankcase has lost its best characteristics as a lubricant; then, it partakes more of the nature of heavy kerosene, contaminated with carbon, metal particles resulting from wear, and road dirt, all of which act as perfect abrasives with the thin fuel-and-oil mixture. Oil in this condition has lost its power as a sealing agent that will prevent losses of compression pressure and gaseous mixture.

The consumption of pistons, piston bushings and piston rings increased 1,480 per cent from 1914 to 1923, and that of piston pins increased 1,380 per cent. Registration covering the same period increased only 700 per cent or about one-half that of worn-out and replaced parts.

The value of replacement parts has increased from being $11,000,000 in 1914 to be $198,000,000 in 1923; this is an increase of 1,800 per cent. When we add the cost of service labor, the public charge is approximately $450,000,000.

Due to the present fuel situation, dilution of internal-combustion-engine lubricating oil is taking place. This means that the oil soon loses its character as a lubricant, and that it fails to function properly in preventing metal-to-metal contact. Wear takes place under these conditions at an alarming rate, necessitating more than twice the number of replacements of parts that were necessary per car in 1914. Hence, the following recommendations are made:

Engines should be drained at more frequent intervals, so that the lubricating oil can be maintained in a thicker condition.

Kerosene or gasoline must not be used for flushing the crankcase.

Engines should be constructed so that draining can be done much more easily than is true at present.

Greater care should be taken of the engines during the first 1,000 miles of travel of the vehicle. During this running-in time, the draining periods should be fixed at 250- to 300-mile intervals.

The increased cost for more oil will not exceed 2 or 3 per cent of the entire cost for operation, and the gain will be in hundreds of dollars because of reduced repair bills and the attainment of better used-car values.

Presented October 11th, 1923, before the Automotive Service Association, New York City.

Use Small Clearances for Bolts Only Where Necessary

When bolt clearances are not important there is no need for making them small, as to do so increases the difficulty and cost of manufacture. The importance of this point to the automobile industry is shown by the fact that the Transmission Division of the Society of Automotive Engineers is gathering information on the clearances used for the bolts holding the transmission case to the flywheel housing. The objects are both to standardize this clearance and to make it as large as possible. The situation is well told in the following letter that was written by an engine manufacturer and was largely responsible for bringing the matter to the attention of the committee on standardization:

"We have occasionally received complaints that it is a difficult matter to line up the transmission mounting holes with the tapped holes of the flywheel housing so that the capscrews can be inserted properly. Inasmuch as the holes in the flywheel-housing flange are tapped and will vary slightly, the holes in the transmission flange are in most cases only $\frac{1}{64}$ in. larger than the capscrews used.

"However, these capscrews have no aligning purpose, as a transmission flange has a pilot which fits in the flywheel housing. We can therefore see no adequate reason why these holes should not be made larger. The present practice of some transmission manufacturers is to use a $\frac{1}{64}$-in. clearance, others use a $\frac{3}{32}$-in. clearance and some, the writer understands, use a clearance as large as $\frac{1}{8}$ inch.

"We can see no objection to a $\frac{1}{8}$-in. clearance, as it will facilitate attaching the transmission to the engine, and would not affect the holding quality of the joint."

Speeding Up Transmission Assembling

SPECIAL CORRESPONDENCE

Installation of simple assembling conveyor increases output of same crew over fifty per cent in Franklin factory—Efficient use made of nut drivers—Reducing production without waste

INCREASE in the output of a crew of fourteen assemblers from 40 to 65 complete transmissions per day was the pleasant result of installing an assembling conveyor at the Syracuse automobile plant of the H. H. Franklin Manufacturing Co. The old method meant that each unit had to be handled fourteen or fifteen times with the attendant rather wearing physical exertion on the part of the assemblers. With this scheme independent jacks were employed and were passed along from man to man.

The new method uses an Alvey-Ferguson conveyor with sixteen jacks, so arranged that there are eight working positions along the line. An end view of the installation looking from the head end of the line is shown in Fig. 1. In Fig. 2 we have a side view just beyond the middle of the line showing two of the jacks, some of the sub-assembly benches and several of the sub-assemblies.

It is interesting to note that when plans were completed for putting in the new conveyor, the transmission department was shut down for three days during which all the installation work was done. The new system was then started with the same crew at the old rate of 40 completed transmissions per day. This rate was maintained for several days until things were running smoothly and then was increased five each day until a total output of 60 was attained, a figure which was held steadily for six months. In case of a rush order it was easily possible to bring the output up to 65. The present arrangement involved so much less lifting and other physical exertion that the assembly crew delivered the 50 per cent greater output with much less fatigue.



FIG. 1—END VIEW OF ASSEMBLING LINE

Another good feature of this layout is the concentration of sub-assemblies. No assembling of any of the units going to make up the complete transmission is done in any other part of the plant. Everything is right in the comparatively small space occupied by the department so that supervision is a very simple matter. Stock for the sub-assemblies for the following day is issued each afternoon. Up to the present time the system has worked so smoothly that it has been found practically unnecessary to provide for reserve stocks at any of the positions except at the hydraulic press where the gears are riveted to the shafts. As this press is an old one and balks occasionally, it has been found advisable to keep two days' supply ahead at this point.

As will be noted in the close-ups shown in Figs. 3, 4 and 5, good use is made of the electrically-driven nut driver built by the Elecdrive Manufacturing Co., Inc., of Syracuse. This driver, which was developed in the Franklin plant, is widely used in various departments and has turned out to be a great time saver.

The sequence of operations in the transmission assembly is as follows:

1—Press in graphite bronze bushings for the shafts. Two Greenerd arbor presses used for this.
2—Mount transmission housing in assembly jack.
3—Install gear assemblies and put on the small covers for the openings in the case.
4—Install clutch brake.
5—Install transmission brake drum.
6—Install water guard and gear shifter assembly.
7—Install pedal assemblies.
8—Install universal joint and tire pump.

The transmission assembly is then complete and is

removed from the jack at the end of the line by means of a pulley block. Two views of the operator at the first station are shown in Figs. 3 and 4, in Fig. 3 installing gears and in Fig. 4 putting on one of the small cover plates. This operator is using the electrically driven nut driver. In Fig. 5 the operator at the next station is shown using the older style of nut driver which will be seen is air-driven. The electrically driven type seems to give much less trouble.

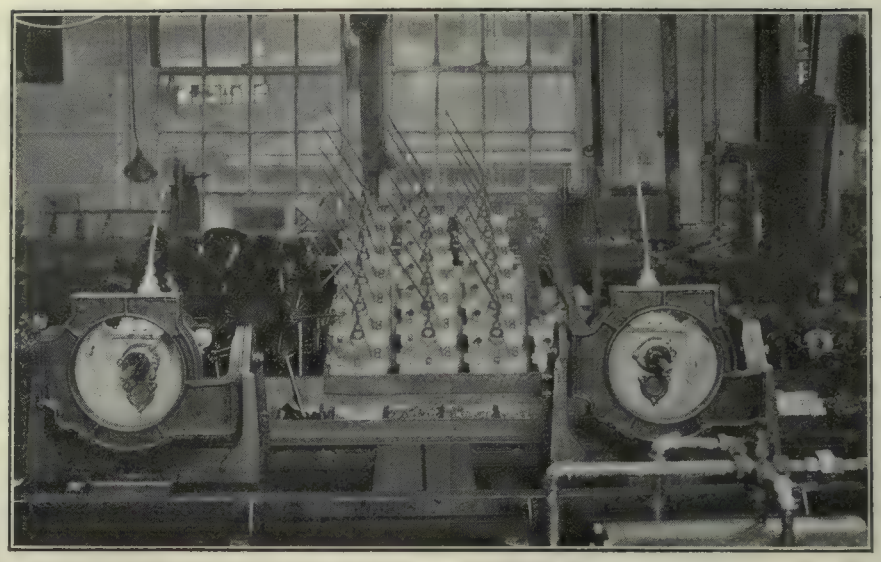


FIG. 2—SIDE VIEW OF LINE SHOWING JACKS

The rack of shifter assemblies, shown in the middle of Fig. 2, illustrates a time-saving feature suggested by one of the sub-assemblers. Before his suggestion was introduced an output of 40 of these sub-assemblies a day required the full time of one man, due principally to the amount of handling that had to be done. The shaper assemblies are now placed in a wooden rack composed of slats set at an angle of 30 deg. to the horizontal. As the assembler takes one from the bottom, the whole row slides down so that the next one is ready as the next jack comes along. This arrangement saves half the time of one man.

At the time this assembling line was visited there had been a slackening of output so that production requirements called for only 45 instead of 60 transmissions per day. The way of taking care of this production without loss of efficiency was this: for full production six men worked on the main line and eight on sub-assembly and the conveyor was regulated to deliver one complete transmission every 8 min. and 5 sec. To handle the reduced output it was only necessary to employ ten men in the department. From starting time until ten o'clock six men worked on the line and four on sub-assembly. At ten o'clock each alternate transmission, no matter what its state of progress, was lifted from the jack and set on the floor. Three men stayed at the main assembly and the other three went to sub-assembly to build up a reserve for the next day. Just before quitting time the partly completed assemblies, which had been removed to the reserve, were put back in place on the empty jacks nearest to them, thus making the complete line ready for full operation the following morning. This arrangement was found more efficient than reducing conveyor speed.

The conveyor installation just described is only one of many in use at the Franklin plant. It is, however, one of the most satisfactory and has given valuable data for further applications.

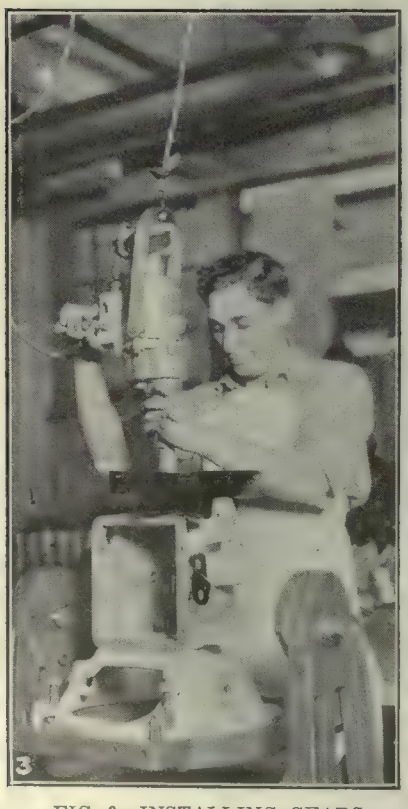


FIG. 3—INSTALLING GEARS



FIG. 4—ATTACHING COVERS



FIG. 5—AIR-DRIVEN NUT DRIVER



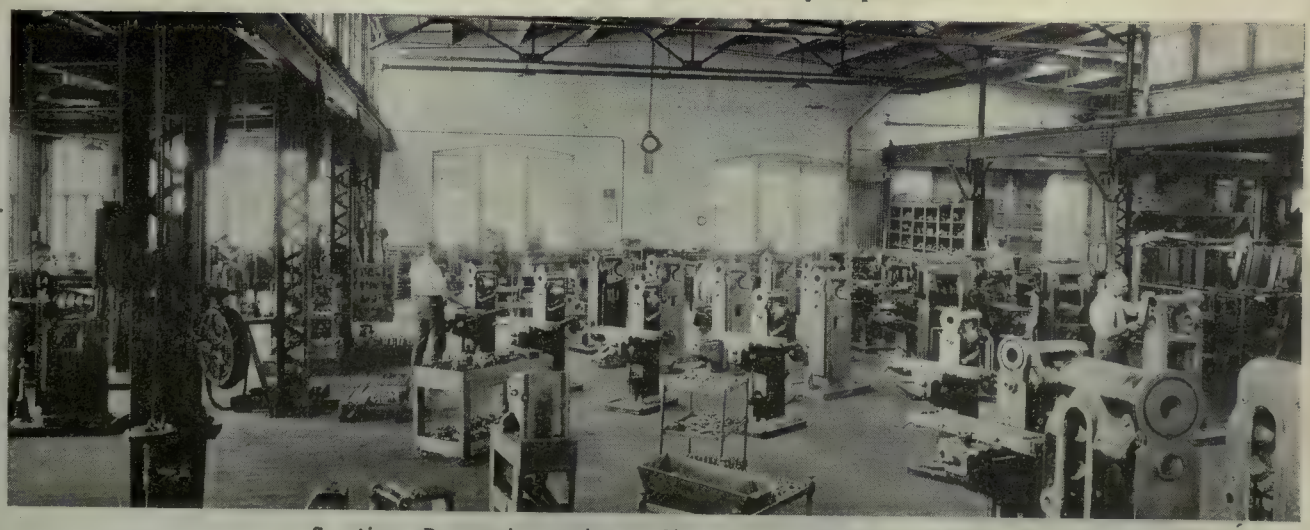
A battery of turret lathes and a few automatics

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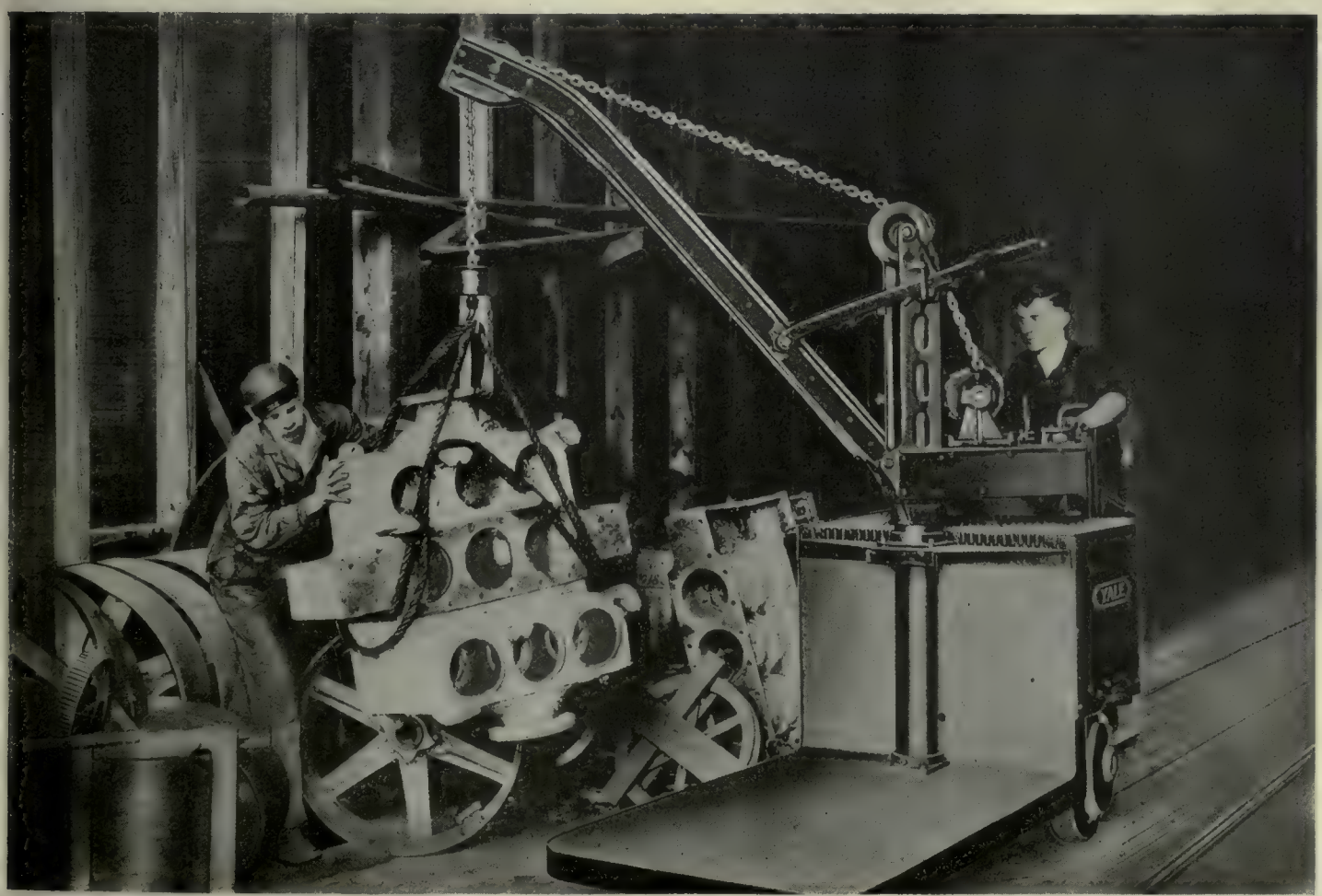


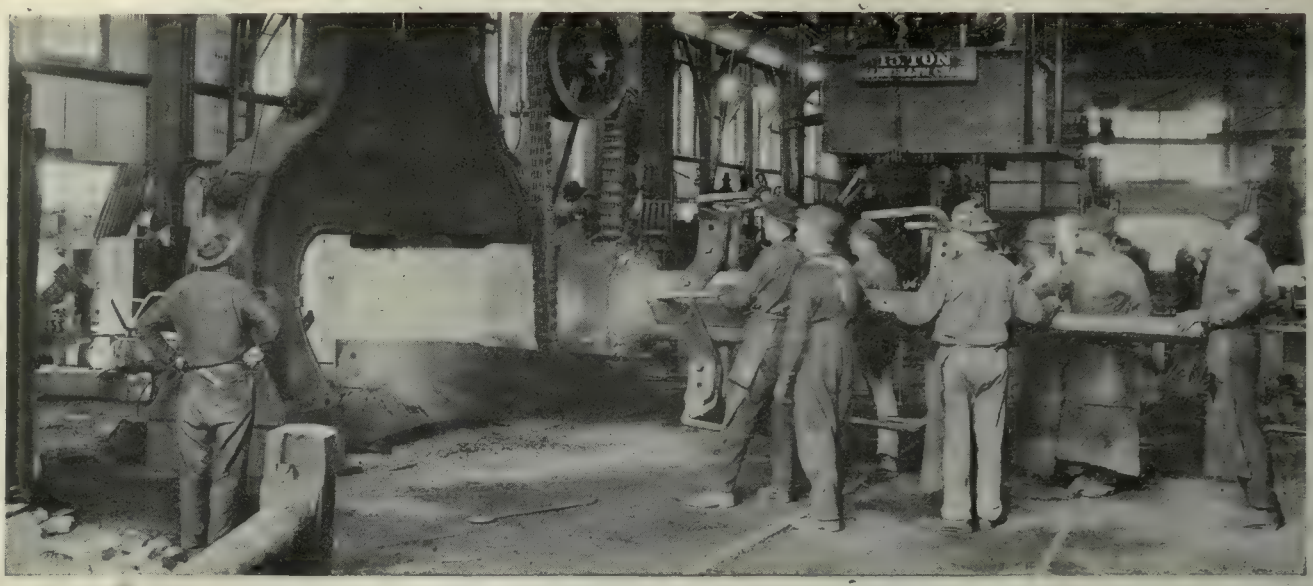
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Forging a Connecting Rod for a 2,800-Hp. Marine Engine

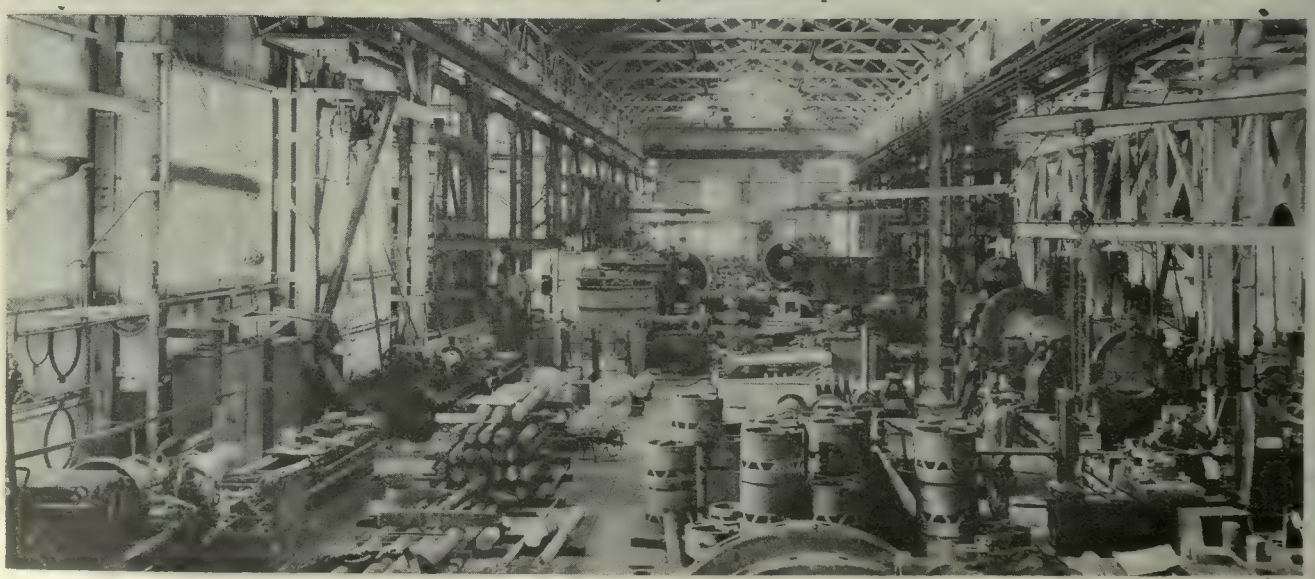
A Large Shop on the Pacific Coast

Llewellyn Iron Works, Los Angeles, Calif.

Turning a Large Crankshaft



General View of Machine Shop



Making Hobs for Cutting the Teeth of Gears

By ELLSWORTH SHELDON
New England Editor, *American Machinist*

Hobs first used to cut worm gears — Cutting spur gears with hobs a logical development—Many complications introduced—Extreme accuracy required — Form of hob finished by grinding

THE applicability of the worm hob to the cutting of teeth in worm wheels is so very obvious that even the earliest mechanics to employe the principle of worm gearing in their mechanisms could hardly have failed to observe it. Indeed, any worm in mesh with a corresponding worm-wheel may be considered as a hob having an infinite number of teeth; each minute portion of the bearing surface being constantly cutting (wearing) its way to a more nearly perfect

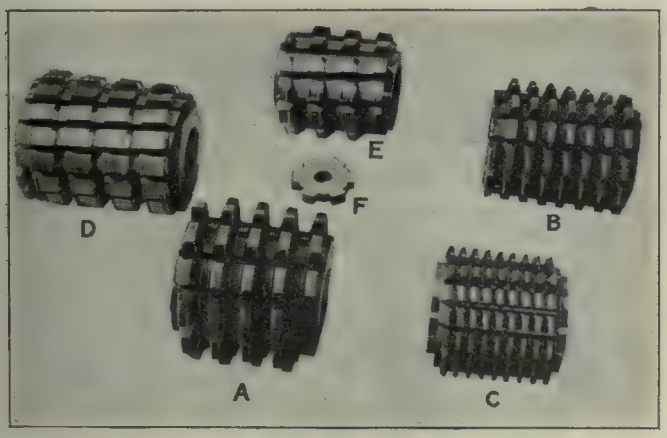


FIG. 1—GEAR AND SPLINE-SHAFT HOBS

mating contour so long as the mechanism is maintained in action.

The apprentice boy's definition of a hob as a "worm with teeth in it" is correct as far as it goes, for when such a worm is applied to the periphery of a worm-wheel blank without lateral or endwise movement, it will cut away all the surplus metal interfering with it and leave only a series of projections or "teeth," conforming to the shape of the space between the threads of the helix, with the necessary modifications to allow them to roll into and out of mesh. With such a hob the shape and position of the longitudinal gashes constituting the cutting teeth is of little moment as, wherever the teeth may be throughout the length of the helix, each remains always in one position relative to the wheel and cuts away only such material as interferes with it in that position.

When, however, the axis of the hob is set at some angle other than a right angle to the axis of the wheel to be cut, and is fed laterally across the face thereof in order to produce a specific shape of gear tooth that is to run not with the hob but with another gear that is to be cut with the same or another hob, complications are introduced that necessitate very careful consideration not only of the contour of the hob thread but in the shape and the relative position of the gashes.

Though the history of the hob as applied to the cutting of worm-wheels goes back to the very early days of machine design, its application to the cutting of plain and helical toothed gearing is almost entirely a development of the last two decades, and it is only during the latter part of even that period that the principles have been thoroughly mastered and the necessity for extreme accuracy in the making of hobs fully appreciated.

It is not, however, the purpose of this article to question the probable origin of the hob nor to enter into a discussion of the theory of its application to the task of cutting teeth in gears, but rather to describe some of the manufacturing operations involved.

Hobs can be, and are, made for other purposes than cutting the teeth in gears, but it is to this class of

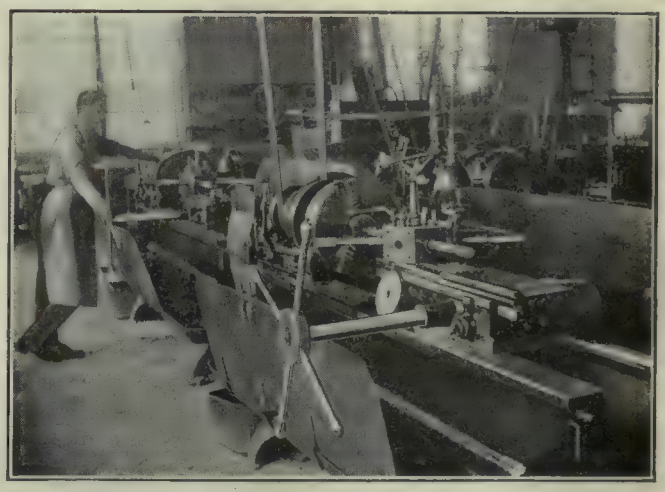
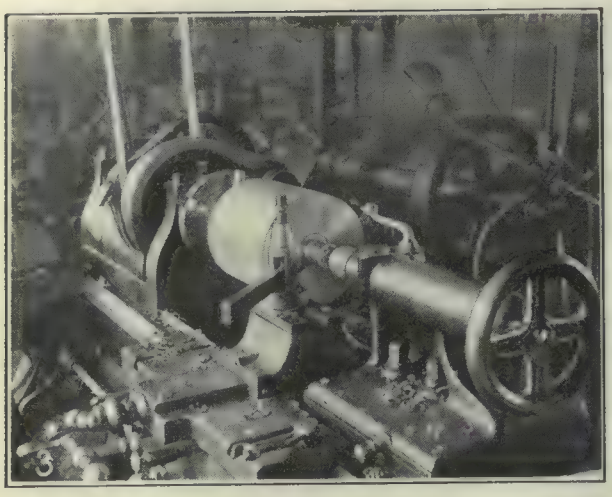


FIG. 2—CHUCKING HOBS AND CUTTERS

work—and to the cutting of splined shafts—that its principal field of application is found, and only hobs of this nature will be considered in this article. Examples of gear tooth and spline-shaft hobs are shown in Fig. 1, where *A*, *B* and *C* represent, respectively, 7, 8 and 12 pitch gear tooth hobs, while at *D* and *E* are spline-shaft hobs for four and six splines. The letter *F* represents a section of six-spline shaft cut with the latter hob.

At the plant of the Union Twist Drill Co., Athol, Mass., which firm specializes in the manufacture of hobs for producing accurately cut gears, spline-shafts, etc., and from whence the data and illustrations for this article were secured, every order for hobs is considered a special job. The characteristics



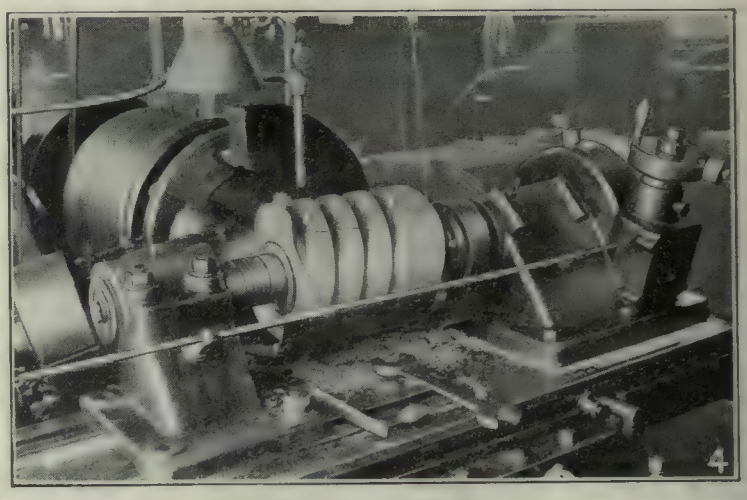


FIG. 3—TURNING A LARGE HOB BLANK. FIG. 4—MILLING THE THREADS

of each individual hob with respect to diameter, contour of thread, angle of helix and number of gashes, or teeth, in the hob, as well as its relation to the gear to be cut, are carefully calculated in the engineering department and are specified on the blueprint that accompanies the order into the shop. The blueprint shows the angular settings of the slides and the actual gears to be used in the change trains of the several machines employed in making the hob.

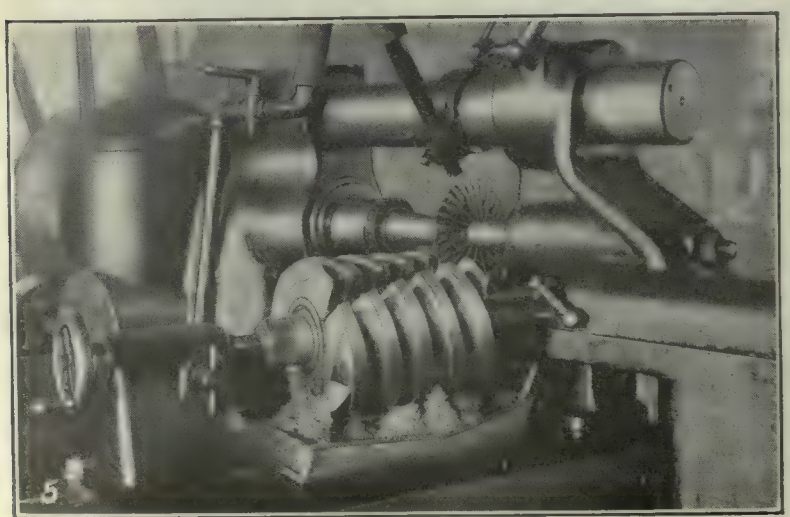
The preliminary work is done mostly upon standard machines and few of the operations are different from those that would be employed in any first-class toolroom having one or two tools of the same nature to make. Regular chucking machines, Fig. 1, bore and ream the blanks to standard sizes, leaving sufficient material to finish the hole by grinding after hardening; a standard engine lathe, Fig. 2, does the turning and facing, making the blank ready for the milling machines; and the threading, whether single or multiple threads, is done upon standard thread millers.

At the time the photographs were made with which this article is illustrated there was in process a more than ordinarily large hob—though by no means the largest size made—and this hob is shown in Figs. 3, 4 and 5, in the turning, thread-milling and gashing operations respectively. It is nearly 9 in. in diameter, triple-threaded, and is for cutting the teeth of a spur gear.

After the gashing, the beginning of which is shown in Fig. 5, is completed there will be at each end of the hob a number of teeth that are not fully formed because of the run-out of the several threads. As these partial teeth are incapable of performing any useful service and because they constitute a menace to the fingers of the operator who is to use the tool and a starting point for cracks and breakage, they are eliminated as shown in Fig. 6, by being milled off with an end mill. The operation is not necessarily performed in the manner shown here; the method most convenient according to the size and nature of the hob being adopted.

When a hob is ready for delivery to the backing-off department, as is the one shown in Fig. 6, it presents to the casual observer the appearance of a finished tool. As a matter of fact, however, the foregoing are but preliminary operations, for the purpose of removing extra stock, or "roughing out" the hob. Long before the hob has reached this stage an order has been issued to the toolroom for the special tool that is to produce the final thread contour, and this tool and the partially prepared hob meet for the first time at the backing-off machines; where the actual making of the hob may be said to begin.

If the hob to be made differs in any characteristic affecting its thread form from hobs previously made, the first job in the toolroom is to lay out the new form on a sheet of blackened zinc, working from the data supplied by the blueprint, and making an accurate



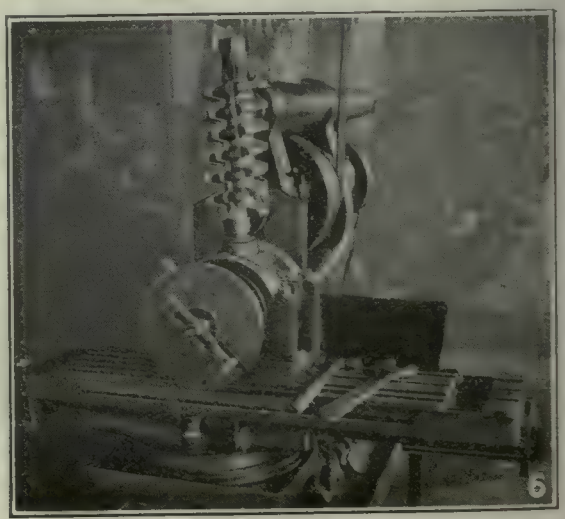


FIG. 5—GASHING THE TEETH. FIG. 6—REMOVING THE INCOMPLETE TEETH

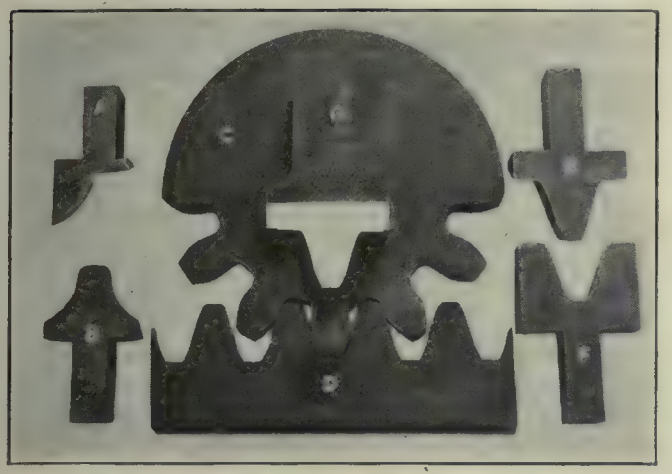


FIG. 7—SET OF TOOLS FOR HOB THREAD

and permanent drawing that is not subject to change from shrinkage or other causes. This drawing on zinc becomes at once the point of departure from which the actual cutting tool is made and a permanent record of the job. The form is never cut out of the zinc, but remains as clear white lines upon the blackened surface.

The illustration, Fig. 7, shows the successive stages through which the design must pass in making the final tool that produces the thread contour of a hob to cut a special gear. Having laid out the tooth curves on the zinc, the second step is to make the master-tool *A* to conform to one side only of the drawing. This tool takes no cognizance of the peculiarities of the hob thread in the matter of shape, angular advance, clearance, etc., but is a counterpart of the tooth as it will appear on the gear. In its making the toolmaker has nothing to guide him but the lines on the zinc and the job is, therefore, one that calls for an unusual degree of skill and experience.

Making the Fly-Tool

The master-tool being completed and hardened, it is used to plane the "first flytool," *B* in the illustration. The stock from which the flytool is made is held in a special fixture that allows it to be turned half-way round after the first side is planed without otherwise disturbing its position, so that the second side is planed with the same tool and setting and perfect symmetry of form is assured.

After this flytool is hardened it is placed in a flytool holder in the milling machine and with it is cut the partial gear *C*. The material of which the latter is made is sheet brass of about $\frac{1}{4}$ in. thickness, and the operation is no different than would be the cutting of a similar gear by toolmakers' methods; using the flytool instead of a regular formed gear tooth cutter.

The flytool must match the tooth it has cut not only in cutting position but also when it has been reversed in the holder. By this means any departure from true

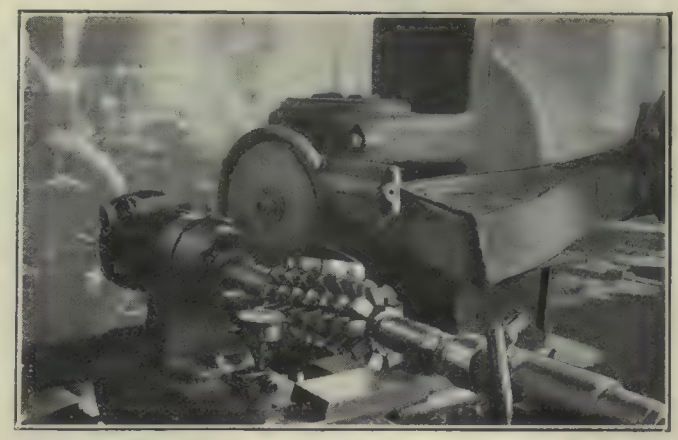


FIG. 9—GRINDING FACE OF TEETH

symmetry, either by reason of distortion in hardening or because of original error, is at once apparent and must be corrected before proceeding further. Having produced a correct form of tooth—or several teeth—of the brass gear segment, the master-tool and first flytool are laid aside and have no further influence upon the making of the hob.

With the partial gear *C* as a starting point the toolmaker next lays out the rack *D*, of the same material as the gear. The bulk of the metal is removed from the tooth spaces by milling or planing with any cutter or tool that may be convenient, but the actual shaping of the teeth is done with file and scraper, and the work is continued until the rack meshes perfectly with the gear in either direction. The rack becomes the templet to which the "second flytool" *E* is fitted, which tool is obviously not a duplicate of the first one,

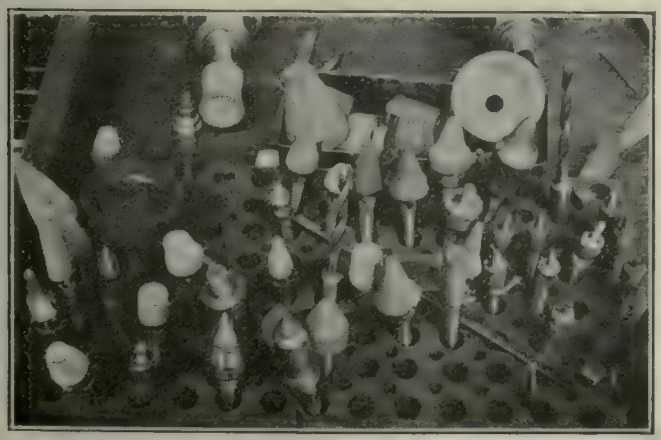


FIG. 8—WHEELS FOR FORM GRINDING

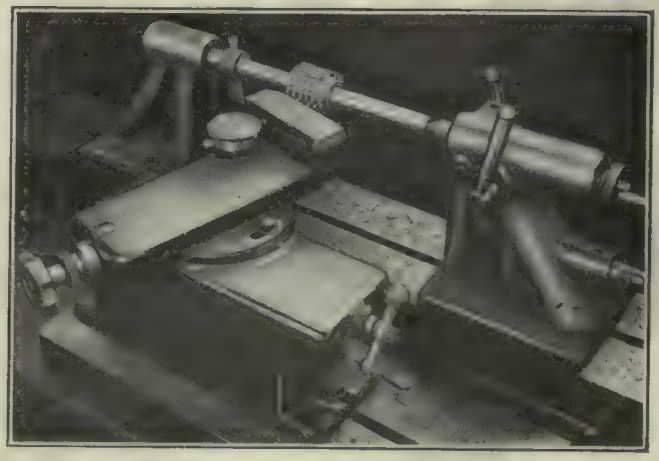


FIG. 10—MEASURING THE MODIFICATION OF FORM

since it has now assumed the characteristic shape of the hob thread.

The "third flytool" *F* is complementary to the second; being actually planed with the second tool. The term "flytool" is one of convenience only, since none of them are used as actual flytools except the first one, and that only in "flying out" the brass gear. All

subsequent operations are those of planing; though the work is done in a milling machine the spindle of which is securely locked against rotative movement.

The special fixture in which the stock is held in all these planing operations is capable of swivelling in both the horizontal and the vertical planes. The cutting tool, being held in a flytool holder in the spindle of the milling machine, may be inclined to any desired degree of departure from the vertical before locking the spindle of the machine. When planing the third flytool with the second, the stock is tilted backward (away from the cut) an amount equal to the clearance angle desired and the cutting tool is inclined to a corresponding degree; hence the tendency to foreshorten the form by reason of the inclined position of the stock is nullified by the equal inclination of the cutting tool, and the resulting shape is an exact complement of the tool that produced it.

The Backing-Off Tool; the Objective Point

The partially formed backing-off tool, shown completed at *G*, Fig. 7, is next placed in the holder and the horizontal swivel of the latter turned to correspond with the helix angle of the hob to be made. The third flytool, now hardened and tempered, is placed in the flytool holder and becomes in turn the cutting tool. The vertical swivel of the work holder is set to produce the proper clearance angle and the table of the milling machine is swung to traverse the work at an angle past the cutting tool.

The effect of this somewhat complicated arrangement of swivels is that the shape of the backing-off tool when completed is unlike that of any of the tools that preceded it, as it now possesses the excessive clearance necessary to tools of its nature, is inclined to correspond to the lateral advance of the hob thread, and is modified in contour to correct the error that would otherwise be introduced by the angular presentation of its cutting face to the work. In short, it is of such shape that when operating under the conditions imposed by the backing-off machine it will reproduce upon the hob the contour of the teeth of the brass rack *D*, and the hob will, in turn, reproduce the tooth form of the brass gear.

The backing-off tool *G* is the only member of the group to leave the toolroom; all the others, including the original lay-out on the blackened zinc, going to the tool vault, from which they are resurrected only when the tool of which each is the immediate progenitor, becomes so badly worn as to require replacement.

There are two additional members of the group, not shown in the illustration, made at the same time as the others. One is a templet for checking the form of the finished hob and is in shape practically a duplicate of the second flytool. The other is a former for guiding the wheel dressing diamond of the form grinding machine (made only when the order calls for form ground hobs) and is much the same in shape as one side of the third flytool. Both are equal in importance to any of the tools illustrated, for the hob must in the final analysis check with the templet; or, failing to do so, prove that there has been error somewhere along the line.

The backing-off machines were designed and built by the Union Twist Drill Co., as was, in fact, all of the special machinery employed in the making and testing of hobs in this shop. They are driven by a single belt, and all movements are obtained through the medium of cams and gears, for all parts must operate in exact synchronism. The speed of the machine as a whole is variable within a very wide range by means of a Reeves variable speed countershaft. Separate change gear trains provide for various leads of thread and for different numbers of gashes, as well as the varying angular advance of the gashes. All angular settings and all gear ratios for each individual job are specified upon the blueprint accompanying it.

Where the Real Work of Hob Cutting Begins

When a hob is delivered to the backing off department it is already finished in appearance, except that it is slightly oversize and has no clearance. The contour of the thread is not necessarily the same as the finished thread must be, though it should conform as closely to it as is conveniently possible in order to relieve an expensive and necessarily slow working machine of the duty of removing an undue amount of stock. It is quite possible to cut a hob directly from the blank in the backing-off machines, and this is sometimes done in case of rush orders when other machines are tied up.

The hob is mounted upon a true-running arbor to which it is keyed to make sure that no slippage can occur to throw the gashes out of time with the reciprocating movement of the relieving slide. It rotates in a forward direction and as the tool enters the cut at the advancing edge of a tooth the slide moves inward toward the axis of the hob at a uniform rate until the tool has cleared the tooth and entered the succeeding gash, when it drops back quickly to its outward position. The rotative movement of the work and the traverse of the carriage to follow the lead of thread are continuous; the operator having no more to do with the backing-off movement than if he were cutting an ordinary thread upon an engine lathe.

The backing-off, familiar to all who have to do with the making of rotative cutters of any kind, is necessary only to provide clearance to the hob teeth. Being necessary, however, it is also necessary that each tooth of the hob receive exactly the same treatment as every other tooth, else after one grinding of the face for sharpening, no two teeth would cut the same shape and, probably, no one tooth would cut the correct shape on the work. For this reason a rigid, powerful, and especially a reliable, machine is necessary; hence the statement in a previous paragraph that the making of a hob out of what was before but a partially prepared piece of stock, really begins at this stage.

The Reason for Form Ground Hobs

Hobs, like other tools—and probably more than most other tools—are subject to distortion in hardening. In modern hardening processes the distortion has been reduced to an almost inappreciable minimum and many tools, including hobs, are used without form grinding. From the nature of the work they are to produce, the gear cutting hob must be more than ordinarily exact and uniform in contour, or the gears cut with it will not run quietly together. In order to attain more nearly to perfection in this respect many hobs are form ground after hardening.

The form grinding machine is in principle a duplicate of the backing-off machine, though its mechanisms are different in some respects to adapt it to the use of a grinding wheel instead of a steel tool as a

cutting medium. Pencil wheels of various sizes and shapes are used, some of them being ordinary vitrified wheels, while others, especially the smaller ones, are copper laps charged with abrasive. Some of the wheels used for the purpose are shown in Fig. 8, though not all the wheels shown are used to grind gear cutting hobs.

In order to grind the contour of a hob thread correctly it is necessary that the grinding wheel be quite as exact in shape as the steel tool of the backing-off machine, and to make and keep it so is the object of the hardened steel former mentioned in a preceding paragraph. The wheels require frequent redressing and the former is so attached to the wheel head of the grinding machine that a diamond may be passed over the contour of the wheel at any time by the simple movement of a lever.

The arbor used to hold the work on the grinding machine is parallel for the greater part of its length and is lapped to the same standard size as the hole in the hob. The short remaining portion of the arbor has an increase taper amounting to but about one-half thousandth of an inch. The carefully lapped hole of the hob is a wringing fit upon the parallel part of the arbor and when wrung into place the taper binds it sufficiently to resist the slight pressure of the grinding wheel.

Though the grinding wheel is of the same shape as the space between two adjacent threads it is not expected to grind upon but one side at a time; therefore its diameter is smaller than the corresponding width of groove and the grinding is done upon opposite sides alternately. The direction of rotation of the wheel is reversible so that the cut is always against the rotation of the hob.

Importance of Setting Hobs True

A form ground hob is made with a short hub at each end, and these hubs are ground truly concentric with the hob before the latter is removed from the grinding machine; the object being to provide means of testing its truth when set up in a hobbing machine, for no amount of care in making a hob as nearly perfect as possible will avail if the tool is allowed to run eccentrically when in service. The spindle of a dial indicator in contact with each hub in turn will show whether or not it is running eccentric, and if the dial shows the hub at each end to be true it may safely be assumed that the hob is equally true.

Grinding the face of the cutting teeth of a hob is an important operation, not only in the manufacture of hobs but in the subsequent resharpening as the tools are continued in service. Owing to the fact that the operation of backing-off has left each row of teeth with a constantly diminishing radius as the cutting edge is ground back from its original position, an error in face grinding may put a whole row of teeth temporarily out of action.

In Fig. 9 is shown a special machine for performing this operation that insures that the radii of all teeth at the cutting edge shall be the same. The position of the face relative to the radius is determined by the pointer of the dial indicator as its measuring spindle rests against the periphery of the tooth. There is no gage or grinding rest against the face of the tooth; it is located circumferentially by the index plate of the dividing head. The spindle of this head is given a rotative movement relative to the traverse of the machine table corresponding to that of a milling machine dividing head when geared to cut a helix, but derived in a different manner.

Back of the index plate and within the housing is a gear, meshing with a rack that has a transverse movement relative to the table. The outer end of the rack is attached to the sliding member of a device that is equivalent to the taper attachment of a toolroom lathe. The angle of inclination of the taper bar, which is attached to the stationary part of the machine, determines directly the angle of lead, or helix, of the spindle movement, and is set to correspond to the helix of the hob to be ground.

To produce a tooth of true involute form upon a gear the sides of the threads upon the hob should be straight lines, like a rack tooth, at an angle to the axis of the hob corresponding to the desired pressure angle of the gear. There is difference of opinion among engineers as to whether or not it is practical to produce gears of true involute tooth form that will run quietly together, and many manufacturers of gears modify the involute; which modification is manifested on the hob as a departure from the straight line of the side of the thread. Such departure is very slight, and is measurable in ten-thousandths of an inch.

A device that has been developed for measuring the amount of departure from a straight line is shown in Fig. 10. The actual curve is, of course, produced by the grinding wheel and the device is applied only for the purpose of checking the result. The lower slide is parallel to the axis of the hob as it rests upon the centers and the upper slide is set to the pressure angle. A multiplying lever attached to the measuring spindle of the dial indicator rests against the side of a hob tooth in such manner that any departure from a straight line as the upper slide is drawn outward is shown by the dial in a ratio of ten to one.

Cylinder Grinding Data

By C. Kotes

Exact data as to cylinder grinding are not always easily obtainable. Here are some data covering the practice on a well known car. The iron is held to the following specifications: Carbon, 0.50-0.80. Phosphorus, 0.20-0.50. Sulphur, 0.10-0.16. Manganese, 0.50-0.70. Silicon, 2.00-3.00. Graphitic Carbon, 2.25-2.75. Total Carbon, 3.00-3.25. Some call this mixture semi-steel.

Each cylinder block is Brinell tested, 150 to 190 being permissible, the casting being of close grain which machines well. The bore is 3.25 $\pm$ 0.0005 and the hole is 8$\frac{5}{16}$ in. long.

Two kinds of wheels are used. One is of carborundum silicon, grade S, 303 grain, OH bond. The other is a Waltham carbon silicon, grade I, 36 grain, clay bond. Both are 3x$\frac{3}{4}$x1$\frac{1}{4}$ in. They average about 135 cylinders per wheel. The time is 44 min. for a four-cylinder block, floor to floor, using a Heald No. 60 or 65 machine.

The cylinders are rough and finish ground at the same set-up and with the same wheel. The amount of metal removed from the wall varies from 0.003 to 0.006 in. It takes from two to three strokes to remove 0.003 in. but only three or four strokes to remove 0.006 in.

Some cylinders are harder than others. We use the Waltham wheels on the harder blocks.

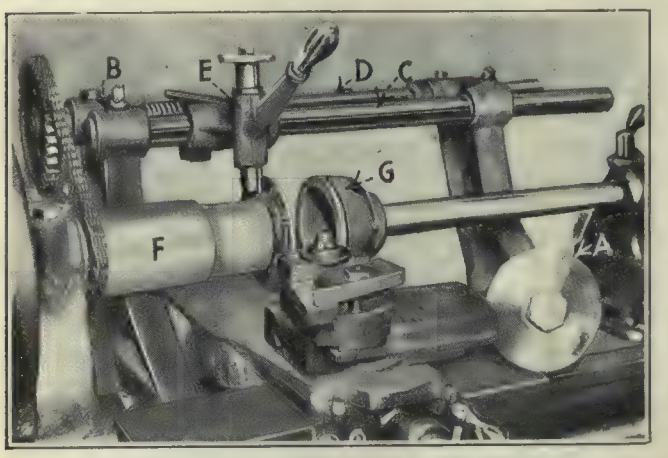
Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

An Improvised Threading Attachment

By Henry M. Clary

In order to expedite the job of turning, facing both sides and cutting a 3-in. pipe thread on a quantity of bronze floor plates for drain traps, the foreman of the Rival Machine Co., Davenport, Iowa, devised the threading attachment illustrated herewith. One of the pieces



AN IMPROVISED THREADING ATTACHMENT

is shown in process and another is to be seen lying on the bed of the lathe at *A*.

A pair of supports *B* were made and machined for attaching to the bed of the lathe, then they were bored and bushed for the shafts *C* and *D*. On shaft *D* a 4-P. square thread was cut, then the toolholder *E* was made and bored to a sliding fit on shaft *C*, as shown. From the rear of the toolholder *E* an arm projects, carrying a half-section of a brass 4-P. square-thread nut in such a position that when the handle on the front of the toolholder is lowered, the rear arm raises and the nut engages the thread on the shaft *D*. The vertical section of the toolholder was bored, threaded and keywayed for a short shaft that was arranged to operate on the principle of a tailstock spindle, the shaft having a square hole through the lower end to carry the threading tool.

A sleeve *F* was now made and threaded to screw onto the spindle nose. Before screwing on, however, a sprocket was attached to the end of the sleeve so that when in position it could be connected by a chain with a similar sprocket on the end of the shaft *D*. The rear sprocket was made with twice as many teeth as the spindle sprocket, so that eight threads per inch, the correct number for 3-in. pipe, could be obtained. The sleeve *F* was tapered inside and slotted so that it could be expanded by means of a draw-bar operated by a handwheel at the opposite end of the spindle. The sleeve acts as a chuck and holds the piece from the inside, as shown.

In operation, the thread is chased with the tool in the same manner as on a fox lathe.

As difficulty was experienced in truing the pieces after chucking, an old wheel puller was screwed onto a section of pipe attached to the tailstock center, so that the piece could be held true while chucking. Two tools were clamped in the toolrest for facing off both sides of the piece in one cut, the end of one facing tool also serving as a turning tool for the periphery of the piece. The average time per piece for chucking, turning, facing and threading both sides was two minutes.

A Special Head Boring Machine That Cuts Production Costs

Special Correspondence

The cost per piece is the important point when figuring the cost of production of work. If economies in the long run can be shown, then certainly a high initial cost for equipment is justified. It was on this assumption that the machine shown in Fig. 1 was designed and built for use in the plant of the Jones & Lamson Machine Co., Springfield, Vt.

The machine is for boring simultaneously the several

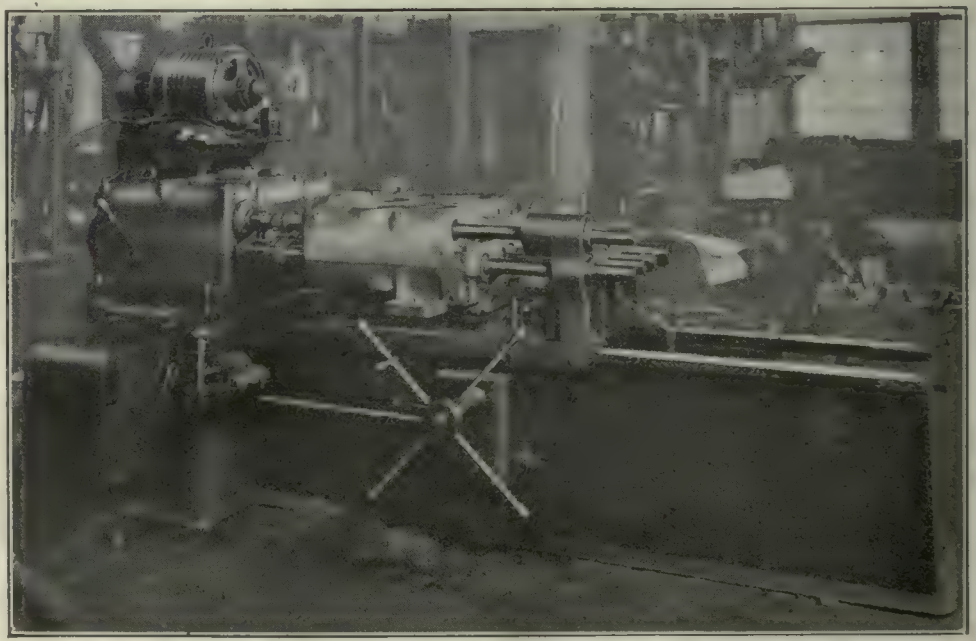


FIG. 1—MACHINE FOR BORING, REAMING AND TAPPING HEADS OF FLAT TURRET LATHES

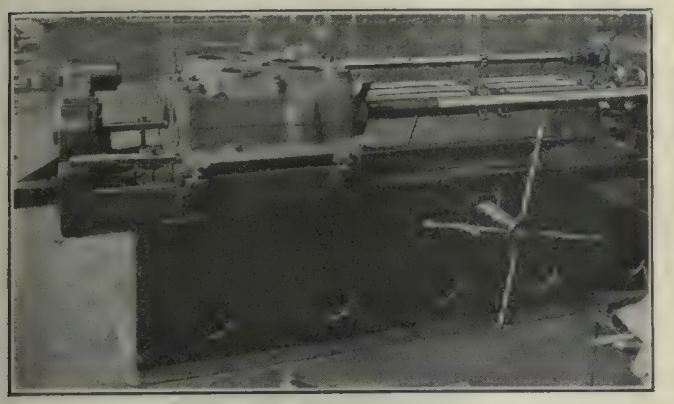


FIG. 2—CARRIAGE RUN BACK TO CLEAR BORING BARS

through holes in the head of a flat turret lathe. Because of the fact that the holes are all bored, reamed and tapped at one setting, a considerable saving in time over the methods previously employed, is effected. The heavy construction and motor drive of the machine should be especially noted.

The head is firmly bolted to the carriage, as can be seen, and is moved forward by either hand or power feed on the ways of the bed. The carriage is driven by a rack and pinion movement, the rack on the bottom of the carriage meshing with the large bull gear between the ways of the bed. The power is transmitted through a standard Jones & Lamson geared feed box, connection being made by the use of a worm and wormgear and the connecting shaft.

The cutter bars revolve, thus boring the holes in the head casting as the carriage is fed forward. There are nine selective feeds for the carriage and two speeds for the bars, one speed for boring and the other for tapping and reaming.

By referring to Fig. 2, it will be noted that the operator can control the machine from either side, thus making it unnecessary for him to walk around to reach the controls. The carriage is shown run back so as to clear the bars for the removal and replacement of the work. When the carriage is moved forward the overhanging ends of the bars enter the outer support before cutting begins. Time is saved by leaving the bars in position in their driving spindles.

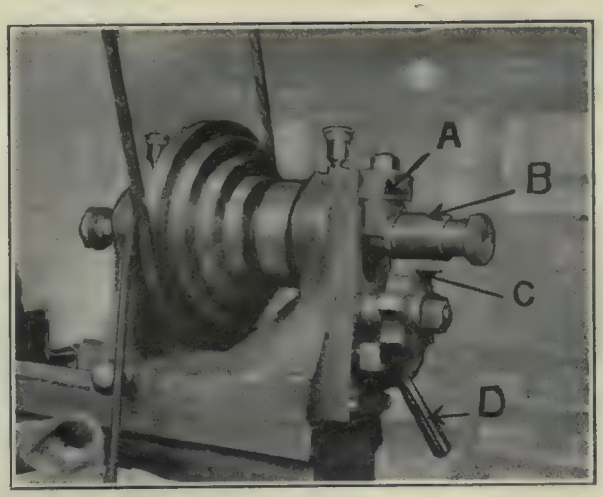
The saving in time, due to performing all operations at one setting, is very noticeable and means a saving in costs. In spite of the high initial cost of the machine, the company estimates that the heads are bored, reamed and tapped on it at a saving of 75 per cent over the old method of handling them.

Feeding the Spindle to Cut Threads

By Henry C. Francis

In the shop of Brandis & Sons, Brooklyn, N. Y., makers of surveying and navigating instruments, I recently saw a lathe with a screw-cutting arrangement which was out of the ordinary. It is a light lathe of perhaps 12 in. swing and driven by a round belt as shown.

On the back end of the spindle is a block *A* which acts as an end thrust. Back of this is a hob *B*, with the desired thread cut on it which is easily removable as in the fox lathe. The piece *C*, acts as a nut, in place of the follower or leader, as in the fox lathe and remains stationary while the spindle moves out, carrying the work with it. This nut has several different threads cut in it to accommodate various hobs.



THREADING BY MOVING SPINDLE

The nut is thrown into action by raising the handle *D*, which must be lowered to bring the spindle back into normal position. While this arrangement seems less convenient than that in the fox lathe, especially in the matter of returning to the beginning of the thread, it seems to work well in the hands of those who know how to use it, as the work it does is excellent.

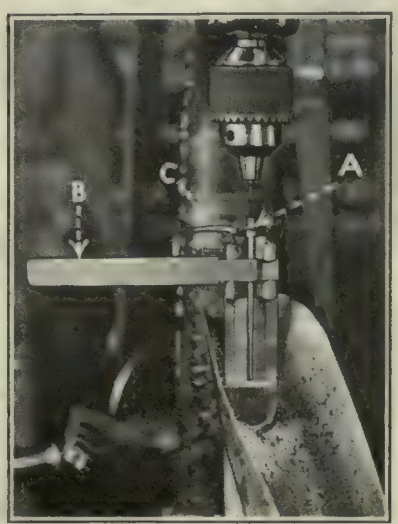
The threads are short, as in nearly all instrument work, and usually of fine pitch. The lathe was built by Auerbach & Co., Dresden-Pieschen, Germany.

Drilling Spark-Plug Spindles

By E. V. Allen

For drilling the ignition-point hole in spark-plug spindles we have a jig, as shown in the illustration, that we are quite proud of. The spark-plug spindle is placed in a V-shaped recess at *A*, and held in place by the lever *B*. The shoulder on the upper end of the spindle prevents it from dropping down when drilling, so all that is needed is pressure enough on the lever *B* to keep the spindle from turning while being drilled, which is very little. As the operator pulls down on the lever of the drilling machine with his right hand, he pulls outward on the lever *B* with his left, which gives all the pressure needed to keep the work from turning as the drill goes in.

When the hole is deep enough the operator pushes up on the drilling spindle lever and presses back on the clamping lever. He pushes this lever far enough back so that not only is the work released but the curved piece *C* hits it and knocks it out of the V-block so that it drops down the chute in front of the machine.

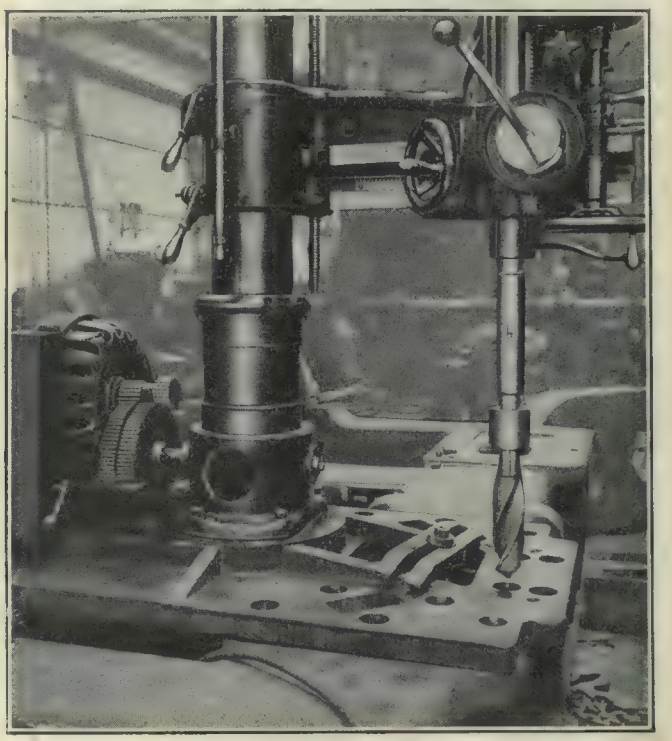


JIG FOR DRILLING SPARK PLUG SPINDLES

Using Drilling Machine Base for Drill Jig

By Herbert Crawford

In these days of traveling cranes for handling heavy work we have become accustomed to picking up a large radial drilling machine or other tool and planting it beside the work to be done. But it is a bit unusual to



USING MACHINE BASE AS DRILL JIG

set the machine down on top of the work and use the base as a drill jig as shown in the accompanying illustration.

A special base was made and the holes laid out in the proper places to drill the bedplates of some marine engines. Locating the machine carefully in the proper position, and fastening it in place by the large hairpin strap shown, it was an easy matter to drill the 14 holes, guiding the drill by the bushed holes in the base.

It will also be noted that two speeds are provided by the gearing between the motor and the column of the machine.

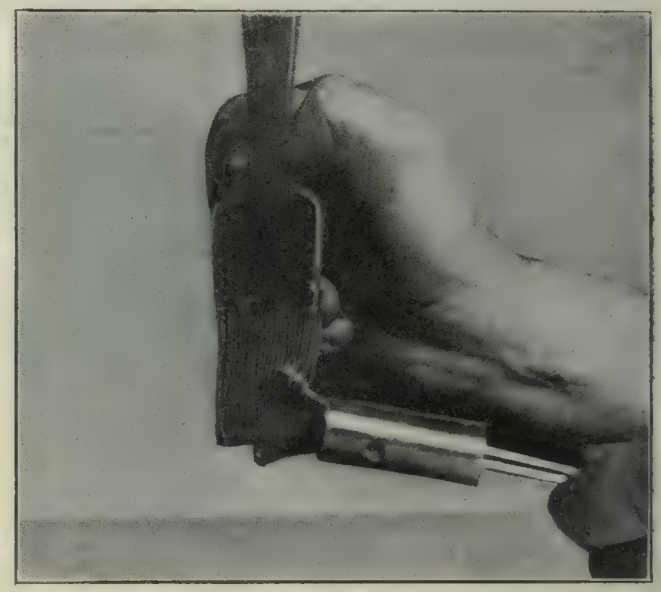
This is from the shop of the Llewellyn Iron Works, Los Angeles, California.

Holder for Painting Nuts

By Harry Moore

The device illustrated herewith has proved of considerable use in a factory where painting nuts is a frequent job. As this is not an uncommon operation where a particular color is standard with the firm's product, it may be of interest to others. The main features of the holder are its quick operation, and the fact that the face of the nut is protected from the paint.

The device comprises two parts only, a piece of wire bent double to fit the nuts, and a sleeve with a hole rather larger than the overall width of the double wire. On one side of the sleeve a hole is drilled and a silght



HOLDER FOR PAINTING NUTS

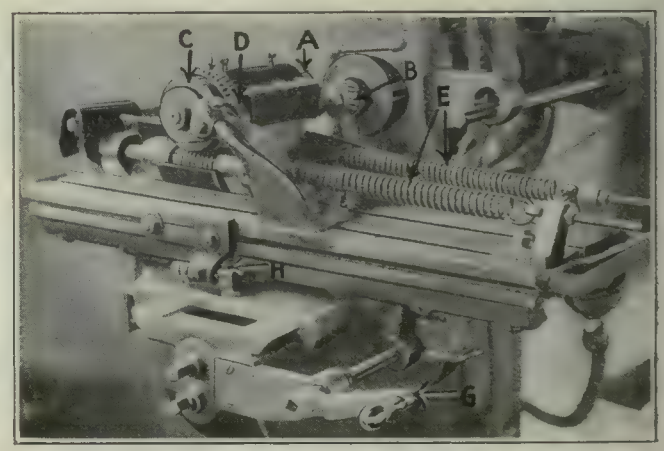
kink made in the wire forms a simple means of opening and closing the wire jaws. The sleeve is pulled back to force the kink in the wire out of the side hole and this closes the ends of the wire to allow the nut to be slipped on. Then the sleeve is pushed forward against the face of the nut until the kink in the wire slips back in the hole and allows the wire to spring out and grip the nut. Thus the painted nuts can be dropped into a box without touching them at all. In the illustration the device is being used for painting thumb nuts.

A Cam Milling Fixture

By Edward Bannon

We make quite a number of cams similar to those used on gas engines, yet we do not make enough to pay us to buy a special machine for shaping them, so we have made the device shown in the accompanying illustration for use on a milling machine.

The cam to be milled is placed at *A*, and the milling



A CAM MILLING FIXTURE

cutter *B*, is the same diameter as the cam roller. The master cam or pattern is placed at *C*, on the opposite end of the spindle which carries the cam to be milled. The roller *D*, is the same diameter as the milling cutter and the master cam is the same size as the finished

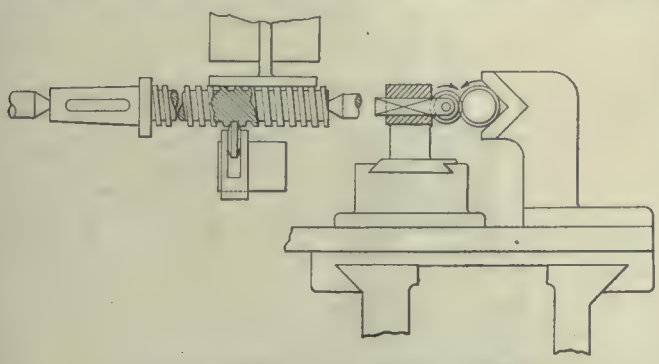
cam. The spindle carrying the master cam and the cam to be milled is driven by means of the worm and worm wheel shown, the worm being operated by the universal-joint shaft commonly used for the index head of the machine. The mechanism carrying the work and master cam spindle and the worm drive is mounted on a slide so that the springs *E* will keep the master cam in continual contact with the roller *D*, which is carried on a bracket bolted solidly to the machine table. While putting on or taking off the work, the table may be run back by means of crank handle *G*, and when starting a cut the table is run forward as far as the stop *H* will allow and kept there until the cut is finished.

We obtained very satisfactory work from this device, and when we have run out enough to last us for a time we remove the fixture and use the machine for other work.

Straightening Bent Shafts in a Lathe—Discussion

By J. T. Towlson
London, England

Shafts and piston rods are by no means the only things subject to distortion by bending, and the methods described by Frank C. Hudson on page 920, Vol. 58, of the *American Machinist* are applicable to other things as well; bent screws, for instance. A bent



CORRECTING A DAMAGED SCREW

screw is a much more difficult job to straighten than is a plain bar, for the reason that the bending may have caused "drunkenness" of thread and consequent errors of pitch.

There is a point well worthy of notice in the straightening of bent shafts and screws—particularly the latter—that Mr. Hudson has not touched upon. If a shaft is bent—let us say—½ in., in the straightening it should be forced beyond the point of true straightness until a bend of one-half the original amount, or ¼ in., is secured in the opposite direction. Then it should again be sprung to about ⅛ in. in the original direction, and again back in the opposite direction for 1/16 in. By thus working the bent shaft or screw in alternate directions a great deal of the tendency for it to assume its bent condition when placed in service is relieved.

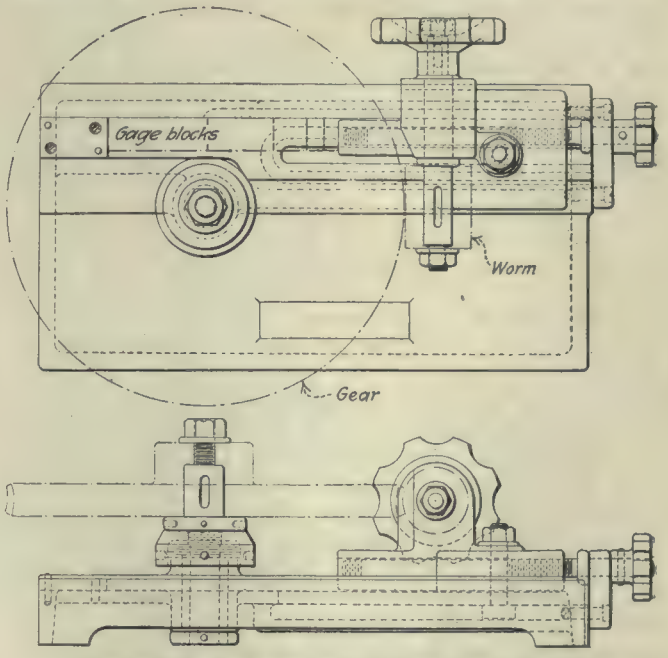
A device I have used to correct errors of pitch or distortion of thread in screws that have become bent and afterward straightened by the means Mr. Hudson describes, is shown in the accompanying sketch. The screw is placed on the centers of a good lathe, which must be geared to the corresponding lead, and the thread gone over with a hardened steel wheel shaped to conform to it.

The action of the wheel is to smooth out and correct any distortion of the threads. No undue strain is imposed upon the lathe for the reason that the thrust of the steel wheel is directly opposed by the V-block of the follow rest.

Fixture for Testing Worms and Worm Gears

By A. J. Cayouette

The fixture shown in the accompanying illustration was designed for the purpose of testing the accuracy of worms and worm gears used in the production of accurate automatic machinery for making electric



FIXTURE FOR TESTING WORMS AND GEARS

lamps. It is also adapted for use in other cases where accurate worms and worm gears are required.

The fixture provides a means for rotating a worm gear with a master worm or a worm with a master worm gear. The worm and gear are accurately located on arbors which can be readily adjusted and positively set to the correct relation of the worm and gear under test.

A cast iron base is provided in which an accurate dovetailed slot is machined and in which the vertical arbor for the worm gear is mounted. As shown in the illustration, the arbor is centered in a sleeve which rotates in the hole in the base, and can be moved vertically by means of a nut threaded on the sleeve. The vertical movement is for aligning the worm and gear. Arbors of various diameters can be used for gears having different sizes of holes, and should be hardened and ground.

The slide which carries the worm arbor is moved along the base by the handwheel and screw shown, and can be locked in a given position by a locking bolt. The worm arbor is also hardened and ground and made in sizes to suit worms having holes of different sizes.

The correct setting of the worm carrying slide is obtained by standard gage blocks which are placed in the fixture as shown, between a locating plate attached to the base and a projecting lug on the slide.

This fixture has been in use for a year or more, it has proved practical in service and satisfactory results have been obtained.

First-Class Machine Shop Foremen

By F. P. Terry
Belfast, Ireland

Although at the present time "Help Wanted" advertisements are few and far between, the few that do appear leave the machine shop man guessing as to the type of individual that is looking for help. Usually we find that a "first-class machine shop foreman" is required, who "must have exceptional experience in machine shop work." This, analyzed, appears to me to be much the same as the landsman who writes of speed at sea as so many knots per hour; unaware, of course, that he is actually announcing so many nautical miles per hour per hour. In like manner the advertiser who is looking for a foreman as above is seeking a first-class foreman of the first class. Looking back over many years of machine shop experience, I cannot recall ever meeting a machine shop foreman worthy of the name or title of first-class, who had not acquired exceptional experience of machine tools and machine shop work.

We also see occasionally that a first-class foreman is required who has had experience in one particular line of production; which is also, I think, an unnecessary appendage, as it matters very little to a really first-class foreman what a machine shop produces. Personally, in cases of this sort, I would much prefer a first-class man who lacked the latter qualification than one who claimed to be first class in this particular line only, as I would be apt to obtain a man who lacked much that is necessary to the make up of a first-class foreman. As many readers of this journal well know, all kinds of machine shops are very much the same from the inside. The human element is the same and the production of all are shafts, gears, bushes, cranks and castings with flat and curved surfaces, bosses and holes. There are, of course, some which make only one item—it may be engines—and in this case, from the machine shop point of view, I would ask (slightly varying a well-known quotation) "What does he know of Engines who only Engines knows"? What chance has such a man against one who has studied a wide range of machine tools and machine tool work, and who, possibly, has produced something very much the same as a connecting-rod, but called something else, by quicker and cheaper methods than the man who has produced connecting-rods only?

Foremen Who Are Specialists

I am quite aware, of course, that we have many first-class machine-shop men fully entitled to call themselves such, engaged on specialized production, men who could succeed in any machine shop; and to these the type of advertisement referred to is not an asset but the reverse, as it limits their prospects for other employment.

The really first-class foreman may specialize, but not to the extent of narrowing his vision. He will always be on the alert for new machine tools and even specialized machine tools, which at the moment may not apply to the work on hand. He will continually read all he can of what others are doing in the machine-shop field. In short, he will keep his machine shop, of whatever kind, bang up-to-date, and the firms requiring such a man may safely drop the little extras referred to from their "ads," as there is nothing better to be obtained than a first-class man who can prove himself such in any machine shop. He may not have any frills, but when it comes to delivering the goods he gets there just the same.

A Compound Combination Die for Light, Rapid Work

By S. A. McDonald

In making the breast for a friction top can, such as shown in Fig. 1 in an inverted position, there is a disk of tin punched out to make the opening, which disk would be waste if there were no small parts being manufactured. Usually this disk is fed into some other die and the necessary operations performed on it.

In the compound combination die shown in Fig. 3 the breast is blanked, punched and formed complete in one stroke of the press, and the disk from the center is formed into a cup as shown in Fig. 2. This cup is the first of a series of operations to make a nozzle for a varnish can.

The die is constructed as follows: The punch *A* is made of machine steel with a tool-steel ring welded to it to form the cutting edge. A machine-steel sleeve *B* runs through the punch and clamps the disk-cutting punch *C*, so that it secures the forming ring *D* in the punch. The knockout stem *E* has a pin *F* driven

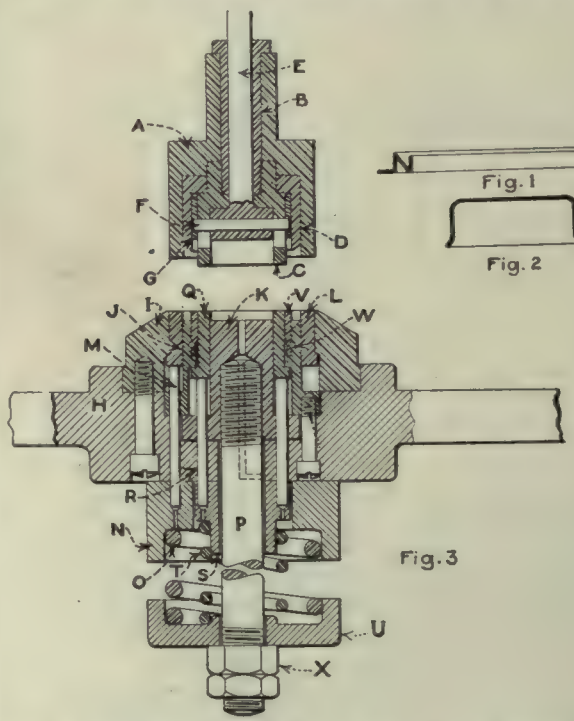


Fig. 1

Fig. 2

Fig. 3

FIG. 1—BREAST FOR CAN TOP. FIG. 2—CUP MADE FROM BREAST SCRAP. FIG. 3—COMPOUND COMBINATION DIE

through it, which operates a knockout ring *G* through a slot in the disk punch *C*.

The die-shoe *H* is bored out to receive the cutting edge *I*, the forming ring *J*, and the center pad *K*. A pressure ring *L* rests on four pins *M* which are driven into the washer *N*. This washer is held up by a spring *O*, which is compressed by the washer *U* and the nut *X* on the stud *P*. The pressure ring *Q* is held in the same manner by the pins *R*, the washer *S* and the spring *T*. The disk cutting edge *V* is a driving fit in the forming ring *J*, and two taper pins *W* hold it in place.

The die works as follows: When the punch comes down it blanks the hole first and then cuts the outer edge. The two blanks, being held between their respective pressure rings and the faces of their punches, are carried down into the die. The hole in the breast is drawn over the rounded corner of the cutting edge *V*

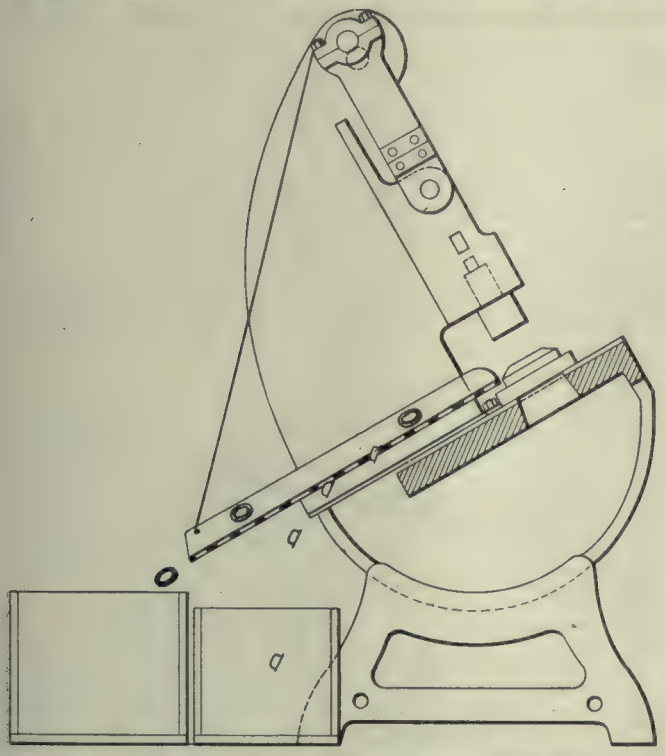


FIG. 4—ARRANGEMENT OF PUNCH PRESS

to make the fit for the cover of the can. The forming ring *D* now forms the angle to the breast, which gives it its final shape.

While the breast forming was being done, the punch *C* was drawing the inner blank over the center pad *K*, to form the cup as shown in Fig. 2. As the punch recedes, the pressure rings strip the ring and cup from the die, so that they are carried up in the punch until near the end of the stroke. Here the knockout forces the knockout stem *E* down, and by the pin *F* the knockout ring *G*, so that both the ring and cup are shed.

The press being inclined as shown in Fig. 4, the ring and cup fall into a chute behind the die. To avoid having the parts mixed together, the chute is made with a double deck, the top deck where they both fall having holes large enough to permit only the cups to fall through to the chute that leads to the cup box, while the breasts slide down to their box. A wire connected with the lower end of the chute and the crankshaft cap agitates the chute, so that the breasts do not stick in the chute.

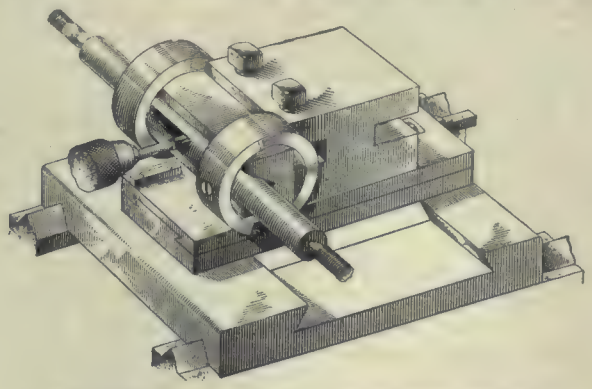
Milling Small Keyways in a Lathe

By J. T. Towlson
London, England

No matter how well equipped a shop may be, there are times when the equipment seems inadequate to handle certain unusual jobs that come in. For example: We accepted a job that required hundreds of small shafts with, perhaps, half a dozen keyways of different lengths and depths in each. The job was wanted promptly and all the available milling machines were tied up for weeks to come.

Two or three old 12-in. lathes were rigged up as shown in the sketch. A milling tool was held in a drill chuck in the live spindle and a V-block milled in position in the tool block of each lathe, so that the V was in exact alignment with the spindle in the matter of height and also exactly parallel with the movement of the cross slide.

A bracket was affixed to each side of the lathe carriage and fitted with adjusting screws to limit the movement of the cross slide in either direction. The compound rest, set parallel with the center line of the lathe, could be depended upon to regulate the depth of the keyway as it, also, was fitted with a stop-screw.



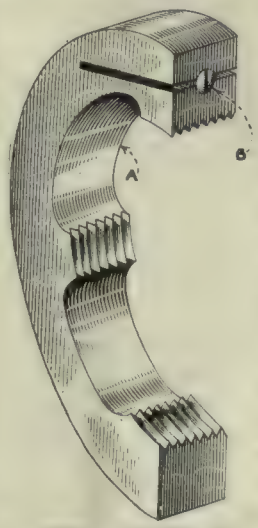
MILLING SMALL KEYWAYS IN THE LATHE

The shafts were held in the V-block by means of a slip collar and setscrew, and all keyways of one length and depth were milled in the whole lot of shafts without altering the adjustments. When one lot was finished the screws would be adjusted for the next lot.

An Effective Screw Thread Gage

By Amasa S. Tracy

I read with considerable interest the article by Messrs. Dowd and Curtis on page 755, Vol. 58, of the *American Machinist*, relating to the difficulties of gaging screw threads. It read much as our own experiences. After encountering the uncertainties of the three-wire method, the impossibilities of the ring gage and giving up the thread micrometer as hopeless, we hit upon the following method as the simplest, the most direct, and consequently the easiest for both the operator and the inspector. The gage, as shown in the illustration herewith, is virtually an exact half of a ring gage. It is cut away at *A* to assist in keeping it clean and to aid adjustment with the screw *B*.



SEMI-CIRCULAR SCREW THREAD GAGE

The original intention was to have sets of two, one gage adjusted to "Go" and the other to "No-Go." The number of threads in the gage should be sufficient to insure adequate accuracy of the pitch.

It is truly surprising how rapidly and accurately one can use the gage, depending on the feel for diameter and on vision, either unaided or aided with a glass if necessary, for form.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors
October 25, 1923

Engineering Education and American Industry

THE mechanical and manufacturing industries of this country must co-operate with the technical school if they are to reach the stage of development required by the needs of the American people. This fact is brought out very forcibly in the recent report of a joint committee of the National Industrial Conference Board and the Society for the Promotion of Engineering Education.

No one doubts that the future leaders of these industries must in a large degree be drawn from the ranks of the technical school graduates. We do not all agree, however, in what constitutes proper training in our technical schools or in the status of the young graduate. From the academic viewpoint he is a finished engineer; from the industrial viewpoint he is a technically trained industrial apprentice.

In the report mentioned above an extremely interesting graphical analysis divides the 750,000 major technical and supervisory positions in the manufacturing and mechanical industries into four groups. Of this number about 78 per cent are grouped in the fourth division which includes owners of small establishments, superintendents of medium sized establishments, engineers, salesmen and foremen. The other three groups include chief executives and superintendents of larger establishments, chief engineers and sales managers. About 150,000 engineers, designers and research men are included in the various divisions.

The interesting feature of this study is the fact that success in the higher groups has been achieved in nearly every case only after years of service and development in the fourth. Future occupants of the higher positions must also receive most of their practical training and experience in the comparatively small positions and competitive atmosphere of the large division which forms, so to speak, the vestibule to the higher realms of industrial leadership.

These are facts; and they certainly form a basis for the characterization of the technical graduate as an industrial apprentice. In general, the education given in our engineering schools should conform to the requirements of this fourth group, in which the graduate will immediately find himself.

The responsibility of industry in this matter is very great, for it is evident that every industrial corporation must have an educational policy for the development of its leaders. Industry can assist in finding and developing men for the teaching service; it can increase the esteem accorded to educators; it can provide industrial contacts for teachers; and it can increase the attractiveness of the teaching profession for men who belong logically in this profession. Furthermore, our industries can insist on the training which their men require. The primary motive of the technical school is to provide the kind of education which industry demands. The practical training of undergraduates, either during the summer holidays or in co-operation with the school work, is another field in which the industrial world can busy itself.

Leaders in industry, who already realize the pressing nature of the problem of an adequate supply of technical ability, are making suggestions which challenge the attention of the technical schools. Improved methods of selection of students, followed by better training in fundamentals, and stimulation of initiative, are of prime importance. The teaching force can be improved by the inclusion of instructors with practical experience, vision and high ideals. Students may be put in touch with affairs by practical training in industrial establishments.

These recommendations show that the present leaders of industry are more interested in the general character and ability of their recruits than in their possession of specific knowledge. If these suggestions are to be carried out the educator and the industrialist must come closer together than ever before. They must realize the sameness of their responsibilities for the country's industrial needs and work in perfect harmony for the benefit of all.

These matters affect industry in general, but are of especial concern to the makers and users of machinery, the mechanical industry. Enormous machines, complicated in design and almost unbelievably accurate in construction, must be continually brought out in an endeavor to meet the needs of America's manufacturers, and the limit is still far distant. The future success of the machinery industry, therefore, lies to a great extent in its ability to co-operate in making available a sufficient number of technically-trained, broad-minded men to occupy its leading positions.

The Navy and the Terms of the Disarmament Treaty

ANNOUNCEMENT by the Navy League that Navy Day, established last year on the birthday of Theodore Roosevelt, will again be celebrated this year on Oct. 27 has just reached us. It calls to mind the work done by the Navy at Smyrna and in Japan during the past year and also brings back the famous 5-5-3 ratio of the disarmament conference.

Some people seem to think that the halt called to our rapidly expanding naval construction program by the terms of the conference meant that the Navy was to be allowed to decline in size and efficiency. Just what means of defence was to take its place appears to have received little attention.

Could anything be more foolish? A nation without adequate naval power to protect its own interests abroad receives scant attention in international affairs. We have limited the size of our Navy by treaty but there is no sound reason for reducing it still further in personnel or equipment.

The Navy League is doing a good work in calling attention to the importance of the Navy and deserves support.

Shop Equipment News

Brown & Sharpe Spur and Spiral Gear Hobbing Machine

A spur and spiral gear hobbing machine which combines accessible arrangement of parts, simplicity of operation and rugged construction, has recently been placed on the market by the Brown & Sharpe Mfg. Co., Providence, R. I. The machine is designated as No. 44 and will hob spur and spiral or helical gears up to 18 in. in diam. and 3 diametral pitch in cast iron, or 4 diametral pitch in steel.

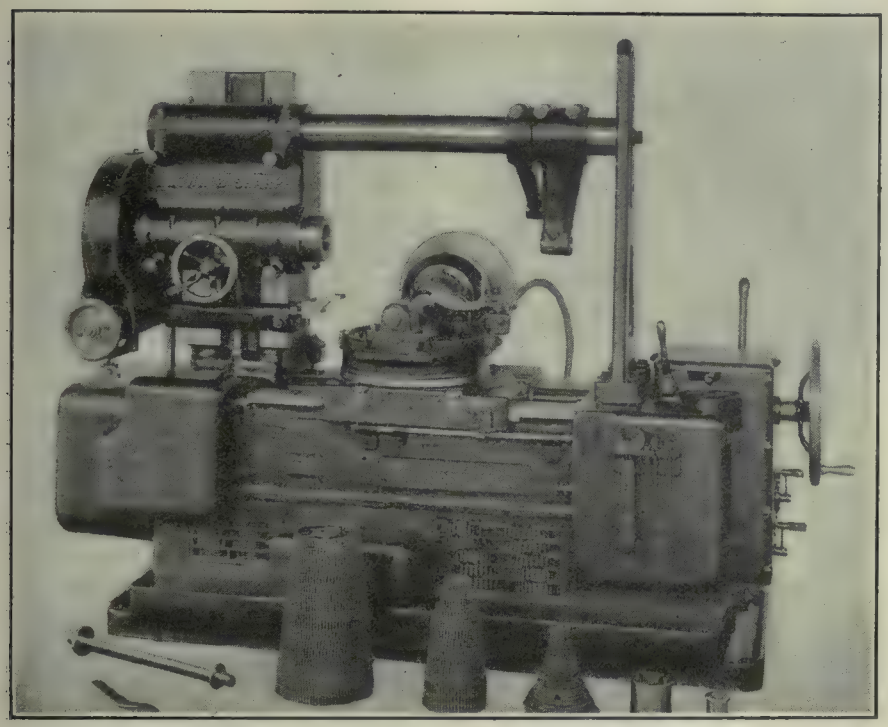


FIG. 1—FRONT VIEW OF BROWN & SHARPE GEAR HOBBING MACHINE

A front view of the machine is shown in Fig. 1 and it will be noted, in general, that the machine consists of a heavy cabinet base upon which the sliding hob carrier is mounted, with the hob feed mechanism enclosed in the casing at the right hand end. At the other end of the bed is a heavy column on which the work spindle housing is arranged to be adjusted up and down. At the left hand end of this housing the worm and gear indexing drive for the work spindle is located, the power being derived through the vertical shaft from the drive gear box underneath.

The machine is driven through a single friction belt pulley which will be seen at the lower left hand of the machine in Fig. 2, the rear view of the machine. The friction portion of the drive pulley is keyed to a shaft which runs through to the front of the machine and drives a set of change gears. These gears, in turn, drive a splined shaft which passes longitudinally along the machine below the center of the hob slide, and is geared to the hob spindle and the work spindle in turn.

The change gears provide 10 speeds for the hob spindle, ranging in geometrical progression from 45 to 166 r.p.m. A sleeve carrying two bevel gears is centered on the hob slide swivel, the lower one of which meshes with a bevel gear mounted on the horizontal splined drive shaft. The upper gear meshes with a gear on a short shaft which is geared to the hob spindle, the entire arrangement providing the flexibility of drive necessary for various angular positions of the hob and the feeding motion of the hob slide.

The hob spindle is hardened and ground and runs in long bearings, the front bearing being removable to permit easy adjustment and quick changing of hobs up to 5 in. in diam. The standard hob spindle is 1¼ in. in diam., and an end adjustment of 1½ in. is provided so that several sections of the hob may be used before re-sharpening. A 1½ in. spindle can be used if desired and accurate end adjustment is obtained by a graduated screw.

A balance wheel, mounted on the end of the hob spindle as shown in Fig. 2, is provided to steady the cutting action of the hob and assist in eliminating chatter. Another arrangement which is also intended to insure smooth hob action is the mounting of the spindle gear in a heavy bearing on the slide. The driving gear thrust is, by this means, carried by the bearing and the spindle bearings carry the cutting or hob load only.

The hob slide has a long bearing on the ways and the swivel is graduated. The swivel may be swung 90 deg. either way from zero, and settings to 5 min. of angle are possible by means of a vernier. The swivel in both directions makes it possible to use the full range of the machine in cutting right or left hand helical gears.

The index gearing for the work spindle is located in the casing at the right hand end of the machine in Fig. 2, and is driven by the longitudinal splined drive shaft mentioned above. The feature of this mechanism is the differential gear, by means of which the change of relative speed between the hob slide and the index spindle to produce helical teeth is obtained.

The differential is of the usual bevel gear type, the driven member being the spider. The driven shaft is connected by change gears to a vertical shaft which drives the indexing worm and may be seen at the right in Fig. 2. The other gear of the differential is driven from the feed shaft by means of a set of lead change gears and a worm and wheel. The lead change gears are calculated

for any particular job by means of a simple formula and for a given pitch and helix angle, the gears remaining unchanged for any number of teeth or direction of helix.

The change gears, through which the vertical index drive shaft is operated, provide for cutting all numbers of teeth from 6 to 50, and from 50 to 180 with the exception of prime numbers and their multiples.

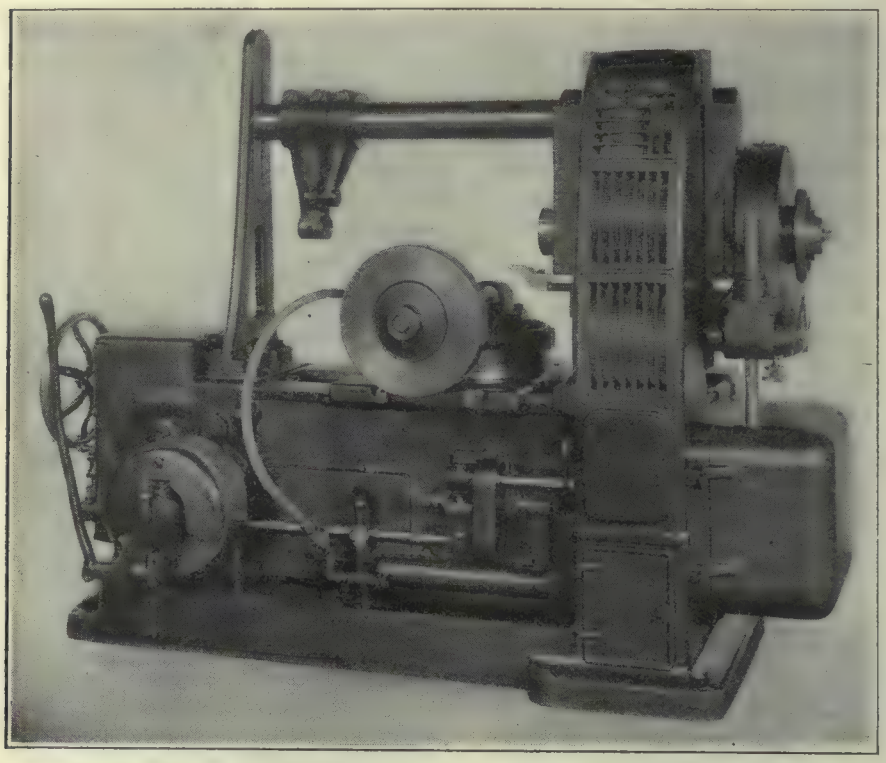


FIG. 2—REAR VIEW OF BROWN & SHARPE GEAR HOBBING MACHINE

The vertical shaft drives the indexing worm through spiral bevel gears. The worm has a double thread, runs in oil and is hardened and ground. A ball thrust bearing is provided together with an arrangement which permits the operation of the worm by hand when desired. This feature is of value when recutting gears as graduations are provided to indicate the relative adjustment of the work arbor. The worm can also be dropped out of mesh so that the indexing wheel can be turned by hand. The indexing worm wheel is of cast iron, finish hobbed in place.

The work spindle has a 2½ in. hole through its center, a No. 16 taper hole at the front end, and is fitted to receive a face plate or fixture. The spindle housing or slide is adjusted vertically by means of a handwheel and screw, the thrust of the screw being taken by a ball bearing. A dial graduated to thousandths of an inch indicates the amount of adjustment.

The feed mechanism for the hob slide is located at the left hand end of the machine in Fig. 1, and is driven by a horizontal shaft at the rear of the machine. This shaft is driven from the change gears in the indexing wheel drive. Twelve changes of feed in geometrical progression from 0.010 to 0.153 in. per revolution of work are provided by means of change gears, which drive the feed screw by means of a worm and a clutched wheel. The feed screw is accurately made and can be removed for replacement if necessary.

Power traverse in both directions is always available when the driving pulley is running and the hob is stationary, thus eliminating laborious hand operation. Hand feed is provided and operated by the handwheel shown in Fig. 1 at the right.

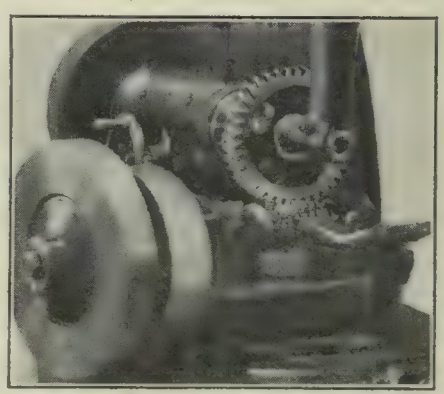


FIG. 3—HOBBING A HELICAL GEAR ON BROWN & SHARPE MACHINE

The outer end of the work arbor is supported by a large overhanging arm equipped with suitable braces. Fig. 3 shows the machine in action hobbing a helical gear and illustrates the method of mounting the hob and gear blank.

The feed case and differential mechanism are automatically lubricated by means of a pump located in the feed case. The cutting lubricant is pumped through a flexible tube to a flat nozzle, which is shown in Fig. 3 and provides an even and well-distributed supply over the cutting surface of the hob. The moving parts below the hob slide are protected from the chips, which fall into the base.

The base is of heavy ribbed construction and has compartments for storing all change gears furnished with the machine. The floor space required with covers open is 104x57 in. and the net weight of the machine is 6,840 pounds.

Keller Flexible Shaft Bench Grinder

A flexible shaft bench grinder designed and built to meet the requirements of the die department for riffling, grinding and polishing dies, has recently been placed on the market by the Keller Mechanical Engineering Corp., 70 Washington St., Brooklyn, N. Y.

The motor of the machine is mounted in a universal swivel joint on a heavy cast iron pedestal, the base of which is 11 in. in diam. The motor may be swiveled to a convenient position on its horizontal pivot and clamped if desired. The swiveling feature is intended to reduce the amount of bending necessary in the flexible shaft, thereby decreasing the wear.

The motor drives a jackshaft through a three-step cone pulley. The jackshaft is mounted eccentrically so that changing the speed by shifting the belt is easy and convenient. Three shaft speeds are available, 875, 1750 and 3200 r.p.m. The motor armature and the jackshaft run in ball bearings.

The handpiece is designed to run without heating and is provided with ball bearings. The flexible cable or shaft runs in a strongly constructed metal sheath.

A variety of tools for use with the apparatus are furnished, including burrs, grinding wheels and polishers. The burrs are hand cut and of various sizes and shapes. The special polishers are so mounted on

a universal joint that there is no tendency to cut into the work with the edge of the disk.

A ¼-hp. Ohio motor for 110 or 220

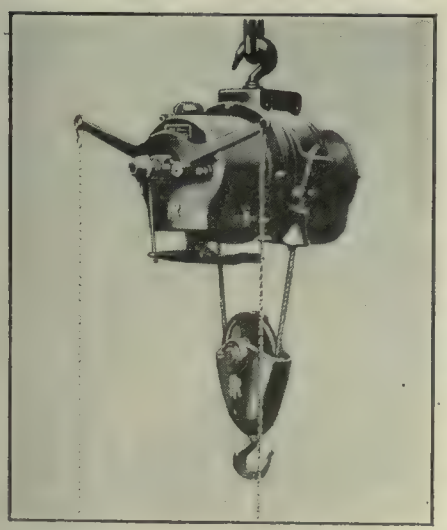


KELLER FLEXIBLE SHAFT BENCH GRINDER

volts, and direct or alternating current as desired, will be furnished. The apparatus in working order weighs about 77 pounds.

Ingersoll-Rand Air Motor Hoist

A size-A air motor hoist of small and compact construction, and with a load capacity of 500 lb., has been recently placed on the market by



INGERSOLL-RAND AIR MOTOR HOIST

the Ingersoll-Rand Co., 11 Broadway, New York, N. Y.

The power is derived from a three-cylinder balanced air motor which operates in either direction at any speed or load within the capacity of the machine. Among the advantages claimed for this motor are its freedom from vibration, ability to throttle down slowly at all loads and small tendency toward lubricating troubles; even when subjected to considerable neglect. The motor shaft is geared to the hoisting drum.

The throttle graduation is fine and gives complete control of the hoist at all speeds. An automatic brake is provided by means of which the load is held at all times when the air supply is cut off from the motor, either by the throttle or failure of the air supply. The brake consists of a disk attached to the motor shaft and against which a spring-operated friction-faced plunger is pressed whenever the hoist is not operating. The action is entirely automatic.

A safety stop lever is provided which closes the throttle and stops the motor whenever the load is by chance raised to the top of the hoist lift. A roller bearing mono-rail trolley can be furnished in place of the hook shown in the illustration, if desired.

Both motor and gears are enclosed and the motor operates in a bath of oil. The gears run in grease and oil passages are provided for all bearings. Ball bearings and bronze bushings are used.

The hoist weighs 150 lb. and operates on air pressures from 60 to 100 lb. The lifting speed at 80 lb air pressure is 50 ft. per min., and the maximum lift is 15 ft. The wire cable is 35 ft. long and ¼ in. in diameter.

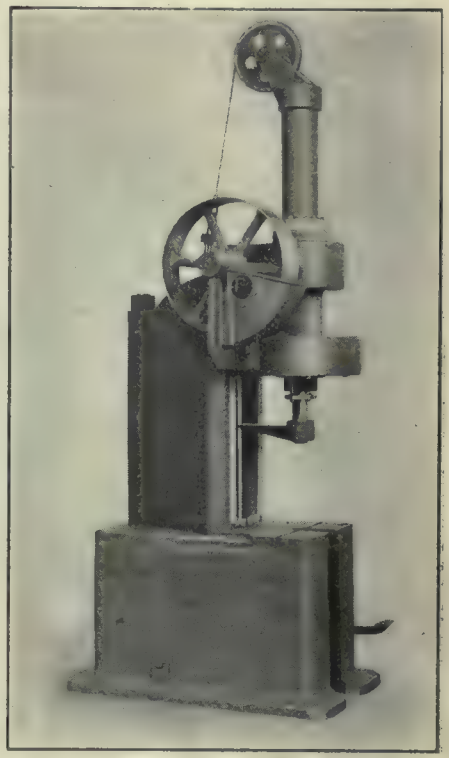
Fox "Flexible" Power Press

A recent addition to the line of tools manufactured by the Fox Machine Co., Jackson, Mich., consists of a "flexible" power press. The flexibility of the drive is obtained by the use of a friction mechanism operated by a treadle.

The press is at present built in two sizes of 8 and 20 tons capacity, respectively. The work is placed on the table and the operator presses down on the treadle causing the ram to descend rapidly upon the work. The pressure of the ram on the work is controlled by the pressure on the treadle and, when the pressure on the treadle is released, the ram is returned rapidly by means of a heavy coil spring.

The column rests on the base and the ram case is fastened to the top of the column by heavy bolts. The column is triangular in section and heavily ribbed to resist torsional strains. The base is slotted under the center of the ram to receive flanged shafts and work of a similar nature.

The ram case is also heavily ribbed to resist the thrust and encloses the ram driving mechanism. The ram has a quadruple thread of coarse pitch and two opposed splined keyways. The rotation of the ram is accomplished by a long steel sleeve which carries the keys which fit the keyways of the ram. The sleeve is



FOX FLEXIBLE POWER PRESS

driven by a steel worm which meshes with a phosphor bronze worm gear secured to the sleeve.

The treadle operates a friction brake through a system of levers and the action of the brake band, by arresting the motion of the brake drum, causes the ram to descend. When the ram reaches the work the pressure on the treadle regulates the slippage of the brake and governs the pressure of the ram.

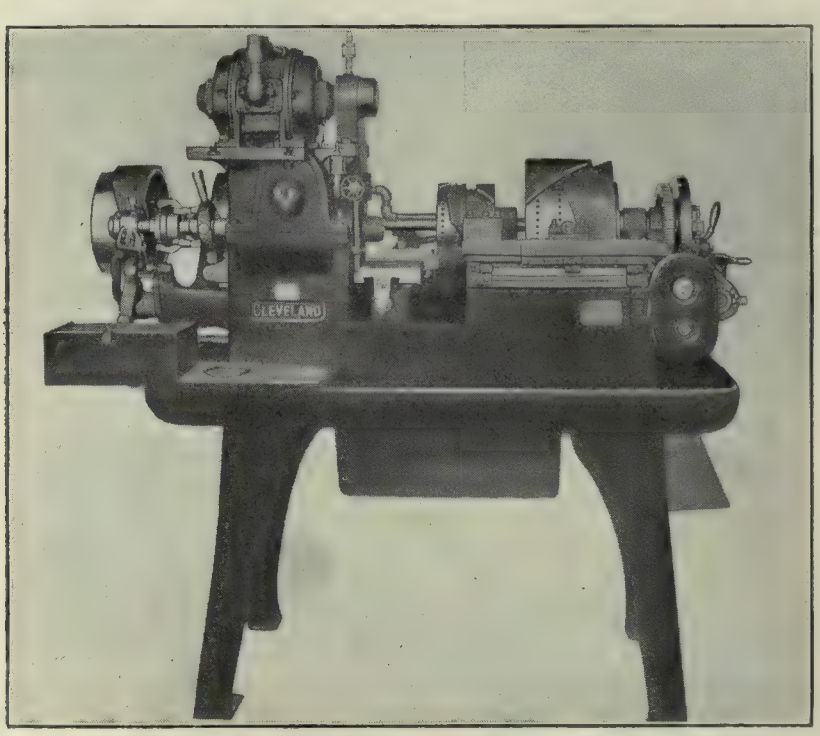
The stroke of the ram is 18 in. in both sizes of the press, the maximum distance from the nose of the ram to the table being 20 in. The ram is made of manganese chrome alloy steel and a hardened steel thrust cap is fitted to the nose. A special nose piece for holding a variety of forming tools in the end

of the ram is also provided. The entire drive is enclosed in a grease case.

The height of the table from the floor is 30 in., the working surface being 12x16 in. on the 8-ton machine and 12x22 in. on the 20-ton size. The distance from the center of the ram to the column face is 8½ in. on the smaller and 11 in. on the larger press. The net weights of the presses are 3,000 and 5,000 lb. respectively.

Cleveland Motor-Driven Automatic Screw Machine

A single pulley belt or motor drive is among the improvements recently developed by the Cleveland Automatic Machine Co., Cleveland, Ohio, for its line of automatic screw machines. The illustration shows the motor drive as applied to the ⅞-in., plain, Model-B machine manufactured by this company.



CLEVELAND MOTOR-DRIVEN AUTOMATIC SCREW MACHINE

An a.c. or d.c. motor with push button control is mounted on the head and drives the machine through a silent chain, for which a suitable tightening device is provided. For belt driving a different gear case cover is furnished.

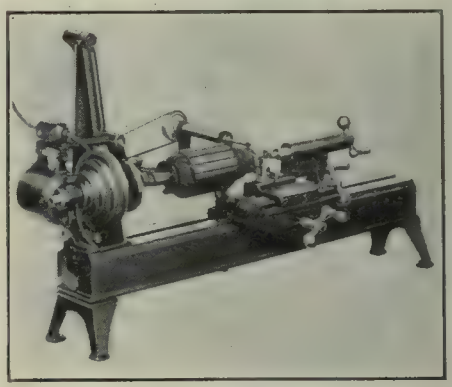
The spindle is driven through helical gears, the shafts being mounted in ball bearings. This arrangement is designed to provide an easy running quiet gear system. Eight spindle speeds are available, ranging from 208 to 1,600 r.p.m., the changes being made by means of a cluster gear and two sets of change gears. The drive is now equipped with a single flat spring type compression collar which, it is said, increases the grip of the work-holding chuck.

The feed mechanism, located at the right-hand end of the machine, is equipped with a friction clutch for idle motion speed. The power for feeding is transmitted from the driving-pulley shaft by means of bevel gears to a longitudinal shaft mounted on the rear of the bed under the camshaft arms. This shaft drives the feed cams by means of a silent chain, and also operates an oil pump. The pump is of the self-priming type with automatic overflow, adapted to handle either cutting lubricant or oil.

Another improvement in the machine which is worthy of note is found in the stock-feeding mechanism. A standard cam is placed on the stock-feed drum and, by means of a spring arrangement, feeds all lengths within the capacity of the machine. Adjustment for various lengths is accomplished by sliding the drum on the camshaft. Special cams for various lengths of stock are unnecessary and the spring also acts as a safety device to prevent breakage due to jamming of tools or from other causes.

Hullhorst Combination Lathe and Mica-Undercutting Machine

The Hullhorst Micro-Tool Co., Toledo, Ohio, is now marketing a small bench lathe equipped with a mica-undercutting mechanism for small armature commutators. With this device the commutator can be turned, undercut and polished without removing the armature from the lathe.



HULLHORST COMBINATION LATHE AND MICA-UNDERCUTTING MACHINE

The lathe swings 6 in. over the bed, 4½ in. over the compound slide and will take 18 in. in length between centers. It can be equipped with chucks and other attachments for doing a variety of work. The spindle has a four-step cone pulley for a round belt and requires a ⅛- or ¼-hp. motor for driving.

The undercutting unit is provided with an independent, universal, 110 volt motor for driving the cutter. The cutter spindle travel is secured through a balanced swinging lever arrangement. In operation the cutter is sunk into the commutator slot and drawn forward by the handle. When the handle is released the cutter immediately recedes from the slot.

The width of cut is controlled by the thickness of the cutter and the depth can be regulated by an adjustable stop.

Disston Hacksaw Blades

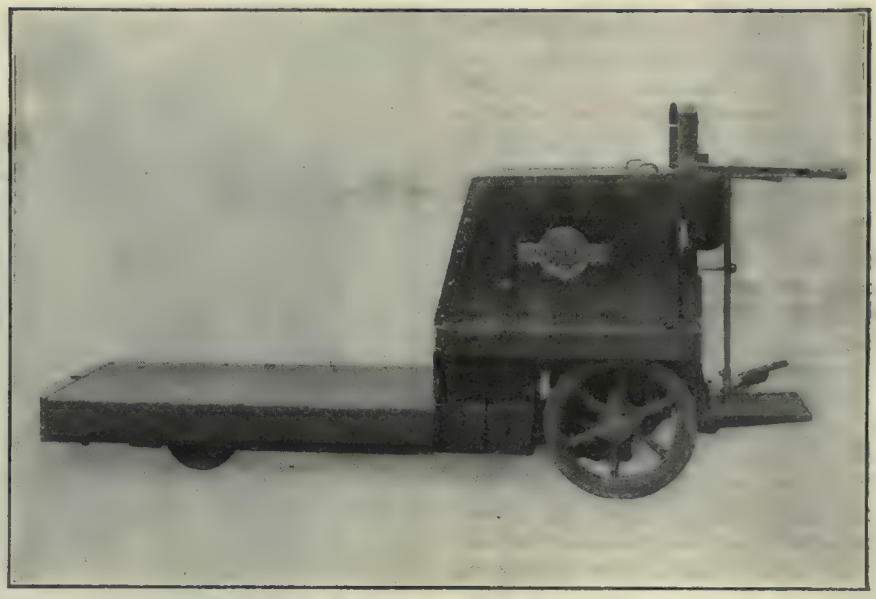
Henry Disston & Sons, Philadelphia, Pa., have recently placed on the market two varieties of hacksaw blades designated as the "Improved Chromol", and "Duraflex," respectively.

The former is an all-hard blade manufactured from a special molybdenum steel. This blade is made in lengths from 8 to 14 in. for hand use,

0.025 in. thick; in lengths from 10 to 14 in. for light gravity feed machines, 0.028 in. thick; and in lengths from 10 to 30 in. with thicknesses from 0.049 to 0.065 in. for heavy machine service.

The "Duraflex" is a flexible-back blade for hand frame use only, and is intended to meet conditions under which ordinary blades are broken frequently. This blade is furnished in lengths from 8 to 12 in. and 0.025 in. thick.

All blades have milled teeth. Every third tooth is left with no set and is called a cleaner tooth, its function being to carry out the chips which tend to slow up the cutting speed and dull the teeth of an ordinary blade. These blades are made in a variety of widths to suit the lengths and with 14, 18, 24 or 32 teeth per inch.



CRESCENT ELEVATING PLATFORM TRUCK

Crescent Elevating Platform Truck

The elevating platform truck recently placed on the market by the Crescent Truck Co., Lebanon, Pa., may be used to move materials on skids or load platforms, or as a straight platform truck. The platform is made of ¼-in. steel plate and is 54 in. long by 26 in. wide. The height of the platform from the floor in its lowered position is 11¼ in., the height when elevated being 15¾ in., a rise of 4½ inches.

The elevating mechanism consists of a separate enclosed G.E. motor running at 1,900 r.p.m. and raising the platform through chrome nickel steel reduction gears, a hardened and ground jack screw and a bronze nut. This motor is controlled by a drum type control switch on the dash and a limit switch is provided. Ball thrust and radial bearings are used and a solenoid brake gives complete control of the elevating apparatus. It is stated that the time required to raise the load is 10 sec., 7 sec. being the time taken to lower.

The truck has four wheels, the 20-in. front wheels being used for driving. All four wheels steer. The wheel base is 58 in. and the tread of the front wheels is 30 in. The trailing wheels are 10½ in. in diam. with a 14-in. tread. All the wheels are rubber-tired, the tires being of the solid rubber, pressed on type.

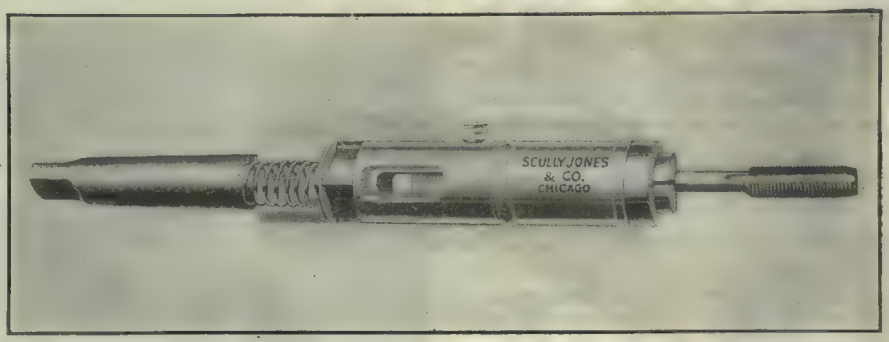
A G.E. motor drives the truck through a hardened steel worm and bronze wheel. The running speed of the motor is 1,500 r.p.m. Self-aligning ball bearings are used in the drive mechanism and the usual bevel gear differential is provided. The full-floating rear axle has chrome nickel steel shafts.

A Cutler-Hammer drum type controller gives 3 speeds forward and reverse, and a drum type safety switch, integral with the controller, is connected with the foot brake pedal. This brake is of the externally contracting type and operates on the drive shaft.

The capacity of the truck is 4,000 lb. and its speed when loaded is 4½ to 5 m.p.h. The weight of the chassis without the battery is 2,550 pounds. The overall width is 39 inches.

Scully-Jones Tap Chuck Holder

A tap chuck holder which is so constructed that the tap is started into the work under spring pressure has recently been developed by the Scully-Jones Co., 2012 West 13th St., Chicago, Ill. The tool is made of steel and consists of a sleeve with a taper shank and a socket with a taper hole to receive the Scully-Jones "Wear-Ever" tap chuck.



SCULLY-JONES TAP CHUCK HOLDER

A square on the driving end of the socket fits into a corresponding square in the sleeve so that a positive drive is produced, and a spring which is located back of the square end imparts a certain amount of flexibility to the tool so that the tap will operate without stripping the thread. In this manner undue strains on the tap are eliminated and breakage is reduced. The socket floats in the sleeve, thus making it possible for the tap to adjust itself to conform with any misalignment of the machine spindle with the work.

The holder is made in four sizes to accommodate four different sizes of tap chucks. The shanks are made with Morse tapers from No. 1 to No. 4, and the compression range is from ½ in. to ¾ in., according to the size of the holder.

Mercury Type-H Tractor

The Mercury Manufacturing Co., 4118 South Halstead St., Chicago, Ill., has recently developed and is now marketing an addition to its line of industrial tractors which is designated the type H.

The feature of this machine is the drive unit. The standard worm and worm-wheel drive has been discarded and replaced by an internal gear arrangement. In this mechanism the motor drives a pinion through a self-aligning spring coupler, the pinion meshing with a gear in the axle housing. The differential is of the conventional bevel-gear type and the axle pinions transmit the power through three idler gears to an internal gear mounted on the drive wheels. It is claimed that this drive is considerably more efficient than the former arrangement.

The motor is a G.E. series-wound, automotive type and, by means of the drum-type controller, gives the tractor three speeds in both directions. The controller resistance is enclosed in the controller housing.

The driving is done by the two rear wheels, the front wheels being mounted close together with the body spring between them. For use where rough travel makes greater stability necessary, the front wheels can be furnished with a longer axle to give a wider tread. This arrangement has a longer turning radius than the other.

Automatic Emergency Brake

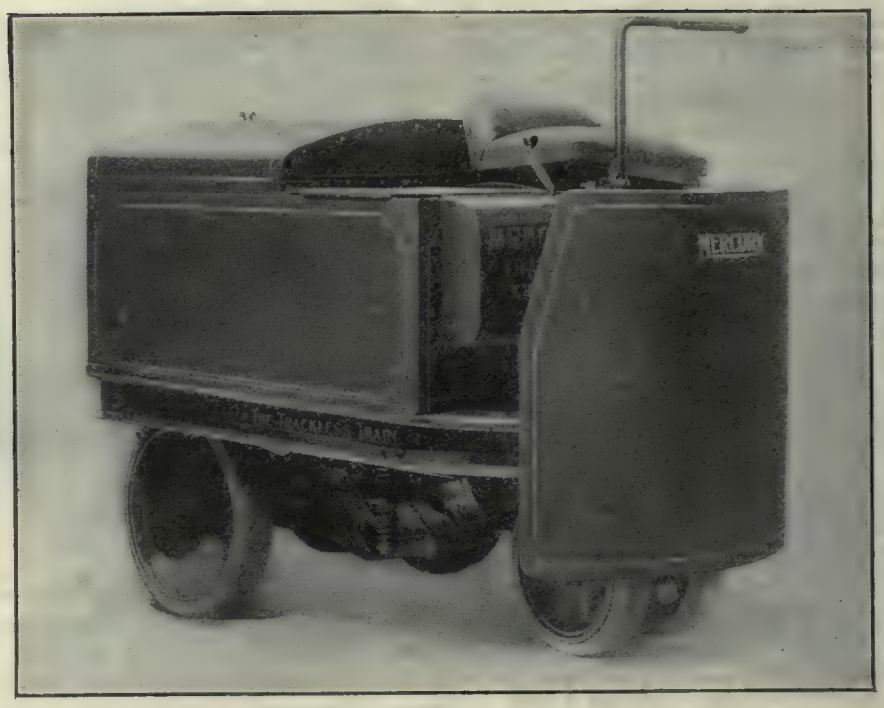
The service brake is applied by means of a foot pedal and is of the contracting type operating on a 7-in. drum attached to the motor armature. An emergency brake is also provided which is applied automatically when the operator leaves the seat. It is said that this brake will stop the tractor in 3 ft. when traveling at full speed.

The controller is also thrown into neutral when the seat is unoccupied and the machine cannot be started by manipulation of the handle unless the driver is on the seat.

The frame is of heavy channel section welded in one piece. The drawbar is connected to the rear axle housing instead of the frame. The drawbar pull is given as 475 lb. normal and 1,800 lb. maximum with the 18 to 1 gear reduction. A 24 to 1 gear reduction can be supplied if a greater drawbar pull is desired.

Timken bearings are furnished in the front wheel hubs, a ball thrust bearing in the steering bracket and Gurney ball bearings throughout the drive unit.

The chassis without the battery weighs 1,850 lb., the complete unit weighing from 2,750 to 3,550 lb. depending on the number of cells and make of the battery.

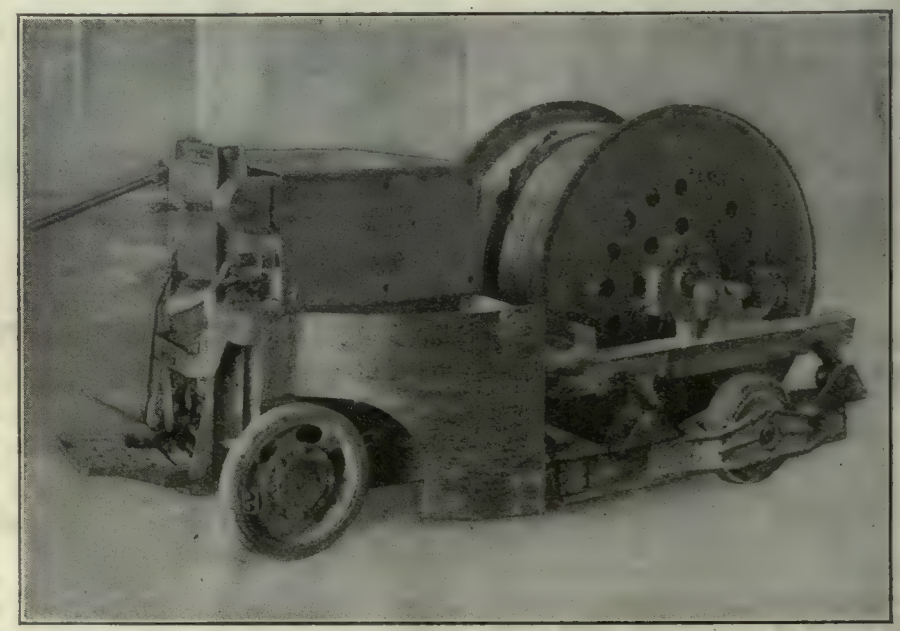


MERCURY TYPE-H TRACTOR

"Automatic" Reel Handling Truck

An electric truck designed especially for handling large reels of wire has recently been placed on the market by the Automatic Transportation Co., 2933 Main St., Buffalo, N. Y.

The elevating action of this truck is similar to that of an elevating platform truck, two long lifting arms being provided to support the reel. These arms are built in the forms of a wishbone and lift the reel by means of a bar placed through the core. The truck can be furnished with a span between the lifting arms to suit the general size of the reels to be handled.



"AUTOMATIC" REEL HANDLING TRUCK

By means of a device on each arm known as a "step-up" jack, the truck is able to handle a variety of sizes of reels up to 84 in. in diam. These jacks consist of a series of interlocking terraces and are shown with a reel of wire in places in the accompanying illustration.

The elevating mechanism consists of a separate motor and worm gear operating the lifting arms. The height of lift is 4½ in., the vertical motion being derived from inclined surfaces on the lifting arms which contact with rollers on the frame. In the raised position a flat surface on the lifting wedges rests on the rollers, thus removing the strain from the lifting apparatus.

The truck driving motor is direct-connected to the worm gearing through which the power is transmitted to the driving wheels. The front wheels are rubber tired and are equipped with Timken bearings. A circuit breaker and an interlocking device work in conjunction with the controller and brake, making it impossible to operate the truck when the operator is not in position.

Crescent Four-Wheel Tractor

The Crescent Truck Co., Lebanon, Pa., is now marketing a four-wheel electric tractor which is designed for heavier service than the three-wheel type manufactured by the same company.

The rear wheels are used to drive the tractor and the forward wheels steer. The tires are of solid rubber pressed on, 20x3½ in. on the front wheels and 20x5 in. on the drive wheels.



CRESCENT FOUR-WHEEL TRACTOR

The driving mechanism consists of a hardened steel worm meshing with a bronze worm wheel which drives a full-floating chrome nickel steel rear axle through a four-pinion differential. Self-aligning ball bearings are used in the drive. A. G.E. motor running at 1500 r.p.m. furnishes the power and a drum type controller allows three speeds forward and reverse.

A drum type safety switch is integral with the controller and is arranged so that the circuit is broken when the driver leaves the seat. The brake is of the outside contracting type, is located on the drive shaft and operated by a foot pedal. All bushings in the steering mechanism are renewable.

Heavy steel bumpers are attached to the frame at front and back. The bumpers are slotted to receive the coupling links, the coupling pins passing through the slot.

The normal draw bar pull is given as 600 lb. with an ultimate pull of 2,400 lb. The speed varies from 5 to 8 miles per hr. according to load conditions. The wheel base is 42 in. and the tread 32 in. The tractor weighs 2,250 lb. without the battery.

The Japanese Situation

"The fundamental strength of Japan has not been affected by the disaster," states Frank R. Eldridge, chief of Far Eastern division, Department of Commerce, in an economic survey made public recently. "The principal agricultural and industrial areas of Japan were not seriously damaged," Mr. Eldridge adds.

"If a true economic balance sheet of the losses were drawn, the cost of replacement would be greatly modified by other factors. First, the Japanese people can and will produce more goods under the impulse of this need than normally. The plant and equipment of the Empire will run at a higher ratio of capacity. The people will, especially in the damaged regions, work longer hours and more energetically. Second, they will expend less upon consumptive goods, especially in the damaged regions. Wherever they can produce more and consume less, this is a mitigation of the theoretical loss. In fact the losses will amount in reality to the imports into the destroyed regions which are necessary to them to rebuild and to replace stocks of goods, plus the reduction in surplus that this region might have exported had it been undamaged. What the ratio of this is to the theoretical replacement cost can not be determined, but it is very much less.

"Agricultural crops such as rice, silk, barley, wheat, fruits, and other food crops, which in 1921 totaled nearly $2,000,000,000 in value, have not been touched by the disaster which struck the distributing and commercial centers of Yokohoma and Tokio.

The Silk Crop Problem

"The food situation seems to be completely in hand, and the stimulus which the destruction of a little over one month's production of silk has given to the reelers in the interior will cause raw silk stocks to accumulate for shipment at Kobe within a few weeks and will postpone the actual shortage in the silk crop to May or June of next year, when the present crop of cocoons runs out. As the cocoon crop for the present season, however, is estimated at three per cent above last year's crop, a destruction of eight per cent will not have as much effect on the whole situation as it at first appeared.

"The principal question not only for the speedy recuperation of Japan's silk industry, which is the backbone of Japanese agriculture, but also for the American silk mills is how speedily the new crop of cocoons can be reeled and delivered to the port for shipment so as to prevent an actual scarcity in the American market.

"The manufacturing industry of Japan has been relatively little affected, the spinning industry, which is the backbone of Japanese industrial growth, being largely outside of the earthquake zone. Manufacturers of electrical goods, metal ware, paper, and chemical products in Osaka and Nagoya will undoubtedly increase their capacity so as to take care of the shortage caused by destruction of factories in Tokio.

"Out of the whole disaster Japan will probably emerge with stimulated productive capacity due to the necessity of large rebuilding programs, modernization of public works and buildings and advanced methods of sanitation, drainage, and the planning of a newer and greater Tokio."

News Section

More Labor Saving Machinery Urged By Philadelphia Investigators

American industrial establishments are looking to scientists and engineers for a way out of the labor shortage, a committee of the Philadelphia Chamber of Commerce finds, in an extensive report dealing with the problems of man power, which has just been approved by the Chamber's directors.

A Philadelphia engineer is quoted as saying that 90 per cent of American factories could easily save the time of from one to 100 men by the installation of labor-saving equipment. The statement is made by the committee that more labor is employed in the United States in handling materials than in any other way, and it is in this field that "We have one of our greatest opportunities to release workers for other essential tasks. There are over 100,000 transfer points where bulky goods are handled by hand."

The fact that a larger percentage of both American and foreign labor shun menial work in favor of employment offering more agreeable conditions leads the committee to the suggestion that a larger percentage of menial work could be rendered unnecessary by modern machinery.

Continuing the report says:

"Dr. Royal Meeker, Pennsylvania Commissioner of Labor, makes the statement that industries are about 30 per cent efficient in their operations. In order to secure industrial peace and prosperity there must be contact, conference, confidence and co-operation between the men and the management. And this relationship must be in the spirit of truth, justice, honesty, integrity and righteousness. These are spiritual, and therefore, vital things.

"Wages, hours, hygiene, etc., are material things and while tremendously important, they are in a very real sense secondary. The material things would naturally find satisfying adjustment if procedure were based on the spiritual.

"The story of what science and engineering actually are accomplishing in the way of saving life, property and human effort is a most amazing record of achievement."

George L. Markland, of the Philadelphia Gear Works, is chairman of the subcommittee which framed the report. The study was instituted by the Industrial Relations Committee of the Chamber of Commerce. The same committee recently made extensive recommendations for a new system of apprenticeship in industry and other valuable work is being done by it.

A.S.C.E. Condemns Action of Secretary Work

After a detailed investigation of the action of Dr. Hubert Work, Secretary of the Interior, in dismissing A. P. Davis from the position of director of the reclamation service, the Board of Directors of the American Society of Civil Engineers has addressed a letter to Secretary Work protesting against the action "with the utmost vigor." The letter is divided into five sections, each section answering portions of an explanation that was made to the society recently. Undermining the morale and loyalty of the reclamation service, the possibility of the waste of public funds through making Mr. Davis' office a political one, and the inadvisability of the drastic action are all brought forth in the letter.

Resents Slander

The letter is concluded with the following statement:

"Indeed, the whole engineering profession resents most strongly the slander (implied in your letter) that engineers cannot, or at least do not possess business qualifications of the highest order. In transportation, in mining, mechanical, electrical and other great industries, engineering executives play a most important part. Engineers are presidents of the Pennsylvania R.R., the New Haven, the Delaware and Hudson, the Chicago and Northwestern, the Santa Fé, the Great Northern, the Chicago and Great Western, and many others. Both presidents of the two big electrical companies are engineers; many of our large industrial and manufacturing operators are headed by engineers in fact, engineers play important parts in business affairs in the long list of human activities in the United States. The fact that hundreds of thousands of Americans are content to trust investments of billions of dollars to the hands of engineers is ample proof—if any is needed—of the falsity of the charge that engineers are not business men.

"Your explanation, therefore, is inadequate in every respect. Your action is of a character most dangerous as well as unjust. We protest it in the strongest terms."

Prof. Bristol Explains Amplification

New Britain Branch, Connecticut Section of A.S.M.E. held its opening meeting of the season in Y. M. C. A. hall, Main and Court Sts., New Britain, Conn., on the evening of Thursday, Oct. 18. Prof. W. H. Bristol of the Bristol Co., Waterbury, Conn., manufacturers of recording instruments and devices, entertained the members with a talk upon the subject of sound reproduction and amplification, illustrated with charts and diagrams showing the development and construction of sound transmitting and reproducing apparatus from the ordinary telephone transmitter and receiver up to the last word in radio reception.

Prof. Bristol has made a thorough and exhaustive study of this subject over a period of years and has personally developed some remarkable apparatus, including devices for reproducing and amplifying the music of the phonograph record, loud speaking radio, and instruments for transmitting and magnifying the human voice so that public speakers may be heard clearly in all parts of large auditoriums or outdoor spaces without the necessity of raising the voice above ordinary conversational tones. All of this apparatus was exhibited and demonstrated before the members.

Restoration Plans for Japan Being Made

It is estimated in Tokio that the rebuilding of the devastated area of Japan will be extended over a period of from five to seven years and that the full employment of labor during that period will cause greatly increased activity throughout the Empire, says a cable received by the Far Eastern division of the Department of Commerce from the Commercial Attache at Tokio. This activity will be reflected not only in the foreign purchases of building and construction materials for the rehabilitation of the stricken cities but in increased purchasing power of the masses at large, and causing the imports of all necessities and so called luxuries to show increases. Plans and specifications for the rebuilding of the area are being drawn up at present by the Capital Restoration Board and it is expected that they will be completed in time to be submitted to the Diet when it convenes on Nov. 10. Meantime no permanent construction is permitted and the temporary buildings that are springing up like mush-rooms throughout the stricken area gives it the appearance of our mid-west boom-town belt.

The shipbuilding and electrical industries were seriously damaged by the earthquake and the demand for electrical equipment is heavy at present. It is stated that the government will probably make direct purchases of lumber and steel products in the United States. Steel framed reinforced concrete buildings are generally conceded to be best suited for business buildings in Japan and a heavy demand for structural steel and other building materials is anticipated. Demand for machinery to replace that destroyed in factories is heavy and the demand for saw mill equipment is especially active. Many inquiries are being received regarding portable houses and heavy purchases of motor cars and trucks are reported in both stricken cities.

Unemployment Doles Not Needed in U. S. Says Conference Board

American big business and the American workingman have accepted the challenge of Europe to solve the problem of unemployment insurance without resorting to government bonuses or doles. That legislation like England's unemployment insurance measures probably will never be needed in the United States is the opinion of economists of the National Industrial Conference Board, of 10 East 39th St., New York, which has been making a special study of unemployment relief both in America and Europe.

Economists returning from Europe—notably Magnus W. Alexander, managing director of the conference board—have commented recently on the unsatisfactory condition of the workers in the United Kingdom, and former Premier Lloyd George in a statement recently in New York confirmed this view. Government doles and insurance against unemployment in the United Kingdom are in contrast, the National Industrial Conference Board finds, with recent developments in American industry, where the workers and their employers have joined hands to insure an all-year round wage.

Notable among these developments the board cites the case of the Procter & Gamble Co. in Cincinnati, employing thousands of men and women, which has virtually guaranteed continuous work to its employees. Likewise, the garment workers and their employers in Chicago have reached an arrangement whereby unemployment benefits will be shared by upwards of 35,000 men and women, both workers and employers contributing toward this arrangement.

Investigation Impending

Data now being collected by economists of the conference board's research staff confirm the earlier conclusions reached by the board in an independent investigation, that American industry was able and probably willing to bear the responsibility of whatever unemployment insurance measures might be adopted, independent of any federal or state legislation with its accompanying expense to the taxpayers as a whole. As a result of this investigation, which covered conditions not only here but in Europe, the board finds as follows:

"Such legislation for public unemployment insurance as that projected in the Wisconsin bill of 1921 and others modeled on it, is based on the recognition of the necessity of promoting individual effort to determine, stabilize and reduce the unemployment risk. On its actual success in achieving this end in practice depend its cost and effectiveness in the relief of unemployment.

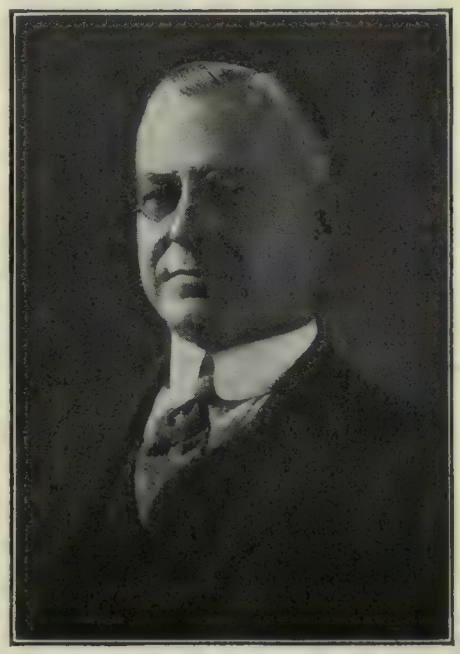
"This in turn is dependent on better knowledge regarding unemployment and on the extent to which similar methods are adopted in other states and over the country as a whole."

The peril of federal legislation affecting unemployment insurance is pointed out as follows:

"Such extensive adoption would require nation-wide legislation, but this would be of great practical difficulty and great cost. The final question raised in connection with a proposal for such legislation is whether the stimulation of private co-operative efforts to reduce unemployment, which are necessary to meet the need for unemployment relief, and serve as a basis for any comprehensive system, can be more economically and effectively achieved by compulsory legislation than by some other means. In the United States, therefore, the problem of devising such other means is put squarely to industrial management."

Howard E. Adt Succumbs to Heart Disease

Howard Ellsworth Adt, president and treasurer of the Geometric Tool Co., New Haven, Conn., died suddenly Sunday evening, Oct. 14, at 9.30 o'clock



HOWARD E. ADT

at his country home in Woodbridge, Conn. Death was caused by acute dilation of the heart and was preceded by a two hours' illness. Mr. Adt had returned from a three months' trip to Europe on Sept. 20 and recently had been on a ten-day visit to his camp at Big Island, Maine.

Mr. Adt was born in Haydenville, Mass., June 18, 1862, and was educated in the public schools of Torrington. He took up the study of medicine with the idea of specializing in surgery, but was persuaded to enter the business field, designing special wire working machinery. He became very proficient in that field and for fourteen years was a designer and superintendent of construction. In 1899 he organized the Geometric Tool Co. of which he was president and treasurer and until very recently general manager, having been succeeded in this capacity by James W. Hook the former president of the Allied Machinery Co. of America, who assumed his new duties on Oct. 1.

In addition to his connection with the Geometric Tool Co., he was also treasurer of the Bellis Heat Treating Co., secretary of the Geometric Garage Co., a director of the Greist Manufacturing Co., the English & Merrick Co., and the Morris Plan Bank. He was on the board of directors of the Grace Hospital, a member of the executive committee of the Hartford Committee of 100, a member of the Governor's Foot Guard, the Chamber of Commerce, the Y. M. C. A., the Calvary Baptist Church and the Quinnipiac Club.

Mr. Adt is survived by his wife and his daughter.

October Sales Good in New York

Reports from machine tool dealers in the New York district state that a slight improvement is shown this week over last week in the volume of sales as well as in the number of inquiries received. Predictions for the entire month are to the effect that it will be much better than September and if the same rate of increase obtains in November and December, dealers will finish the year in excellent shape.

But in spite of this optimistic tone, there have been few big sales reported, the business being made up almost entirely of small purchases made by many customers.

Railroad car builders and locomotive builders are buying and inquiring and a good sized list was recently received from the American Locomotive Co. Additional business is expected from these sources as the railroads have been buying cars in quantities lately.

Some Lists Out

Railroad buying itself has not been particularly lively, although some good lists have been sent out during the past week. The Lehigh Valley, Delaware, Lackawanna & Western and the New York Central have all been inquiring for tools.

Japanese buying has started with a few needed machine tools and it is expected that before the end of the year good sized purchases will have been made. Many of the requirements for the stricken country will be bought direct from the factories and in big quantities. Japanese houses located in New York during the past week received more definite advices on what will be needed.

Prospects Good

No inquiries from the automotive field have been received this week, but as was pointed out by one dealer, none were expected. Textile factories are not in the market, but dealers are looking for inquiries from this source within the next ten days.

Used machinery did not find as ready a market during the past week as it did in the early days of October and the latter part of September, and dealers report that they have large stocks in the warehouses at the present time.

New Automotive Paper

A new publication, *Automotive Abstracts*, edited by John Younger of Cleveland, Ohio, has been started with the October issue. The magazine contains briefs of current articles appearing in business papers that serve the automotive field.

Canada's Prosperity Is Reflected in Machine Tool Business

While there are no indications that a boom is impending, the demand for machine tools in Canada during the last couple of weeks has been slightly stronger. The automobile industry has made some calls recently for tools; the pulp and paper industry has been a factor in the improvement, and several plants to be erected in Canada in the next few months will help to stimulate the demand.

Favorable aspects of the business situation in Canada may be summarized as follows: steadily improving trade returns; heavier railway earnings (Canadian railways as a whole showed an increase in freight traffic in September of seventeen per cent over the corresponding period last year); improvement of a decided character in the milling industry; prosperous conditions in the mining, lumbering and pulp and paper industries; and normal activity in several other major lines. There is little unemployment and the labor outlook for the coming Winter is more hopeful than for the past three years.

That a revival in the implement trade is imminent is the opinion of J. N. Shenstone of the Massey Harris Co. who announced a few days ago that the plant at Toronto, which has been closed for repairs, would re-open again shortly and operate at about sixty to seventy-five per cent capacity. Farm implement sales during the past Summer were only fair, and this condition extended to all parts of the country. Mr. Shenstone is confident, however, that the late Winter and early Spring will show a considerable revival.

The remarkable growth and prosperity of the automobile industry in this country is reflected in the financial statement of the Ford Motor Co. of Canada, and the September sales of the General Motors Co. The Ford Co. reports a most successful year for the period ending July 1, 1923. Sales and profits were considerably in excess of other years and the company was able to add over $4,000,000 to surplus account. Total sales were 70,328 cars and 3,958 tractors, as compared with 45,000 cars and 1,192 tractors for the previous year. The General Motors Co. in September sold 69,400 cars and trucks compared with 66,019 in August, and 35,443 in September, 1922.

It is reported that the Pressed Metals Co. of Canada is working three shifts a day on large bushing orders received from several motor car manufacturers, and earnings, it is said, will run well into the neighborhood of $500,000 for 1923.

New construction valued at $50,779,000 was reported in the Dominion during September, which is $11,702,000 higher than a year ago. This is taken as a clear indication that the balance of the building year will exceed expectations in activity.

Pittsburgh Market Is Better

Inquiries for machine tools and equipment brought out so far this month, added to the lists that are developing from orders, give almost a definite basis for the belief that October will outstrip the previous month as regards sales of tools and machinery in general. This refers to new as well as used material, and seems to be the experience of the majority of sellers in this district, although a few of them still report business as dull and showing a waiting attitude on the part of prospective buyers.

In the past week or ten days it has developed that the Pennsylvania R.R. is distributing orders for lathes, milling machines and various other tools on its recent list for lines west of Altoona. Then there is the fact that the Westinghouse Electric & Manufacturing Co. has issued its fourth quarter inquiry on machine tool requirements, running into 65 or 70 items.

Sales Recorded

A seller in Pittsburgh last week disposed of six woodworking machines to the same buyer, and among four other purchasers he placed a 6-in. pipe machine, a motor-driven floor grinder, a punch and shear, and a drill press. Inquiries in the past week involve from three to five machines in each of a number of cases, but a number of the inquiries call for single installations. The Pittsburgh & Lake Erie R.R. has been heard from as needing a 600-ton wheel press and a 24-in. shaper.

Activity is noted in the used machinery market, orders coming in for single tools such as a 24-in. shaper, a 24-in. rapid production mill and an air compressor to three customers here, and a 4-spindle boring mill for an Ohio manufacturer. New Castle, Pa., also inquired for a large lathe, which was finally filled by a local seller. Japan has been heard from in iron and steel inquiries in this district, and lately there have been tentative orders placed involving about $6,000 for corrugating roll. Very little is doing in the crane market just now, although an occasional inquiry comes out, and intermittent awards are noted.

New England Sales Are Better

Salesmanagers of several of the principal Connecticut machine industries went on the road this week to visit the trade and make a survey of trade conditions with the view of having first hand information upon which to build the production schedules for the next year. Practically a month will be taken by the representatives of the bigger organizations and about the middle or last of November the prospects for the next year will be fairly well comprehended. A large organization has its salesmanager and a specially commissioned expert engaged in making independent surveys and reports have been received as a result of their first week's calls. The production superintendent at this plant said if the results continue his schedules will have to be materially increased over those of the current year.

A New Britain chuck manufacturing concern finds its volume of business the first nine months of this year equaling that of the entire twelve months of 1922. "Business is quite a bit better and the prospects are favorable," said the salesmanager. The automobile industry is absorbing a good volume of the production but there is no particular trade reflecting itself so strongly as to make it particularly marked. This company has for a long time had an extensive trade in Japan and while shipments are going forward regularly sufficient time has not elapsed since the earthquake to make a consequential excessive demand specially noticeable.

The opinion of salesmanagers is that October's business will surpass September trade, and still further improvement will carry along through November and December.

In one of the smaller organizations a study of production is being made to ascertain conditions. This has been in progress some time and the material at hand proves that in this factory the individual effort is much better. Labor is producing fifteen to twenty per cent more efficiently than during the war.

Buying in Chicago Improves

Chicago machine tool dealers report some improvement in business this week, but not to any appreciable extent. The New York, Chicago & St. Louis R.R. purchased four lathes, the Burlington R.R. purchased six small sliding head drills and some miscellaneous small tools. The Erie R.R. purchased about $10,000 worth of flue shop equipment from one dealer. The Nash Motor Co., Milwaukee, purchased a cylinder lapping machine. The Illinois Central R.R. purchased three machines and is expected to issue an inquiry for about $225,000 worth of equipment in the near future. It is reported that the Western Electric Co. is about to secure prices on about $50,000 worth of special machinery.

Dealers are optimistic as to the future and lean to the belief that this week's slight improvement is the forerunner of continued activity. The greater part of the present buying is scattered and mostly for single tools. It is known that at least three large users have plans for rather large additions to their equipment but are undecided as to whether the present is the proper time to buy.

Prospects Excellent

If the pending and anticipated inquiries for machine tools materialize as sales in October, it will outstrip any single month since last Spring.

Railroad car orders of importance are before the trade and more carriers are believed ready to come into the market for cars requiring substantial steel tonnages. Between 50,000 and 100,000 cars are in the market and only a few carriers have been heard from. In some quarters it is reported that car builders are negotiating for 150,000 tons of steel. The railroad car buying, together with pending track inquiries and recent heavy rail buying, has strengthened the steel situation materially.

Dealers point out that whereas the Summer was dull Fall business should be good and, together with the exceptional Spring business, the year's total ought to be satisfactory.

Milwaukee Output Shows Gain

Despite the existence of an admittedly cautious and conservative feeling in the foundry and machine shop trades which presents considerable resistance to the free purchasing of additional machinery and other equipment, makers and dealers in machine tools consider the situation as progressive in improvement. To some interests the improvement appears painfully slow, while others regard any betterment whatever as being substantially encouraging. So far in October sales have been considerably more plentiful than in August or September, although hardly equal to the monthly average from January to June.

The smaller shops apparently are faring better than many of the big works with respect to current and future orders. Some of the large shops have been experiencing a decrease in unfilled orders, which ordinarily involve a large sum of money. In the case of the small and medium-sized shop, handling work that is of a nature which means quick production rather than large construction, capacity continues to be well occupied, with advance orders spread out past Jan. 1 in a majority of instances. Foundries as well as machine shops dealing principally with the automobile trade report a relatively small falling off in orders, while at this time of the year in the past they have been accustomed to sharp cuts in delivery specifications. Automobile patronage remains the principal bulwark of the metal trades. The Ford interests naturally loom predominantly, with General Motors Corp. still a buyer.

Makers of milling machines are not particularly pressed with orders, although they are holding their own in respect to degree of output. They report a shortage of skilled labor, although this is less of a handicap than before. Sales of special types of millers have been running ahead of standard designs, and considerable custom work is being offered by shop owners requiring machines for special toolroom and floor purposes.

Used Tools Plentiful

Competition from used tools remains very keen, dealers say. There is still a very large quantity of second-hand equipment on the market and much of it is in a serviceable condition making it acceptable in place of new when the first cost factor is uppermost. An unusually large quantity of excellent machinery has been thrown on the market through the liquidation of the Mitchell automobile factory in Racine, and nearly an equal amount remains to be sold by the trustee.

The American Metal Products Co. of Milwaukee is adding a rolling mill to its foundry to make bars and plates. It has purchased two used mills, but is inquiring for a cropping shear, a squaring shear and a roll lathe, besides several other items.

St. Louis Dealers Watching Southern Oil Field Production

There has been very little change in the machine tool market in this district during the past two weeks. There has been some buying by the railroads for replacements, but there are no additions being made to equipment already on hand. However, some of the roads are seeking prices for their 1924 budgets.

The oil fields in the Southwest, which have been quiet for some time, have not yet resumed operations, but a representative of a machinery firm who has just returned from a trip through that section of the country brings the cheering news that resumption of production is expected within the next few months. Until that time, however, it is anticipated that the oil producing industry will be a poor field for the sale of machine tools.

That the general slackening up is due somewhat to sellers of machinery is indicated by the statements of some dealers that they have made little or no sales effort during the past few months. They hope to again put forth their usual efforts soon and expect that this may have a beneficial effect on their business.

But most members of the trade feel that sales are not going to pick up appreciably until after the first of the new year. They feel that the looked for increase in business, which was anticipated for the Fall, did not materialize.

Most of the sales that are being consummated are for small tools and few orders for big amounts are being taken.

Collections are spotty, some firms report them bad, while others say they have held up pretty well. No purchasers, except the very largest and soundest companies are taking advantage of discounts.

The labor situation is satisfactory so far as the employer is concerned, some shops are still working less than full time and no difficulty is being experienced in getting the necessary mechanics.

Buffalo Business Slowly Gains

While business in Buffalo in far from what is desired, dealers report that the monthly totals for October will show an increase over either August or September and that there are excellent chances for resumed trading in the last two months of the year. Perhaps one of the biggest purchases by any automotive company in the East occurred in the Buffalo district when the Willys-Morrow Co. purchased $600,000 worth of machine tools from one dealer. Deliveries on this order are to start immediately, it is understood.

Other automotive plants in the Buffalo district are not buying any machine tools at this time. Most of these factories are well stocked with equipment either left over from the war or purchased directly following the war and one dealer reported that he did not look for automotive inquiries on any extensive scale for at least a year more.

Sewing machine manufacturers, makers of specialties and other small factories around this district have been buying a normal amount of machine tools, while the two big steel mills in this district have bought practically nothing for several months.

Auto Production in Detroit Gains

Increased production of automobiles and announcements of additions and enlargements of plants to care for steadily mounting orders from all parts of the country have brought to Detroit's industry a stability that business experts consider reassuring beyond the expectations of a few weeks ago.

Since the announcements of new models were made an entire new market for cars was opened up in the view of automotive leaders who today are planning on an unprecedented production during 1924.

While orders for new machinery and tools are being placed by many firms in anticipation of increased production, others are already considering and experimenting with further improvements in both factory and product.

Bank clearings, building permits, post office receipts, and internal revenue receipts give a favorable index to Detroit's prosperity at this time.

Railroad Work

Railroads are hastening completion of extensions before cold weather sets in. The new Pennsylvania R.R. freight terminal was thrown open this week. The Pere Marquette R.R. is now making its annual expansion. Double tracking on its main line from Plymouth to Detroit is almost finished. The Detroit traffic territory which includes within its radius Lansing and Flint, shows an increase of about 20 per cent in forwarded shipments and a 60 per cent increase in outbound shipments over the same period last year.

New construction in Detroit for the year has already passed the 1922 figure when total construction was $94,615,093. It is expected that this year's figure will be close to $120,000,000.

Employment continues to hover between the 214,000 and 215,000 mark. A slight decrease of 49 is shown in the figures of the Employers' Association which announces the employment among its members as 214,022 as against 214,071 for the previous week.

Railroads Buy More Equipment

The Kansas City Southern Railway Co. has applied to the Interstate Commerce Commission for authority to issue $1,620,000 in equipment trust certificates for the purpose of acquiring ten mallet-type freight locomotives to cost $91,100 each, and 500 steel-frame box cars to cost $2,500 each.

The Norfolk Southern Railroad Co. has asked for authority to issue equipment trust agreements sufficient to permit the purchase of five locomotives.

James W. Hook Succeeds Howard E. Adt

James W. Hook, formerly president of the Allied Machinery Co. of America, has been elected president and treasurer of the Geometric Tool Co., New Haven, Conn., succeeding the late Howard E. Adt. On Oct. 1 Mr. Hook resigned as president of the Allied Machinery Co. of America and became vice-president of the Geometric Tool Co. He has long been identified with the machine tool business and is well known throughout the industry.

Personals

T. J. DAVIS has been appointed the representative for the Chicago territory for the Buckeye Twist Drill Co., Alliance, Ohio, and the Gardner Tap & Die Co., Cleveland, Ohio. His headquarters will be located at 542 W. Washington Boulevard.

N. S. BATES has resigned as superintendent of equipment of the Pratt & Whitney Co., Hartford, Conn., and has become factory manager of the Hartford Special Machine Co., Hartford, Conn.

A. C. LINDHOLM has been appointed Pacific Coast representative for the Van Norman Machine Tool Co., Springfield, Mass. Mr. Lindholm was formerly general manager of Franklin Machine & Tool Co., that was merged with the Van Norman Machine Tool Co.

ARTHUR JACKSON has been appointed Canadian agent for the Potter & Johnston Machine Co., Pawtucket, R. I. His headquarters will be at 177 Roxboro St., East Toronto, and he will also carry non-competing lines in conjunction with the Potter & Johnston lines. Mr. Jackson recently returned from Japan where he had several narrow escapes during the earthquake.

W. J. BRYAN has joined the organization of the Heintz Manufacturing Co., Philadelphia, Pa.

FRED J. OSIUS, founder and principal stockholder in the Hamilton-Beach Mfg. Co., Racine, Wis., has disposed of his interests to a group of Eastern capitalists identified with the Scovill Mfg. Co., Waterbury, Conn., and will retire from active business to reside in Florida.

FREDERICK K. COPELAND, president of the Sullivan Machine Co., was in Michigan City, Ind., recently visiting the plant. The Sullivan Machine Co. has 400 men at work in this plant. The force is working four nights a week overtime in an endeavor to catch up with the orders.

NILS MILLER has been appointed district sales representative succeeding WORRELL H. HOLBY in the Atlanta district for the SKF Industries, Inc. His headquarters will be in the Healey Building.

JOHN M. WATSON, formerly with the Watson Bros. Steel Co., Youngstown, Ohio, is now president of the Union Steel Co., brokers in steel sheets, in that city.

FRANK R. FROST, who has been general manager of sales in the West for the Superior Steel Co., Carnegie, Pa., has been appointed general manager of sales East and West.

SETH RIDOUT, for the past two years associated with the Atlanta office of the David Lupton's Sons Co., of Philadelphia, manufacturer of steel products, has been appointed general manager of the company's new office opened recently at Birmingham, Ala., under the name of the David Lupton's Sons Construction Co. The Birmingham office will handle the Alabama, Mississippi and Tennessee territory, and part of Louisiana and Kentucky.

WILLIAM E. DUNN, JR., executive secretary of the Southern Metal Trades Association, with headquarters in Atlanta, has returned to his duties following a tour in Europe as a delegate to the recent International Congress of Foundrymen, held at Paris. Mr. Dunn also visited a number of industrial plants in the North following his return to this country. Offices of the association have been recently moved from the Candler Building, Atlanta, to 1230 Healey Building.

DR. JOHN A. MATHEWS has resigned as president of the Crucible Steel Co. of America. He is succeeded by E. C. COLLINS, who has been assistant to the chairman of directors.

W. H. HAINES, formerly chief inspector of the Schenectady Works of the General Electric Co., has retired. He has been succeeded by W. W. WAGNER as chief inspector of that plant.

BENJAMIN SOBY has been appointed assistant to manager, promotion of sales department of the Westinghouse Electric International Co.

Business Items

The Landis Tool Co., Waynesboro, Pa., has purchased all patents, patterns, jigs, etc., for the manufacture of the Oakley cutter and reamer grinder formerly made by the Oakley Machine Tool Co., Cincinnati, Ohio. The machine will henceforth be known as the Landis cutter and reamer grinder.

The Cogsdill Manufacturing Co., Detroit, Mich., will move Nov. 1 from 5132 Grand River Ave. to a new building on Epworth Boulevard.

The Chicago Pneumatic Tool Co. has taken over the exclusive sale of all the products of the Crescent Pump Co., Detroit, Mich.

The Victor Piston Pin Co. has been incorporated to manufacture piston pins and will have its plant at 115 North Noble St., Indianapolis, Ind.

An addition to the present machine shop of the Western Gas Construction Co., Ft. Wayne, Ind., is being planned. It will cost approximately $50,000, according to W. C. Marquardt, assistant treasurer of the company. The new building will be a two-story extension at the east end of the present machine shop along Buchanan St. to Winter St. and will be 90 feet long by 85 feet wide.

The name of the Arnold Electric Drill Co., New Haven, Conn., has been changed to the National Electric Manufacturing Co.

The Patent Laughton Drive Co., Ltd., of Sheffield, England, is sending its representative to this country with the intention of selling the rights or arranging for the manufacture of the patent Laughton drive in this country. Headquarters of the representative will be in the offices of the American representative, Will E. Sheel, 1547 Third St., N. W., Washington, D. C. The patent Laughton drive is a belt regulator of the two-pulley floating type.

The Hamilton Press & Machinery Co. has been organized for the purpose of manufacturing and selling power presses and special machinery. The officers are: Gordon S. Rentschler, president; C. T. Ziegler, A. A. Byerlein, and R. L. Messimer, vice-presidents; J. H. Black, secretary and treasurer. The executive offices are in Hamilton, Ohio. The sales and engineering offices are at 516 Marquette Building, Detroit, Mich. Mr. Ziegler is in charge of sales and Mr. Byerlein is chief engineer. This company is closely affiliated with the Hooven, Owens, Rentschler Co., of Hamilton, Ohio.

Production of Flint "Sixes" has started in the new Flint plant of the Flint Motor Co. at Flint, Mich. The Flint car has for some time been built at the first Durant plant at Long Island City, New York, which will continue to supply Eastern demand. Western marketing of the Flint "Six" is under the control of the Flint Motor Co.

Production of the Liberty "Sixes" has been resumed by the Columbia Motor Co., of Detroit, which recently took possession of the Liberty plant. The production of Libertys had been practically at a standstill for some time during the settlement of Liberty affairs. Both Columbias and Libertys are now being turned out.

Machinery is now being installed in the new factory of the Paige-Detroit Motor Car Co., Detroit, Mich., which will be devoted exclusively to the production of the Jewett Six. With the exception of the installation of the machinery only the depressed railroad tracks, for which the excavation has been made beside the receiving platform, remain to be laid. It is expected that all machinery will be ready for operation by Jan. 1, 1924, when officials plan to begin production.

Completion of the rearrangements of departments at the plant of the Olds Motor Works at Lansing, Mich., makes for more logical and economic movement of materials through the factory. The changes at the plant provide for the manufacture of a six-cylinder automobile and to provide better factory methods, have necessitated new machinery and dies. This has used a greater portion of the $2,000,000 appropriation of the General Motors Corp. set aside for the improvements at the Olds plant. Those portions of the former machinery, most of it new within the past four years, that could not be used, had to be sold at junk prices on account of being rendered obsolete by the newer equipment. Production of the Olds plant with the new machinery which has been installed will probably be 400 cars a day.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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MORE than 20 years ago Max O'Rell commented upon the blessedness of this country because it was comparatively tranquil and was not constantly making history. It is, however, questionable whether the business men of the United States are entirely in agreement with this sentiment, for many of them seem to feel that we cannot be prosperous unless prices are constantly moving upward and something like what used to be called a boom impends.

But economists have long acclaimed stability in the price level as an ideal condition, and if stability is to be preferred to instability then the record of last week is most encouraging, for there has been but little change in the value of any of the more important commodities.

Wheat and corn have re-acted slightly from the peak of a week ago. An unimportant recession in cotton futures is also to be noted, and raw silk has settled somewhat as the excitement caused by the Japanese earthquake has subsided. Sugar, coffee, wool and rubber are practically unchanged. Opinions differ as to the future of steel, but the mills seem to be fairly well employed, and the demand is fully up to normal. Copper is a shade steadier, but the price has not changed significantly.

Car loadings are still up to or in excess of previous records, and a slight shortage in cars is reported from some points in the Middle West. A distinct revival in the hardware trade is discernable and the agricultural implement companies are preparing for a better business. Retail trade is good. The sales of the five and ten cent stores and other chain stores for the first nine months of 1923 are in most cases substantially above those of the corresponding period of any preceding year.

The Standard Daily Trade Service predicts a record breaking volume of business for the present quarter. The department stores are preparing for an exceptionally large holiday trade. Sears, Roebuck & Co. report an increase of 12.02 per cent in their September business, while Montgomery, Ward & Co. announce a gain of 40.36 per cent for the same month. The comparison in both cases is with September, 1922.

The figures of our foreign trade for September are also encouraging. Exports were valued at $381,000,000 as compared with $313,000,000 in August, and imports at $255,000,000 as compared with $275,000,000. The excess of exports over imports is therefore $126,000,000, and the indications are that the calendar year will show a substantial balance of trade in our favor. Furthermore, we continue to draw gold, net imports for September being $27,000,000.

The income of the American Telephone & Telegraph Co., which is coming to be regarded as barometric, tells substantially the same story. For the first nine months of 1923 it shows an increase of approximately 14 per cent over 1922. The same statement is true of railroad earnings. For the year the net and gross will probably be the largest on record in the history of American transportation.

The jobbing trade is satisfactory, though not abnormally active. Cotton goods are distinctly firmer in sympathy with the market for the raw material. Some of the New England mills recently idle are going to work again now that their fears of a 48-hour week in Maine have been allayed by the referendum held last Monday, when the proposed law was defeated by a majority of 20,000 out of a total vote of about 85,000.

> "As between the encouragement that is to be found in the record of general business and the pessimism that prevails in the stock market, business men must make a choice, but it is difficult to believe that there can be any depression in American trade or industry while everyone is fully employed and relatively high prices are obtainable for every important agricultural product except wheat."

The weekly statement of the Federal Reserve System shows a gain of $3,000,000 in the gold held and a reserve ratio of 75.3 per cent. These figures assure a continued abundance of credit. This assurance is reflected in the bond market, which has been somewhat steadier for seasoned issues and has absorbed with ease $47,000,000 of Federal Land Bank bonds, $21,000,000 of Illinois Bonus bonds and an issue of $10,000,000 bonds made by the Republic of Finland on a basis that yields 6.89 per cent.

In addition to these bond issues the market has also taken $15,000,000 of the preferred stock of the Nickel Plate Railroad and $2,000,000 of bonds issued by the Italian Power Co., the proceeds of which are to be used to develop hydro-electric power in Italy.

This brief recital, which includes all the more important commercial and financial happenings of the week would seem to indicate prosperity, both presently and in the immediate future. But on the New York Stock Exchange pessimism persists, the market is lifeless and both railroad and industrial stocks are somewhat lower than they were a week ago.

The stock brokers who attempt to explain the blight that seems to have attacked their business attribute it to the heavy income taxes which deter men of means from speculative operations, the continued issuance of tax exempt securities and the larger share of the profits of business that labor is receiving through higher wages paid, as a consequence of which there is less money for speculation and more for expenditure in automobiles and other luxuries formerly denied to the workingman.

The President's suggestion of a reduction in the rail freights on grain intended for export, the fear that Congress will pass a bonus bill and the rather gloomy picture that Lloyd George has painted of conditions in Europe are also alluded to as factors which may exercise a depressing influence later on and act as deterrents to those who may otherwise be willing to purchase some of the undeniably low priced securities that are dealt in on the Stock Exchange.

As between the encouragement that is to be found in the record of general business and the pessimism that prevails in the stock market, business men must make a choice in determining their policy for the future, but it is difficult to believe that there can be any depression in American trade or industry while everyone is fully employed and relatively high prices are obtainable for every important agricultural product except wheat.

It is true that the foreign situation is still unsatisfactory, but it is better than it was and allowance must be made for the strategy of Lloyd George in describing conditions abroad as his admitted purpose is to secure the cooperation of America in mending them.

Made 1,500,000 Fords So Far This Year

Domestic production of the Ford Motor Co. for the year 1923 passed the 1,500,000 mark on Oct. 17.

Illustrating the record-breaking pace established by the automobile industry generally this year, it is officially announced at the offices of the Ford company that from Jan. 1 up to and including Oct. 17 the output of passenger cars and trucks reached the grand total of 1,500,696, or an increase of 564,774, approximately 60 per cent, over the same period of 1922, which also was an exceptional year from a production standpoint. The 1922 output was 935,922 cars and trucks.

Germany's Export Business

Machine tools have declined in the list of exports as compared with last year and ten years ago —The Ruhr and Upper Silesia influences of German trade

BY OUR BERLIN CORRESPONDENT

THE German export and import business since the beginning of January, 1923, has been standing under the adverse influence of the Ruhr war. In February the separation of the occupied parts from the German interior was almost complete, reducing the former to a state of isolation with regards to industrial traffic. From that time the business life in the German interior was carried on almost independently of the occupied section. Exports from the latter including shipments across interstate border lines have nearly stopped, and such as had been continued have escaped German control and could not be recorded officially for this reason. The official statistics of Germany's foreign trade therefore exclude the occupied parts and practically represent the German interior only.

Keeping this fact in mind, the returns of foreign trade of the first half of the current year make a remarkable showing. Although they reflect the distressful circumstances of the period, the decline which becomes apparent by comparison with last year's figures is not nearly as large as one would have been led to expect, at least as far as it can be traced to the direct influence of the Ruhr blockade. The slump resulting from the unfortunate attempt at mark stabilization, which held business from March almost up to June under an evil spell, has been coresponsible to a large degree, as a study of the trade balance shows. Substitution of the supply for which the Ruhr holds a prominent position by importation does not come into appearance with the sole exception of coal.

Imports and Exports

The total volume of imports has increased from 17 million tons in January-June, 1922, to 26.7 million tons or by 9½ million tons. This increase is, however, caused by two items only—coal which shows an increase of 13 million tons, and wood of which two million tons were imported in excess of the corresponding period of 1922. Even for these the Ruhr blockade is not solely responsible. In the case of coal it is attributable to the loss of the greater parts of Upper Silesia, by which the supply from this source now has become import. The import of iron and steel and products therefrom has kept approximately at last year's level, that of all other materials of which the Ruhr is the chief source of supply has dropped considerably. Taking into account the increased foreign supply of coal and wood, it appears that the import of all other products has declined amounting to about 5½ million tons or one-third the volume of the first half of 1922.

In the export business similar features can be noted in comparison with that of last year. The total volume of export shows a drop from 12 million tons in 1922 to 6.2 million tons or nearly by one-half. A survey of the various classes of produce shows that this drop is due chiefly to reduced export of raw material, while that of manufactured goods has suffered a diminution, which in comparison is remarkably small. The main products of the Ruhr are coal, iron and steel and its products include machinery. Compared with 1922, the export of iron and steel products shows a decline of 21 per cent and that of machinery of 31 per cent. The whole country participates in the latter and not the Ruhr alone.

The conclusion is derived that the direct influence of the Ruhr occupancy is not so strong as its indirect consequences. A clearer impression is gained by comparing the present export business with that of 1913. Germany's post-war recovery as an exporting country has been strongly overestimated, on the strength of the apparently booming business. Judged by the standard of 1913, this appearance is clearly deceptive, even when considering that the returns of 1913 are the highest on record.

Machinery export which last year held a privileged position in foreign trade, having run up nearest to the standard of 1913 of all lines of industry, has this year dropped to 57 per cent of the volume of 1913. Most lines share in the decline, strongest amongst them railroad engines, that last year had almost doubled their export of 1913, but dropped to 56 per cent in the first half of the current year.

The following figures giving the export of the chief lines of machine building in the first half of 1923, 1922 and 1913 with the ratio of the former two years to the latter, added in percents, illustrate the trend of business:

	1923 Metric Tons	1922 Metric Tons	1913 Metirc Tons
Steam and gas turbines	379	1,227	3,168
Water power machinery	464	451	1,872
Combustion motors	9,454	10,208	13,556
Textile machinery	21,812	21,413	40,282
Machine tools	18,109	28,493	34,849
Wood working machinery	6,280	7,439	6,695
Forging and riveting machinery	572	1,505	1,141
Agricultural machinery	23,511	29,748	37,349
Paper machinery	1,865	2,107	2,920
Hoisting machinery	2,647	3,441	6,328
Ore dressing machinery	1,416	1,737	5,376
Shoe and leather machinery	2,682	3,266	2,055
Ceramic machinery	2,497	3,376	10,146
Printing presses	5,783	5,671	5,961

While last year a number of machine building branches could materially improve upon their export of 1913, only one line—shoe and leather machinery—has retained this position in the current year. The strongest resistance against the general retrograde movement is seen in the case of printing presses, woodworking machinery and combustion motors, while the strongest decline is visible in that of steam engines, the export of which has dropped to 12 per cent of that of 1913. The machine tool export has this year, the same as last year, kept at a fair average.

Some Improvements

On the strength of the figures accompanying this article, the decline of business with the various foreign countries was not uniform. In a number of cases like that of Norway, Poland, Russia, British India, Japan, Brazil and United States an improvement can even be noted. The export to Great Britain, Switzerland and the Argentine retained its last year's size. In all other cases it has dropped, strongest in that of Belgium and Italy. The volume of export of 1913 has not been reached in any country with a few exceptions, foremost amongst them the United States, where it has been surpassed.

Thorough comparison is impossible as in the case of several countries the export of 1913 is not given specifically. It can be concluded from the existing practice that the export to countries totaled under "other" specified now but not in 1913 was then insignificant, but has increased since then. The ad valorem figures of export are omitted since last year on account of the vagaries of the mark rate, which prevents comparison in this respect One of the most striking features of machine tool export may be found in the number of tools exported. Although the tonnage of the total export has in the first half of 1923 been only 64 per cent of that of 1922 and 52 per cent of that of 1913, this number has actually increased. It was 49,884 tons in 1913, 54,724 tons in 1922 and 58,218 tons in 1923. An explanation may be found in the re-

Where German Machine Tools Went During the First Months of the Year

EUROPE	1923	1922	1913
Former German possessions	813	1,416	....
Belgium	734	3,711	2,493
Bulgaria	124	150	58
Denmark	561	764	545
France	1,880	2,906	6,508
Greece	70	116	....
Great Britain	1,279	1,289	1,952
Italy	817	3,598	2,826
Luxemburg	48	112	....
Holland	1,111	2,330	2,258
Norway	256	180	425
Austria	1,230	1,862	
Jugoslavia	92	264	5,919
Czechoslovakia	537	1,230	
Hungary	190	1,172	
Poland	831	198	
Russia	203	37	4,635
Litovania, Estonia, Lettonia	168	303	
Finland	205	237	144
Rumania	....	....	419
Sweden	301	679	755
Switzerland	977	992	1,416
Spain	592	1,035	726
Turkey	35	54	72
AFRICA			
Egypt	65	71	....
ASIA			
British India	144	97	....
China	475	669	....
Japan	472	400	432
Dutch-Indies	254	463	251
AMERICA			
Argentine	720	728	785
Brazil	647	488	729
Chile	126	80	175
Mexico	77	94	....
Uruguay	26	52	84
United States	855	524	608
OTHER COUNTRIES	1,194	192	634
Total	18,109	28,493	34,849
Number of tools	58,218	54,724	49,884

duction of weight in most designs. The chief cause is the decrease in the export of heavy tools and the predominating demand for small sizes.

The import of machinery had in 1923 further declined. It was during the first six months of the year only 2,670 tons compared with 5,846 tons during the corresponding period of 1922 and 3,772 tons in 1913. In this year's reduced figure the import from former German possessions like Upper Silesia plays an important part which makes the decline appear still more marked. Machine tools form by far the largest item in the list of import. They numbered 381 tools with an aggregate weight of 319 tons, which is 12 per cent of all the goods brought in. Of countries of origin only Holland, Austria, Switzerland and the U. S. are specified.

Roads Break Records in First Nine Months

The railroads of the United States have moved the greatest traffic in their history without a car shortage, according to the figures made public by the Car Service Division of the American Railway Association. The report points out that for sixteen weeks car loadings exceeded 1,000,000 cars; yet since June there has been a surplus of cars in good condition.

Special attention is called to the peak week of Sept. 29, when car loadings reached 1,097,000, with a gross surplus of approximately 41,000 cars.

The report has been summarized as follows:

"The total cars of revenue freight loaded for the thirty-nine weeks from Jan. 1 to Sept. 29, inclusive, show an increase of 19 per cent over the same period in 1922, 28 per cent over 1921, and 10 per cent over the corresponding period in 1920.

"The thirty-nine weeks' total loadings this year were 37,308,891, compared with 31,307,098 in 1922; 29,135,147 in 1921, and 33,788,565 in 1920, the previous record year.

Sixteen Capacity Weeks

"In sixteen of the eighteen weeks' period from May 12 to Sept. 29, car loadings exceeded the million mark, and in these weeks there was an average surplus of more than 50,000 cars.

"The loading of 1,097,274 cars in the week ended Sept. 29 was the highest weekly loading on record, exceeding the previous peak week of Sept. 1 this year, when 1,092,567 cars were loaded.

"In the first nine months of this year the railroads installed in service 134,636 new freight cars and 2,963 new locomotives. On Oct. 1 64,601 new freight cars and 1,242 new locomotives were still on order.

"In the first nine months of this year freight cars awaiting repairs were reduced from 216,011, or 9.5 per cent of the total, on Jan. 1 to 151,332, or 6.7 per cent, on Oct. 1. Cars awaiting heavy repairs were reduced from 164,041, or 7.2 per cent, on Jan. 1, to 118,563 or 5.3 per cent, on Oct. 1. The constructive program called for a reduction of cars awaiting heavy repairs to 5 per cent.

"In the first nine months of this year locomotives awaiting repairs were reduced from 15,549, or 24.1 per cent of the total, on Jan. 1 to 9,823, or 15.3 per cent on Oct. 1."

Notes of Washington Activities

By Paul Wooton

One lesson of the war which is of very great value, in the opinion of D. R. Crissinger, the Governor of the Federal Reserve Board, is the exploding of the old theory of the economic causation of wars. It formerly was a widely held opinion that the world was not big enough to contain at the same time two highly prosperous nations. He pointed out that many think the war of 1914 was due to the fact that Germany thought it was necessary to destroy England if Germany were to go on prospering and expanding. "It seems never to have occurred to any of the economic causationists," says Mr. Crissinger, "that the world might be big enough to hold a prosperous Germany and a prosperous England at the same time. Far less did any of these theorists suspect that a prosperous Germany might be yet more prosperous because of the existence of a prosperous England, or that a prosperous England actually might be the gainer because of the good fortune of Germany."

Prosperous Neighbors Most Useful

He declares that the war has taught us that "prosperous neighbors are more useful as customers than they are harmful as competitors. There is a screw loose somewhere in the theory of getting rich from your neighbors' misfortunes." Continuing, Mr. Crissinger says:

"The current year has been on the whole a year of conservation and moderation in both business and politics. The greatest difficulty about economic rehabilitation since the war has been that the world has had to deal with its economic problems in an atmosphere surcharged with politics. Politics and economics have been inextricably mixed. In both business and the broad field of world relationships, we find disposition to caution, to moderation, to patience and reasonableness. This should be altogether gratifying. The situation may not be to the liking of those extremists who believe things cannot begin to get better until they have got very much worse. It may not be satisfactory to the opposite group, who believe that by this time we ought to be in the midst of an economic millenium. But it does contain many elements—let me say, a decided preponderance of the elements—of reassurance to that great majority of people who do not expect and do not want either a millenium or a revolution."

Will Work on Line Standards

In view of the remarkable progress which has been made during the last five years on end standards, the Bureau of Standards is planning intensive work on line standards, which have fallen more and more behind. In that connection, a new precision lathe, with a 10-ft. bed and a 14-in. swing, has been installed, with the idea of inaugurating new work on precision screw cutting. It is the ultimate intention to build a precision ruling machine, but to do that a precision lead screw must be developed.

Non-Corrosive Steels

Great strides in the development of non-corrosive steels may be expected during the next few years, in the opinion of Dr. G. K. Burgess, the Director of the Bureau of Standards. The waste represented by the corrosion of steel is so great that its prevention by the development of these special steels constitutes, in his opinion, one of the most important present day trends in the steel industry. The cost of certain forms of non-corrosive steel already have been cut two-thirds by recent progress in its development and further advance in this art is assured, Dr. Burgess believes. Important work in connection with corrosion problems is being carried forward by the Bureau of Standards.

Reducing Fire Hazards

The greatly increased fire losses of the past two years has resulted in an insistent demand for more research work on fire-resisting materials. As a result of this demand, the Bureau of Standards expects to expand its activities in that connection. The Bureau already has developed a large amount of valuable information as to the use of fire-resisting materials. It has demonstrated, among other things, that columns can be protected with a wide range of materials at a very slightly increased cost. The work has been particularly valuable in that it has shown the minimum amount of protection which can be used to advantage, particularly in respect to the thickness of walls which will be resistant to a considerable range of fire exposures.

Catalogs Wanted

The Wheeling Machine Products Co., Wheeling, W. Va., requests data and circulars pertaining to machines for the rapid castellation of hexagon S. A.E. standard nuts ranging in size from ¼-in. to 1¼-in.

Forthcoming Meetings

American Welding Society. Fall meeting. Oct. 24, 25 and 26. Fort Pitt Hotel, Pittsburgh, Pa.

Society of Automotive Engineers. Production meeting at Cleveland, Ohio, Oct. 25 and 26. Headquarters, 29 West 39th St., New York City.

American Gear Manufacturers Association. Fall meeting. Mountain House, Lake Mohonk, N. Y. Oct. 25, 26 and 27. T. W. Owen, secretary, 2,443 Prospect Ave., Cleveland, Ohio.

American Management Association. October 29, 30, and 31, Hotel Astor, New York City.

American Society of Mechanical Engineers. Annual meeting, Dec. 3 to 6, in New York City. Calvin W. Rice, 29 W. 39th St., New York City, secretary.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8. Headquarters, Grand Central Palace, New York City.

Society of Automotive Engineers. Annual meeting, Jan. 22 to 25, at the General Motors Building, Detroit, Mich. Coker F. Clarkson, 29 W. 39th St., secretary.

Foreign Trade Council. Eleventh annual convention at Boston, June 4, 5 and 6. O. K. Davis, India House, Hanover Square, New York City, secretary.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Iron and Steel—Pig-iron business confined mostly to small tonnages. Price of domestic iron sufficiently low to compete with foreign product; imports falling off. Buying movement developed in locomotives; car material in good demand. Steel buying on hand to month basis. Considerable new inquiry for plates and structurals; tendency to shade $2.50 base. Some exceptionally large structural steel projects recently awarded, are: New York Telephone Co. additions requiring 18,000 tons of steel; a power plant for the Public Service Corp. at Kearny, N. J., taking 14,000 tons and buildings for the Western Electric Co., also at Kearny, calling for 10,000 tons or more.

Advances—Improved sentiment in copper market continues; reported rise of ¼c. per lb. in week. Tin swinging upward; also advanced ¼c. Lead steady. Zinc continues to advance; up $\frac{5}{16}$c. in New York warehouses. Raw linseed oil, $1.05 per gal. (5 bbl. lots) in Cleveland, against $1.02 last week.

Declines—Babbitt metal down 1½c. per lb. in Cleveland.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$26.05
Northern Basic	25.00
Southern Ohio No. 2	25.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	29.00
BIRMINGHAM	
No. 2 Foundry	23.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	25.25
Virginia No. 2	29.17
Basic	25.00
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	25.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	28.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	26.77
Basic	26.77
Bessemer	27.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.95	4.45	5.05
Nos. 22 and 24.	3.75	5 00	4.50	5.05
Nos. 25 and 26.	3.80	5 05	4.55	5.10
No. 28	3.85	5.15	4.65	5.20
Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00	5.15	4.70	5.35
Nos. 12 and 14.	4.10	5.25	4.80	5.45
Nos. 17 and 21.	4.40	5.55	5.10	5.75
Nos. 22 and 24.	4.55	5.70	5.25	5.90
No. 26	4.70	5.85	5.50	6.05
No. 28	5.00	6.15	5.80	6.35

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	62	50½	¾ to 1½	30	13
		LAP WELD			
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	28	13
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	60	49½	¾	28	12
2 and 3	61	50½	1 to 1½	30	14
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded.	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods(base)	6.53	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold drawn shafting or screw	4.65	3.90	4.55
Cold drawn flats, squares	5.15	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, $\frac{31}{32}$, 8.35c.; ⅛, 7.85c.; $\frac{5}{32}$ to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			13.62½
Tin, 5-ton lots, New York			42.25
Lead (up to carlots), St. Louis	6.60	New York	7.37½
Zinc (up to carlots), St. Louis	6.45	New York	7.12½

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.50	27.00	25.50
Antimony (Chinese), ton spot	8.50	10.50	7.50
Copper sheets, base	21.25	21.50	23.00
Copper wire, base	15.50	18.75	16.25
Copper bars, base	19.75	22.00	19.50
Copper tubing, base	24.00	27.00	23.00
Brass sheets, base	17.50	21.75	18.75
Brass tubing, base	22.50	27.00	20.50
Brass rods, base	15.25	17.75	15.75
Brass wire, base	18.00	21.75	.....
Zinc sheets (casks)	10.25	10.45	.....
Solder (½ and ½), (case lots)	29.50	29.00	24.00
Babbitt metal (83% tin)	52.00	52.00	40@42
Babbitt metal (35% tin)	25.00	17.50	17@20
Nickel (ingot and shot)	29.00	.....	.....
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.75	11.50	11.50
Copper, heavy, and wire	10.75	11.00	10.75
Copper, light, and bottoms	9.50	9.00	9.75
Lead, heavy	5.75	5.25	5.90
Lead, tea	4.75	4.00	5.00
Brass, heavy, yellow	7.00	....	7.00
Brass, heavy, red	8.75	9.25	8.75
Brass, light	6.25	5.00	6.25
No. 1 yellow brass turnings	7.00	5.75	7.00
Zinc	3.75	2.75	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$25.10	$22.85	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.40	18.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	13.00	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13¼x13¼, per lb.	11.00	36.00 per M	.10
Wiping cloths, 13½x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	.98	1.05	1.14
White lead, dry or in oil	100 lb. kegs.	New York, 14.00	
Red lead, dry	100 lb. kegs.	New York, 14.00	
Red lead, in oil	100 lb. kegs.	New York, 15.50	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.00@4.25	
Coke, prompt foundry, Connellsville	per net ton	5.00@5.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40-10%	50-10%	45-5%
1½ and 1¼x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	25-10%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30-10%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	40-10%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30-10%	45%	40-5%
Bolt ends, with hot pressed nuts	40-10%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 5/16 and smaller	60%	.....	....
Semi-finished nuts, ⅜ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.. ....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	0.50	2.75	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	50-10%	50-10%	60%
Rivets, tinned	50-10%	50-10%	4½c. net
Button heads ⅝-in., ¾-in., 1x2 in. to 5 in., per 100 lb (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30-10%	30-10%	30-10%
Heavy grade	20-5-2½	30%	20-5-2½%
Rubber and duck:			
First grade	.50-10-5%	50-10%	40-10%
Second grade	60-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20

New and Enlarged Shops

Machine Tools Wanted

Calif., Eureka—Bd. Educ., G. B. Albee, Secy.—30 or 36 in. single cylinder cabinet planer; 16 in. hand jointer; 36 in. bandsaw machine; twenty two 9 in. cabinet makers vises; bandsaw setting and gumming machine; sheet metal machinery, including No. 980 Pexto bench plate; No. 0547 hand wiring machine with one set of burring rolls; No. 137B squaring shear, 36 in. wide, for 18 gage metal and lighter; No. 587A crimping and beading machine with both crimping and beading rolls; No. 911 P. S. & W. Co. 60 in. hollow mandrel stake.

Kan., Lawrence — Lawrence Iron Wks., 6th and Vermont Sts. (machine shop), R. C. Rankin, Mgr.—keyseater.

Mo., Carterville — Carterville Garage — drill press and lathe (used).

Mo., Carterville—W. A. Wilson, 120-122 East Main St.—lathe for garage (used).

Mo., Webb City—N. R. Bartlett, 214 North Madison St.—lathe and drill press for garage.

Mo., Webb City—West Side Machine Co. —lathe, drill press, etc.

N. Y., Brooklyn—Viking Tool & Machine Co., 745 65th St.—three kick presses, ten power punch presses and one 30 in. squaring shear.

N. Y., Buffalo—E. Gladner, 110 Sherman St.—equipment, also one 1,000 gal. gasoline tank and pump for proposed garage and repair shop on Abbott Rd. and Dash St.

N. Y., Conewango Valley—P. Nickerson, R. F. D. 1—10 to 12 in. lathe and garage tools.

N. Y., Johnson City — Borden Bros., 5-7 Endicott Ave.—small tools, drill press, 10 in. lathe and equipment for garage.

N. Y., New York—Brambach Piano Co., 639 West 49th St.—20 in. back geared drill press.

O., Toledo — Dukes Auto Repair Shop, Southard Ave. and 14th St., A. Duke, Purch. Agt.—machinery, equipment, small tools, electric drills, etc., for new shop.

Ore., Portland—The City Comn., J. H. Mann, Comr., City Hall—lathes, shapers, drills and general equipment for proposed $150,000 garage.

Pa., Pittsburgh—Hoeveler-Stutz Co., Center St. and Negley Ave.—complete service station and repair equipment.

Pa., Plymouth — H. S. Mains, 24 East Main St.—complete garage equipment, small lathe and tools.

Pa., Sharon—J. Moyer Motor Car Co., North Main St.—complete equipment, including small lathe, for proposed $20,000 garage and service station.

Wis., Hartland—F. Wein (automobile repairs)—portable drill, air compressor and tool room lathe (used preferred).

Wis., Madison—Madison Nash Co., 155 East Wilson St., A. R. Dillon, Mgr.—automobile repair machinery, drill press, gasoline tanks, etc., for proposed $60,000 garage.

Wis., Milwaukee—P. Mellantine & Co., 567 Muskego Ave.—boring machine, battery charger and portable drill for garage.

Wis., Milwaukee—A. H. Niemann, 110 Howell Ave.—air compressor, emery wheel, stand and drill press for garage.

Wis., Sheboygan — A. Zupansich, 723 North 9th St.—automobile repair machinery and small tools for proposed garage on 9th St.

Ont., Carleton Place—McGregor Bros.—bench tools, lathe, etc., for automobile repair shop.

Ont., Douglas—A. J. Marks—bench tools and small lathe for garage.

Ont., Forester's Falls—T. Moxam—drill press for blacksmith shop.

Ont., Pakenham—G. A. Mott—general machine tools for garage.

Ont., Pakenham—Scott & Gillan—garage and repair shop equipment.

Ont., Renfrew—C. O. Thacker—lathe for garage.

Que., Breakeyville — O. Gosselin — lathe and other equipment for automobile repair shop.

Que., Mont Joli—J. A. Landry—bench tools and small lathe for garage repair work.

Que., Montreal — Automobile Ltd., 232 Sanguinet St.—equipment for automobile repair shop.

Que., Montreal — Bowman Bros., 781 Clarke St., A. Bowman, Purch. Agt.—drill press and lathe for garage.

Que., Montreal — Canadian Yellow Cab Mfg. Co., Ltd., c/o A. H. Elder, 22 Summerhill Ave.—machinery and equipment for the manufacture and repair of taxicabs, etc.

Que., St. Jerome—M. Viau—machine tools and foundry equipment.

Que., St. Pamphile—P. Morneau—small tools, lathe, etc., for blacksmith shop and garage.

Machinery Wanted

Ala., Bay Minette—B. A. Neal—newspaper press.

Ala., Mobile—R. M. Smith, City Bank Bldg.—sheet metal machinery, including box and pan brakes, bending machinery and squaring shears (new or used).

Ark., Little Rock—Arkansas Bauxite Products Co., P. O. Box 381, G. W. Goodman, Secy.—machinery for $40,000 plant for the manufacture of aluminum sulphate and affiliated products.

Calif., Los Angeles—The county, L. E. Lampton, Clk. of Bd. of Supervisors—receiving bids until Oct. 29 for laundry machinery for county hospital.

Del., Wilmington—Dupont Fibre Silk Co. —equipment for proposed $4,000,000 plant at Jacksonville, Tenn.

Ga., Macon — Schuster-Adams Chemical Co.—special machinery and equipment for new $1,000,000 plant for the manufacture of dry cells.

Ill., Chicago—Amer. Pneumatic Carpet Cleaning Co., 1035 West Lake St.—air compressor, 500 cu.ft. per min. at 60 lb., either steam or electric drive.

Ill., Chicago—C. S. Brown, 536 Rush St. —job printing press.

Ill., Chicago—Illinois Central R.R., 135 East 11th St., J. J. Bennett, Purch. Agt.—one 20 in. motor driven upright high speed drill with power feed.

Ill., Chicago—Palmer Equipment Corp., 80 East Jackson Blvd. (railway equipment) —36 in. bandsaw.

Ill., Grayslake—Times—perforator.

Ind., Huntington — Indiana Farmers Guide—No. 5 linotype (used).

Kan., Wichita—J. Miller, 742 Hendryx St. (job printer)—5 x 8 in. and 7 x 11 in. card presses.

Ky., Louisville—Office of United States Engineer, P. O. Box 72—two hundred forty steel, lapwelded boiler tubes, 2¾ in. diameter, 8 ft. 1 in. long; twenty-five ¼ x ¼ x 2¼ in., one hundred $\frac{5}{16}$ x $\frac{5}{16}$ x ¾ in., two hundred ⅜ x ⅜ x 3¼ in., fifty ½ x ½ x 4 in. high speed steel cutters; two bandsaws, 18 gage, 1 in. pitch, 19 ft. 4 in. long.

Mich., Detroit — Caille Bros. Co., 6210 2nd Blvd.—miscellaneous equipment for the manufacture of coin controlled machines.

Mich., Detroit—C. B. Shepard Co., Hart and Charlevoix Aves.—machinery and equipment for the manufacture of automobile hardware.

Mich., Harbor Springs—Graphic Publishing Co.—perforator, stitcher and job printing press.

Minn., Carlton—W. H. Hassing—model 15 linotype (used).

Minn., McGregor—M. H. Galer—job printing press, belting, hangers, pulleys and linotype.

Mo., Chillicothe—The Printer, 430 Cherry St.—newspaper press.

Mo., Columbia — Saxon Press — rubber stamp vulcanizer press.

Mo., St. Louis—Hoyer Printing Co., Lemp and Arsenal Sts.—20 x 26 in. Washington press.

Mo., Webb City—Champion Boot Shop, 210 North Madison St., J. W., Chastain, Purch. Agt.—shoe finisher and leather stitcher, electric power (used).

Mo., Webb City—J. W. Gass, 911 West Daugherty St. (cabinet shop)—wood lathe, sander, Universal saw and scroll saw.

N. Y., Binghamton—Willys-Morrow Co., C. E. Killinger, Purch. Agt.—$800,000 worth of machinery for the manufacture of automobile parts and transmissions.

N. Y., Buffalo—W. Dolinsky, 619 Hertel Ave.—equipment for small bakery.

N. Y., Buffalo — Main Central Market Corp., 206 Morgan Bldg., W. B. Asbury, Pres.—equipment for bakery at 636 Main St.

N. Y., Buffalo—F. A. Reppenhager, 11-13 Perry St.—equipment for covering printing press rollers for proposed factory at 339 Oak St.

N. Y., Buffalo—Rich Ice Cream Co., 470 Spring St.—equipment for the manufacture of ice cream for plant at 414 Pratt St.

N. Y., Buffalo—J. Schaef, Miller Ave. along tracks of West Shore R. R.—equipment for small factory for repairing electric batteries and light manufacturing at 1872 Genesee St.

N. Y., Fancher—Fancher Canning Factory, M. J. Buckley, 43 Brighton Ave., Rochester, Purch. Agt.—machinery for canning factory, to replace that which was recently destroyed by fire.

N. Y., Hornby (Beaver Dams P. O.)—E. Cady—complete machinery and equipment for proposed $15,000 cheese factory, to replace that which was destroyed by fire.

N. Y., Jamestown — S. Cusimano, 812 Foote Ave.—two gasoline pumps and garage tools.

N. Y., Medina—Medina Case & Furniture Co., Inc., East Center St. — woodworking machinery and equipment, to replace that which was destroyed by fire.

N. Y., Niagara Falls—Certainteed-Products Co., Elizabeth St. — equipment and refrigeration machinery for new warehouse.

N. Y., North Tonawanda—Becker & Moore Co.—planers, saws and special machinery for the manufacture of shaving fibre.

N. Y., Penn Yan—Penn Yan Boat Co.—machinery, equipment, shafting, hangers, pulleys, etc., for new plant.

N. Y., Webster—A. Hillifker—machinery and equipment for canning plant, to replace that which was destroyed by fire at Fancher.

N. C., Asheville—B. & D. Confectionery Co.—complete candy making machinery.

N. C., High Point—J. E. Cox Mfg. Co.—machinery for the manufacture of bobbins and bobbin heads for textile plants, to replace fire loss.

O., Bucyrus—Woodruff Printing Co.—one 10 x 15 in. and one 12 x 18 in. Chandler & Price job press.

O., Cincinnati—W. F. Robertson, Elm and Commerce Sts.—machinery and equipment for proposed plant for the manufacture of tin cans at Marietta.

O., Findlay — C. A. Shubert — machinery and equipment, including bending and forging machinery, belting, shafting, hangers, etc., for the manufacture of coal handling equipment.

O., Lakewood (Cleveland P. O.)—Anderson Rolled Gear Co.—one B. & S. No. 13 heavy gear cutter.

O., McDonald—International Baking Co., Marshall Rd.—machinery and equipment for bakery, to replace that which was destroyed by fire.

O., Newark—P. Smith & Sons Lumber Co., W. H. Smith, Pres. — woodworking machinery.

O., Toledo—J. Urzykowski, 1644-48 Campbell St.—machinery and equipment for new plant for the manufacture of specialties.

O., Youngstown — Chelekis Bros., East Federal St., R. Chelekis, Purch. Agt.—ovens and equipment for new bakery.

O., Youngstown — Mahoning County — laundry, refrigeration and cold storage machinery and equipment for proposed hospital near Cornersburg.

Pa., Pittsburgh — J. H. Hunkele, Penn Ave. and Derby St. (manufacturer of specialties) — machinery, equipment and tools for proposed $32,000 plant.

Pa., Pittsburgh—Rode & Co., 510 Sandusky St.—machinery and equipment for canning plant, to replace that which was destroyed by fire.

Pa., Warren—Conewango Furniture Co. —woodworking machinery and equipment for plant at Titusville.

S. C., Beaufort—I. J. and G. W. **Beckell** —complete canning equipment.

Tenn., Knoxville — Duncan Mchy. Co., Box 265—direct connected gasoline air compressor, 200 ft. capacity.

Tex., Clyde — E. Slater — job printing press, belting, hangers, pulleys, paper cutter and bearings (used preferred).

Tex., Houston—Oil Well Service Co., 411 Cotton Exch.—drill rig.

Tex., Wolfe City—W. R. Sharpe—wagon scale, 20 ft. long.

Tex., Ysleta—C. C. Cricket, Box 1014—15 ton ice plant equipment, belting, pulleys, shafting and hangers.

Va., Ripplemead—I. C. Painter—copying lathe for handles and spokes.

Wash., Spokane—A. R. Gross, 0807 Ash St.—newspaper press and equipment.

W. Va., Orlando—Bens Run Oil & Gas Co., G. H. Allman, Purch. Agt.—oil drilling outfit, etc.

Wis., Ashland—Ashland Daily Press, 321 West 3rd St.—presses and paper cutter for proposed newspaper plant.

Wis., Beloit—W. Karlen, 1099 Park Ave. —gasoline storage tanks and six pumps for proposed filling station.

Wis., Burlington—Hillside Garage, F. C. Platefield, Purch. Agt.—air compressor, gasoline storage tank, pump, bench tools and chain hoist.

Wis., Colby—Colby Co-operative Cheese Co., c/o A. Herrmann—power churn, cheese vats, separators and weighing machine.

Wis., Cudahy—C. L. Coughlin, Packard Ave. (forgings)—power hammer and furnace.

Wis., Deerfield—Deerfield Canning Co., c/o G. O. Bergland—canning and conveying machinery.

Wis., Fort Atkinson—Knoepfel Bros. Co. —gasoline storage tanks and pumps for proposed filling station.

Wis., Friesland—Friesland Canning Co.— canning and conveying machinery for proposed cannery.

Wis., Green Bay—Badger Show Case Co., 133 North Pearl St.—veneer press for proposed factory.

Wis., Kenosha—Allen A. Co., 1009 Prairie Ave.—textile machinery for proposed $40,000 addition to hosiery factory at Green Bay.

Wis., Kenosha—Amer. Brass Co., 570 Elizabeth St.—special machinery for the manufacture of copper wire.

Wis., Madison—G. Gropas, 908 Jenifer St. —refrigeration equipment and dish washing machinery for proposed restaurant.

Wis., Madison—A. Newell, 2306 University Ave.—36 in. sander (used).

Wis., Madison—N. Olsen, 1928 Railroad St.—12 and 16 in. jointers, also 5 in. sticker.

Wis., Merrill—Smith Wood Products Co., 1207 River St., W. A. Smith, Purch. Agt.— matcher, sander, belting and shafting.

Wis., Middle Inlet—Pike River Granite Co. (monument works and quarry). E. A. Mundt, Purch. Agt.—saw and planer, electrically driven.

Wis., Milwaukee—Finkler Motor Car Co., 924 3rd St.—gasoline storage tanks and pumps for proposed $40,000 addition to garage.

Wis., Milwaukee—C. Utech, 906 11th St. (manufacturer of screens and sash)—one sander, either drum or belt.

Wis., New London—Bd. Educ., R. J. McMahon, Supt.—manual training equipment, woodworking machinery, etc., for new high school.

Wis., Oconomowoc—Medford Canning Co., c/o J. B. Weix, Mgr.—conveyors and canning machinery equipped with motors, for proposed cannery at Medford.

Wis., Oshkosh — Triangle Mfg. Co., 36 West New York Ave., F. J. Sullivan, Mgr.— special equipment for the manufacture of patented hospital bed.

Wis., Sheboygan—D. & D. Hanger & Panel Co., 721 Jefferson St., H. Davis, Pres. —small woodworking machinery and tools for proposed $50,000 factory.

Wis., Waukesha — Thompson's Malted Food Co., Riverside Dr.—special machinery for proposed $40,000 addition to plant.

Wis., Waunakee—H. R. Burr—belting and shafting for canning factory.

Wis., West Bend—Atlantic & Pacific Products Co.—special machinery, belting and shafting for proposed $60,000 addition to condensery.

Wis., Williams Bay—G. A. Van Velzer— air compressor outfit for proposed garage at Elkhorn.

N. S., Sydney—McKinley & Sons, McKay's Corner—bottling equipment.

Ont., Almonte—A. Metcalfe—well drilling equipment.

Ont., Cutler—Spanish River Lumber Co., Ltd., W. J. Bell, Mgr.—bandsaws, resaws, edgers, planers, etc., for steam power lumber and sawmill, to replace that which was destroyed by fire.

Ont., Dougles—Neville & Lynch, D. J. Lynch, Purch. Agt.—chain hoist, small tools, etc., for garage.

Ont., Eganville—Leader Printing & Publishing Co., John St.—job printing press.

Ont., Forester's Falls—A. H. McClurg— tire shrinker, forge, etc., for blacksmith shop.

Ont., Galt — P. W. Gardiner & Sons, A. Gardiner, Purch. Agt.—complete equipment for sash and door factory.

Ont., Hamilton—Dominion Canners, Ltd., Hughson St.—equipment for plant, to replace that which was destroyed by fire at St. David's.

Ont., Matheson—R. Potter—lumber saw, carriage, edger, resaws, etc., for steam sawmill, to replace that which was destroyed by fire.

Ont., Maxville—S. McDonald—air compressor emery wheel, stand, etc., for garage.

Ont., Middleville—J. Penman—mortising machine, planer, etc., for planing mill.

Ont., Morrisburg—J. A. Harback—gasoline storage tank, pump, etc., for garage.

Ont., Pembroke—A. Barr, 143 Victoria St.—equipment for carriage factory.

Ont., Pembroke—L. S. Barraud, 121 Lake St.—planer, saws, etc., for planing mill.

Ont., Pembroke—West End Garage, 283 Trafalgar St., D. W. White, Purch. Agt.— chain hoist, emery wheel, etc.

Ont., Renfrew—L. Imbleau & Sons, M. Imbleau, Purch. Agt.—foundry equipment in December.

Ont., Stratford—Brooks Steam Motors, Ltd., P. J. Brooks, Pres.—equipment for the manufacture of steam driven autos.

Ont., Toronto—Castle Tretheway Mines, Ltd., Standard Bldg.—stamps, tube and ball mills, pumps, cyanide apparatus, crushers, etc., for 100 ton gold mining mill at Gowganda.

Que., Lac au Saumon—G. J. Paradis— circular saw, etc., for planing mill.

Que., Levis—J. B. Carriere, 9 Napoleon St.—tire shrinker for blacksmith shop.

Que., Montreal—P. Brauet, 178 St. Antoine St.—equipment for wagon repair shop.

Que., Montreal—G. Haysey & Co., 55 St. Mark St. (cabinet maker)—bandsaw.

Que., Montreal — Modern Welding Co., 2581 Notre Dame St., E. (automobile repairs, etc.)—welding and cutting equipment.

Que., Montreal — Mov-Esy Seating Co., Ltd., J. C. Corcoran, 413 MacKay St., Purch. Agt.—machinery for the manufacture of chairs and chair fixtures.

Que., St. Lin—T. Paquin—foundry equipment.

Que., St. Pamphile—F. Chouinard—sawmill and planer knives.

Que., Ste. Scholastique — M. Senecal — complete sawmill equipment.

Metal Working Shops

Calif., Long Beach—The F. A. McKenzie Co., 212 Locust St., is having plans prepared for the construction of a 1 story, 50 x 150 ft. automobile service building on American Ave. H. L. Gogerty, 239 East Bway., Long Beach, Archt.

Calif., Long Beach—The Southern Service Co., 925 West 7th St., is having plans prepared for the construction of a 2 story, 50 x 80 ft. addition to shop and a 1 story, 80 x 125 ft. addition to laundry on Bway. and Mitchell St. Wright & Gentry, Marine Bank Bldg., Long Beach, Archts.

Calif., Los Angeles—The Emsco Steel Products Co., 7111 South Alameda St., awarded the contract for the construction of a factory on 70th St. Estimated cost $18,000.

Calif., Los Angeles—D. E. Foster, 1259 Maryland St., awarded the contract for the construction of a 2 story garage on Maryland St. Cost will exceed $40,000. Noted Oct. 11.

Calif., Los Angeles—The Industrial Stores Co., c/o C. C. Rittenhouse, Archt., Wilcox Bldg., is having plans prepared for the construction of a 1 story, 150 x 225 ft. garage on East 7th St.

Calif., Los Angeles—The Solar Lighting Co., 219 East 4th St., manufacturer of lighting fixtures, is having plans preparred for the construction of a 2 story, 50 x 150 ft. factory on Los Angeles St. W. D. Lee, Sun Bldg., Los Angeles, Archt.

Calif., Monrovia—G. N. Turner, c/o Ruoff & Munson, Archts., Story Bldg., Los Angeles, is receiving bids for the construction of a 1 story, 50 x 150 ft. garage and salesroom, here.

Calif., Oakland—The Pacific Enameling & Mfg. Co., 880 60th St., has had preliminary plans prepared for the construction of a factory. Estimated cost $9,500. Private plans.

Calif., Oakland — E. H. Vincent, 3121 Humboldt Ave., plans to build a factory for the manufacture of Remal-Vincent steam power autos. Cost will exceed $40,000.

Calif., Paso Robles—The Pioneer Garage, c/o W. C. Henderson, is having plans prepared for the construction of an addition to garage. Estimated cost $40,000. Miller & Warnecke, Perry Bldg., Oakland, Archts.

Calif., San Barnardino—The Atchison, Topeka & Santa Fe Ry. Co., Kerckhoff Bldg., Los Angeles, is having plans prepared for the construction of shops, here. This will be the first unit of $1,500,000 construction program. Private plans. Noted June 7.

Calif., San Pedro—L. J. Harris, 1939 Gaffey St., awarded the contract for the construction of a 1 story, 50 x 150 ft. garage on 13th St. Noted Oct. 4.

Conn., Bristol—Truden & Platt, Inc., 67 Prospect St., are having plans prepared for for the construction of a 1 story, 60 x 70 ft. garage on Church St. Estimated cost $40,000. Sperry & Buell, 175 Main St., Bristol, Engrs. and Archts.

Conn., Glenbrook—The Norma Co. of America, Anable Ave., Long Island City, N. Y., awarded the contract for the construction of a 1 story, 100 x 400 ft. factory for the manufacture of ball bearings, here. Estimated cost $70,000. Noted Aug. 2.

Conn., Hartford—Long Bros., State St., will soon award the contract for the construction of a 1 story, 60 x 240 ft. garage. Estimated cost $40,000. F. C. Walz, Trumbull St., Hartford, Archt. Noted Oct. 4.

Conn., Hartford—J. A. Pilgard, 1026 Main St., plans to build a garage on Ann St. Estimated cost $400,000.

Conn., Hartford—The Skayef Ball Bearing Co., 330 New Park Ave., awarded the contract for the construction of a 2 story, 50 x 80 ft. factory. Estimated cost $40,000.

Conn., Norwalk—C. Mintz, 92 Washington St., South Norwalk, is having plans prepared for the construction of a 2 story garage on West Ave., here. Estimated cost $40,000. H. W. Mather, Norwalk, Archt.

Conn., Waterbury—A. Genua, 73 Union St., is having plans prepared for the construction of a 2 story, 60 x 100 ft. garage on Jefferson St. Estimated cost $40,000. E. E. Benedict, 51 Leavenworth St., Waterbury, Archt.

D. C., Bellevue—The Bureau of Yards & Docks, Navy Dept., Wash., awarded the contract for the construction of a barracks, garage and generator buildings at the Naval Experimental & Research Laboratory, here. Estimated cost $23,400.

Fla., Jacksonville—The Ford Motor Co., Highland Park (Detroit P. O.), plans to build a distributing plant and assembling factory, here. Estimated cost $250,000.

Fla., South Jacksonville—The Leesburg Fibre Pulp & Paper Co., Leesburg, plans to build a paper plant, including a 50 x 300 ft. main building, machine shops, etc., here. Estimated cost $500,000. G. D. Leach, Secy.

Ill., Joliet—The S. & H. Motor Co., 203 Hacker Ave., is having preliminary plans prepared for the construction of a 3 story, 100 x 150 ft. garage, sales and service station on Cass Ave. Estimated cost $65,000. T. T. Shaver, 7 South Dearborn St., Chicago, Engr. Downie, Inc., Higgins Bldg., Joliet, Archt.

Ind., Indianapolis—T. L. Greene & Co., 202 Miley Ave., is having plans prepared for the construction of a 1 story, 75 x 110 ft. addition to plant for the manufacture of bakers' machinery and equipment. Estimated cost $40,000. C. E. Bacon, 605 I. O. O. F. Bldg., Indianapolis, Archt.

Ky., Louisville—J. P. Dant, 1718 Windsor Pl. plans to build a 2 story, 70 x 110 ft. garage at 901-905 Bway. Estimated cost $40,000. Engineer or architect not selected.

Mass., Boston—The Boston Gear Wks., 256 Franklin St., awarded the contract for the construction of a 2 story, 85 x 100 ft. addition to its plant on Haywood St.

Mich., Detroit—The Caille Bros. Co., 6210 2nd Blvd., will soon award the contract for the construction of a 2 story, 78 x 101 ft. addition to factory for the manufacture of boat motors on 2nd and Amsterdam Aves. Baxter, O'Dell & Halpin, 1024 Hammond Bldg., Detroit, Archts.

Mich., Detroit—The Michigan Stamping Co., 11631 Mack Ave., is having plans prepared for the construction of a 1 and 2 story, 50 x 100 ft. addition to its plant on Hart Ave. Estimated cost $75,000. A. Kahn, 1000 Marquette Bldg., Detroit, Archt.

Mich., Detroit — The Towson Body Co., 1424 Aberle St., awarded the contract for the construction of a 6 story addition to its automobile body plant. Estimated cost $160,000.

Mich., Lansing—Lorenz Bros. awarded the contract for the construction of a 3 story (ultimately 5 story), 83 x 216 ft. garage on North Grand St.

Minn., St. Paul—The Amer. Radiator Co., 688 Hampden Ave., plans to build an addition to its plant. Estimated cost $250,000. Engineer or architect not announced.

Mo., Cape Girardeau—The Groves Motor Co. awarded the contract for the construction of a 2 story, 100 x 100 ft. garage on Prague and Spruce Sts. Estimated cost $50,000.

Mo., Kansas City—The Ford Motor Co., Highland Park (Detroit P. O.), is having plans prepared for remodeling present assembly plant and the construction of a 1 story, 220 x 880 ft. addition, here. A. Kahn, Marquette Bldg., Detroit, Archt.

Mo., St. Louis—The Quick Meal Stove Co., Kingshighway and Daggett St., awarded the contract for the construction of a 1 and 2 story, 83 x 316 ft. stove factory on Wilson Ave. Estimated cost $75,000.

N. J., Elizabeth — The Union County Park Comn., 286 North Broad St., will receive bids until Oct. 26 for the construction of a garage, machine shop, store house, carpenter shop, etc., on the Elizabeth-Roselle Park Tract. W. R. Tracy, Engr. C. G. Poggi, 275 Morris Ave., Elizabeth, Archt.

N. Y., Brooklyn—The Baltire Powers Realty Co., c/o Magnuson & Kleinert, Engrs. and Archts., 52 Vanderbilt Ave., will build a 1 story garage on 3rd Ave. Estimated cost $60,000.

N. Y., Brooklyn—W. Feistag, c/o E. M. Adelsohn, Engr. and Archt., 1778 Pitkin Ave., will build a 1 story, 100 x 150 ft. garage on Liberty Ave. Estimated cost $50,000.

N. Y., Buffalo—J. A. Cramer, 1010 Main St., Dodge agent, awarded the contract for the construction of a 3 story, 51 x 110 ft. addition to sales and service station.

N. Y., Salem—The Acme Road Mchy. Co., Frankfort, is having plans prepared for the construction of a 1 story factory on Railroad Ave., here. Estimated cost $200,000. E. H. Cook, Frankfort, Engr. and Archt.

O., Cleveland—The Frankel Chevrolet Co., c/o P. Frankel, Discount Bldg., awarded the contract for the construction of a 1 story, 25 x 106 ft. addition to garage at 1250 East 105th St. Estimated cost $40,000.

O., Cleveland—The Gabriel Mfg. Co., 1407 East 40th St., manufacturer of automobile bumpers, awarded the contract for the construction of a 2 story, 80 x 150 ft. addition to factory. Estimated cost $60,000. C. H. Foster, Mgr. Noted Sept. 27.

O., Cleveland—The Grennen Cake Corp., 1941 East 66th St., has had plans prepared for the construction of a 1 story, 69 x 100 ft. garage at 1937 East 66th St. Estimated cost $40,000. J. F. Steffens, Fidelity Mortgage Bldg., Cleveland, Archt.

O., Cleveland — H. D. Koblitz, Osborn Bldg., awarded the contract for the construction of a 1 story, 89 x 116 ft. garage and commercial building at 2118 East 55th St. Estimated cost $50,000. Noted Sept. 13.

O., Cleveland—B. Ris, c/o H. N. Ferguson Co., Archts., 12821 Phillips Ave., has had plans prepared for the construction of a 2 story, 40 x 156 ft. factory at 3035 St. Clair Ave. Estimated cost $60,000.

O., Cleveland—The White Motor Co., 842 East 79th St., has had plans prepared for the construction of a 1 story, 100 x 100 ft. addition to its factory. Estimated cost $50,000. W. C. White, Pres. The Watson Co., 4614 Prospect Ave., Cleveland, Archts.

O., Cleveland—The White Motor Co., 842 East 73rd St., awarded the contract for the construction of a 1 story, 90 x 216 ft. garage at 787 East 73rd St. Estimated cost $80,000. W. C. White, Pres.

O., Columbus—The Shaffer Roofing Co., 272 West Broad St., plans to build a factory on Broad and Gift Sts. Estimated cost $40,000. W. A. Shaffer, Mgr. Engineer or architect not selected.

O., Dayton—The Dayton & Troy Auto Co., 2nd and St. Clair Sts., plans to build a 10 story, 60 x 200 ft. automobile sales and repair building. Estimated cost $500,000. Engineer or architect not selected.

O., Painesville—M. H. Carmody is receiving bids for the construction of a 2 story garage. Estimated cost $50,000. H. K. Ferguson Co., 4900 Euclid Ave., Cleveland, Archt.

O., Steubenville — F. Scott, Studebaker agent, is receiving bids for the construction of a 2 story automobile sales and service station. Estimated cost $75,000. W. S. Ferguson Co., 1900 Euclid Ave., Cleveland, Archts. Noted Oct. 4.

Ore., Portland — The City Comn., J. H. Mann., Comr., City Hall, is having plans prepared for the construction of a garage and machine shop on Montgomery and Laragee Sts. Estimated cost $150,000. O. Laurgaard, City Hall, Engr.

Pa., Altoona—H. H. Fleck, Central Trust Bldg., and H. M. Fleck, 208 Logan Ave., Llyswen (Altoona P. O.), awarded the contract for the construction of a 3 story, 100 x 120 ft. garage on 13th Ave. Estimated cost $130,000.

Pa., Phila.—The Koelle-Greenwood Motor Co., 6025 Germantown Ave., awarded the contract for the construction of a 2 story, 70 x 209 ft. garage on Chelton Ave. east of Wayne St. Noted Aug. 16.

Pa., Phila.—The G. W. Smith Co., Inc., 49th and Botanic Sts., awarded the contract for the construction of a 1 story, 212 x 352 ft. assembly plant on 51st and Botanic Sts. Estimated cost $200,000.

S. C., Greenville—The Steele Heddle Mfg. Co., 21st and Allegheny Sts., Phila., Pa., awarded the contract for the construction of a 2 story, 120 x 160 ft. plant for the manufacture of reeds, loom harness, drop wires., etc., here. Noted Sept. 13.

Tenn., Lexington—The Herron Motor Car Co. is having plans prepared for the construction of a 1 story garage. Estimated cost $40,000. E. W. Mann, Madison Ave. Bldg., Memphis, Archt.

Tex., Brownsville—The Gulf Coast Lines are having plans prepared for the construction of a roundhouse and shops. Estimated cost $100,000. C. S. Kirkpatrick, Houston, Ch. Engr.

Tex., Dallas — W. E. Easterwood, 716 Lowell St., awarded the contract for the construction of a 1 story, 110 x 150 ft. garage on Ervay and Hickory Sts. Estimated cost $40,000.

Tex., El Paso—The Ampco Iron Co., Springfield, Mo., is having preliminary plans prepared for the construction of a 1 story foundry, here. Cost between $40,000 and $50,000. Private plans.

Tex., Houston — The Standard Sanitary Mfg. Co., Preston and Smith Sts., manufacturer of plumbers' supplies, is having plans prepared for the construction of a 4 story, 125 x 125 ft. factory on McKinney St. and Bway. Cost will exceed $75,000. A. C. Finn, Bankers Life Bldg., Houston, Archt.

Tex., Jacksonville — The Hall Fdry. & Machine Co. plans to rebuild its foundry which was destroyed by fire. Estimated cost $50,000. Engineer or architect not selected.

W. Va., Wheeling—The Warwood Tool Co. plans to build a 1 story, 40 x 80 ft. machine shop. Estimated cost $25,000. Private plans.

Wis., Appleton—The Fox River Tractor Co., Rankin St., will build a 2 story, 50 x 75 ft. factory. Estimated cost $40,000.

Wis., Kenosha—The Nicholson Transit Co., 2654 East Atwater St., Detroit, Mich., awarded the contract for the construction of a 1 story, 64 x 170 ft. garage, here. Estimated cost $45,000.

Wis., La Crosse—Mashak & Schwalbe, 326 South 5th St., awarded the contract for the construction of a 1 story, 60 x 152 ft. garage. Estimated cost $45,000.

Wis., Milwaukee—The Koehring Co., 31st St. and Concordia Ave., is having plans prepared for the construction of a 1 story, 122 x 360 ft. factory for the manufacture of concrete mixers. Van Ryn & De Gelleke, 114 Grand Ave., Milwaukee, Archts.

Wis., Milwaukee — Leenhouts & Guthrie, Archts., 424 Jefferson St., are receiving bids for the construction of a 1 or 4 story, 120 x 120 ft. garage on Van Buren St. for the Luick Ice Cream Co., 183 Ogden Ave. Noted Sept. 13.

Wis., Milwaukee—F. Luber, Archt., c/o Milwaukee Electric Ry. & Light Co., Public Service Bldg., is receiving bids for the construction of a 1 story, 60 x 100 ft. garage on Cold Spring Ave. Estimated cost $40,000.

Wis., Milwaukee—The Stewart-Warner Products Service Sta., 582 Jefferson St., plans to build a 1 story, 120 x 128 ft. sales and service station on Van Buren and Martin Sts. Estimated cost $100,000. Engineer or architect not selected.

Wis., Milwaukee—The Thorner Heat Treating Co., 126 Ferry St., awarded the contract for the construction of a 1 story, 48 x 100 ft. heat treating plant on National Ave. Estimated cost $40,000.

Wis., Milwaukee—H. Weisner, 1433 Prairie St., awarded the contract for the construction of a 1 story, 64 x 145 ft. garage on 35th St. Estimated cost $40,000.

Wis., Plymouth—The Plymouth Phonograph Co. awarded the contract for the construction of a 2 story, 58 x 160 ft. and 40 x 162 ft. factory. Estimated cost $45,000. Noted Sept. 27.

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SEARCHLIGHT SECTION

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What About Automobile Shops?

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Consulting Editor, *American Machinist* Editor, *American Machinist*

Competition in the automobile field will be intense in 1924—Capacity exceeds demand—Best equipped manufacturers have the advantage—How well prepared is the industry as a whole?

FOR YEARS the automobile industry has stood for the ultimate in American interchangeable manufacture. What is its condition today? Is equipment up-to-date and in good condition? Have production methods kept pace with advanced engineering design? Is there room for further improvement in machine tool designs and for new types of machines?

These are some of the questions we propose to answer in this article and the ones to follow it. If our suggestions and friendly criticism are of practical benefit to the industry we shall feel that the time and effort we have put in on them has been well spent.

SOME rather impressive figures on the risk involved in manufacturing automobiles for the American public were brought to our attention recently. Their compilers had made up a list of all the companies engaged in the business during each of the last five years and against these totals had set up the number of failures as reported by one of the big credit agencies. The percentage of failures was decidedly startling running up to more than 30 per cent in 1921 which, of course, was a bad year. The gravity of the situation was emphasized by comparing the per cent of automobile failures with the average per cent of failures of all American business. It sounds incredible but the result showed the automobile percentage to be over thirty times as much. To make matters worse the figures give the average amount of liabilities in the automobile failure as something over ten times as great as in the average business failure.

Here is something serious for the automobile builders to think about and also for those who sell various kinds of equipment to them. It is also a matter of concern for the ultimate consumer who is certainly not over anxious to be the proud possessor of an orphan car.

The failures mentioned naturally occur among the weaker producers and probably have but little effect on the total output of automobiles. Nevertheless they show what happens to the manufacturer who is not adequately equipped to meet the aggressive competition of today.

The saturation point in the automobile market has been a decidedly elusive factor ever since the automobile business really got on its feet. All sorts of dire predictions have been made as to the speedy calamity that was due to befall the industry about twelve months hence. But up to the present time the saturation point has proved to be a veritable will-o'-the-wisp, dancing on ahead every time the forecasters thought it had nearly been reached. For the sake of those who build automobiles and also of those who build the machines which make automobiles we hope that the saturation point is still far ahead. There are several things, however, which lead us to believe that we are at last getting closer to it. One of the most significant is the fact that cash sales of passenger cars are getting to be matters of congratulation among automobile salesmen. Elaborate machinery has been provided by the larger organizations to provide for the carrying of various partial payment plans, and most of them have been entirely successful. We do not mean to infer that it is poor business to sell automobiles on time as that is a custom that prevails in many branches of commerce. Nevertheless, we do believe that the change from straight cash to partial payments indicates that automobiles are getting harder and harder to sell even to the undiscriminating buyer.

The good old days, when anything that would run on four wheels could be sold to an eager purchaser, are gone forever. The desire for individual transportation is probably stronger than it ever was for the effect of the early missionary work of the automobile sales forces has grown like a snowball. Unfortunately, a large number of the would-be purchasers of new cars already possess something in the way of a motorized vehicle and the trade-in question looms large. In view of the small allowances it will be possible to make such would-be purchasers it seems certain that only a very excellent product in each price class will bring sales. To manufacture such a product will require first-class factory

equipment and management if any money is to be made.

Another thing which will certainly bring the saturation point closer is the increasing capacity of the automobile plants. Not a great deal of new construction is going on, but methods are constantly being improved and better equipment is steadily being provided so that more cars can be manufactured in the same building area and by the same operatives. Someone has estimated that the automobile plants, if run at capacity, can turn out in the neighborhood of 5,000,000 cars for the season of 1924. The same estimator appraises the market as capable of absorbing somewhere between 2½ and 3 million cars. What is to become of the others?

With such figures as these before us it seems obvious that competition in the automobile industry will be keener during the next year than it has ever been before. With more supply than demand it goes without saying that the company which can turn out the best car for the least money in any given price class will survive at the expense of its less efficient competitors. Consequently, the subject of efficient mass production is a decidedly live one for the manufacturers of motor cars.

The time honored question, as to whether or not the hen antedated the egg, is about as easy to answer as the question as to which has done the most for the other, the automobile or the machine tool. Certainly the modern automobile would not be possible without the machine tool and the machine tool would hardly have reached anywhere near its present development without the stimulus of the efficient methods of the automobile manufacturers. We believe that there can be little question that when the automobile started its meteoric career shortly after 1900, it found machine tools for its production that were pretty well stabilized in design. Things had been rather dull in the machine tool business and there had been no particular need for better tools than were being turned out at that time. Machinery comparable in size with the automobile was almost universally built rather than manufactured. Standard tools were entirely adequate for such requirements. When it became necessary to produce automobiles in large quantities to satisfy the rapidly increasing public demand for them there was an imme diate cry for better and higher production machine tools. The machine tool men were not slow to rise to their opportunity and many tools were developed during the early automobile days which practically marked a revolution in machine tool design.

Mass Assembly Far Advanced

The automobile plants of the United States have for years been held up as the last word in mass production and assembly. They have been given credit for leading the mechanical world in these two phases of manufacturing. With the idea of ascertaining just what the present conditions are in the automobile shops and how well justified this reputation is, the authors of this article and the ones to follow made a careful investigation of a number of representative plants. Both passenger car and truck plants were visited and practically the full range of price classification is included.

The results of our investigation were rather surprising to us. It is perhaps sufficient to say now that, so far as mass production of machined parts is concerned, most of the automobile shops have something to learn from the methods employed in other manufacturing industries. When it comes to mass assembly, however, they are in a class quite by themselves where units of such size are concerned. Generally speaking we found a large and efficient application of the conveyor to unit and final assembly. The same thing cannot be said for inter-machine conveyors. In one or two plants the installations showed the result of careful study and were working with considerable efficiency. In other shops the transfer methods were about what one would expect to find in a good job shop. In one of the largest plants visited where conveyors are used to a very considerable extent they were so arranged that the major part of the work done by some of the men consisted of lifting parts higher than their heads. In most cases it would have been perfectly simple to run the conveyors at a handier elevation, thus conserving a great deal of physical energy.

No Uniformity in Speeds and Feeds

As to uniformity of practice in the machining of similar parts in different plants, it may be said that there is none. Cutting speeds on essentially similar parts in one plant were three or four times what they were in another plant. Local conditions, of course, will have a modifying effect on a good many processes, but there seems to be no good reason why there should be such a wide variation in speeds and feeds.

As to manufacturing equipment, there was naturally a wide difference. In some shops the policy of spreading the equipment appropriation uniformly over all departments making small improvements here and there, had been followed. In others the money had been spent in one department so that the equipment in this particular department consisted of the finest and most up to the minute machines and tools. The other departments were hopelessly out of date. The machines were not only old in design but actually worn and battered from excessive use. We naturally expect to see such things in railroad shops where conditions are entirely different but we were surprised to find them even in a few of the automobile shops.

Another factor in which there was wide difference was in the condition of the shop itself. In one shop, where production was proceeding at a high rate and every man seemed to be on his toes, the condition of the floor was such as to be a positive menace to safety, covered with a heavy layer of oil, chips and dirt, with every now and then a slippery metal cover plate for some opening. It was a case of watch your step constantly or else slip and fall into a machine or in someone's way. By contrast, another plant which had beautiful buildings but little new machinery was so immaculately kept as to be almost speckless.

It appeared to us that some of the plants had been constructed with too little attention to proper lighting. Good artificial lighting is desirable but it will hardly compare with good north daylight as arranged for in some of the better shops.

To return for a moment to the condition of the tools used, it is not too much to say that our slogan, "It Pays to Replace," could be applied with considerable profit. In our opinion it would pay to replace from one-third to one-half the equipment now in use in the average shop as either obsolete or worn out or both. It should be understood that some shops are in much better condition than this estimate would imply. Others are rather worse.

In this connection let it be clear that we are not attempting to criticize adversely the policy of the plant

administrations, for they doubtless had excellent reasons for not spending the money necessary to make their equipment all it might be. In fact we were told quite frankly in one plant where money had been spent in one department only that it was the company policy to maintain cash reserves at a high level and appropriate only what was deemed absolutely necessary for new equipment. With business conditions as they are at present, the policy of maintaining adequate cash reserves is entirely sound and we would be the last to question it. Nevertheless, we have felt that it might serve some useful purpose to describe conditions as they exist so that the automobile plant executives can compare their own shops with what is general practice and plan accordingly.

We want to testify to the generally courteous treatment accorded to us throughout our trip, and to say that, judging from the open-minded viewpoint displayed by the mechanical men who accompanied us on our rounds, the automobile business need have little fear of the future. If there is a keener, more intelligent group of mechanical supervisors in any industry in the country, we hope to meet them in the near future. Most of them were entirely aware of the weak places in their production equipment, and where we were able to make an occasional suggestion from the point of view of the disinterested outsider, they listened with attention. With such men as these in its service it is little wonder that the automobile industry occupies its present place in American productive enterprise.

International Aspects of the Safety Problem

By Royal Meeker
Secretary of Department of Labor and Industry of Pennsylvania

AMERICANS are prone to boast of the bigness and superiority of things American. We take pride in the biggest production, and we are not afraid of comparisons as to quality of our output with that of any other country. We have developed our industrial information services far beyond any European country and we do not hesitate to say so. Our industrial information informed us that we were killing and maiming men in industry to an appalling extent. The safety movement and the National Safety Council are the result, and today we stand far in advance of any other country in the world in safety appliances, safety organizations, safety training, safety meetings and everything that has to do with the safeguarding of lives and limbs of workers. When the International Labor Office set up a Safety Section, it looked to the United States as just a matter of course following the latest and best practices along these lines.

We spend proportionately, immensely more time, effort and money, than any other country to prevent accidents and to care for the worker who gets injured despite all preventive measures. Is not this a record—an achievement of which we might well be proud? Might not a little boasting of this record be permissible? Perhaps so; but before pointing with pride to our record and indulging our propensity for boasting, let us consider just what we have accomplished with our safety campaign.

Our Unenviable Record

We lead the world by miles in accident prevention. We lead the world by leagues in accident occurrence, and the economic losses due to accidents. We kill and maim more men per thousand full-time workers and per thousand tons of product than any other country. Unless we regard safety work as an end in itself, our pride in doing big things in a big way will be tempered by humiliation when we compare our achievements in the conservation of human life with those of European countries.

We may console ourselves if we are of a cheerful disposition by figuring out how many more workers we would have killed and maimed in industry if we had not started the safety movement. However, the experience of European countries rises up to mock us. These countries, except Germany and Great Britain, with little or no safety instruction, have much better accident experience than we. The accident statistics of no two countries are strictly comparable—for that matter the accident statistics of no two states of the United States are strictly comparable.

Nevertheless, making all reasonable allowances for discrepancies due to the different methods used in gathering and compiling accident statistics and for the differences in the basic material, it seems probable that in 1920 coal mining in the United States killed about three and a quarter times as many workers per thousand full-time employees as coal mining in Great Britain. More disturbing than the appallingly greater fatality rate is the fact that the relative fatality rates, though fluctuating rather widely, show on the whole a decided increase.

An Example of Bad Statistics

When we make comparison on the basis of the tonnage output, the figures show a lower fatality rate in the United States than in the United Kingdom per thousand tons of coal mined. This is as would be expected because of the much greater use of machinery in mining in our country, and the generally much richer and more accessible coal measures. We must not hastily assume that a low accident rate per thousand tons of output is a favorable accident rate. Quite the reverse is generally the case, as it is in this example.

The low fatality rate per thousand tons is due to the fact that human lives are sacrificed to the God of Big Output. Men are not merely machines to be worked to their limit with the object of producing the largest possible output before the man-machine is worn out or smashed to atoms. To measure deaths and disabilities of workers on a tonnage basis is utterly erroneous and bad statistics. The only just and accurate basis of reference is the man-hours worked, during which time the workers were exposed to the hazard of industrial accidents.

It is greatly to be desired that the accident statistics of all countries should be much improved and standardized so as to make it possible to compare the accident rates by industries and occupations. The International Labor Office was created primarily for the purpose of improving the conditions of labor in all countries and of equalizing these conditions by bringing the labor standards in backward countries up nearer to the level in the more advanced countries.

From an address delivered at the Twelfth Annual Safety Congress, held at Buffalo in October.

In the field of industrial accidents no country of the world has such high accident frequency and severity rates as the United States. What has been shown regarding our higher accident rates in coal mining holds true in all other industries and in street accidents. In no line do we outdistance Europe more emphatically than in the killing and maiming of men in industry and on the public highways. It is a bit anomalous for the nations of Europe, through the International Labor Office, to appeal to America, the greatest industrial killer, to send over apostles of safety to teach them how to save lives and limbs in industry. America is however a land of paradoxes. We do lead the world both in accident prevention and in accident production. Perhaps we excel in the art and science of telling others how to prevent accidents because we have so many accidents to give us practical studies in prevention.

It is difficult to account for the higher accident experience in the United States. It is due partly to the emphasis placed on highest speed in production, partly to improper lay-out and construction of plants, partly to the heterogeneous mixture of nationalities and races in our industries, but most of all to a spirit of recklessness on the part of masters and men alike. This last is, of course, in considerable part a result of the demand for big production. We Americans are, however, by reason of our environment, chance takers, and the workers in our industries manifest the gambling spirit in their work and in their play.

Accident statistics and accident prevention are, however, only two parts of the whole Industrial Health Program of the International Labor Office. Studies on an international scale are being made by the office of industrial diseases and poisons, and the best methods of prevention as shown by the experience in different countries. In the latest reorganization of the International Labor Office, I am informed that the Safety Section and the Industrial Health Section have been combined.

I have always held that it is just as unhealthy for a blast furnace worker to fall one hundred feet from the top of a furnace and light on his head as it is for him to breathe carbon monoxide until his breath ceases. It makes no difference to the worker or his dependents if he loses his hand by means of an unguarded gear or loses the use of his hand by means of mercury poisoning.

Unemployment Hazard

I cannot leave the consideration of the international aspects of the safety problem without some brief mention of the most important and the most destructive of all industrial hazards. The hazard of unemployment is not even considered an industrial hazard at all, although it is more truly an industrial hazard than any accident causing a physical wound or injury.

Unemployment is the only true industrial hazard. It is also far and away the most prevalent and the most detrimental of all industrial hazards. In periods of industrial crisis and depression, unemployment numbers its victims by millions, whereas physical accidents affect only thousands. The demoralization of workers due to unemployment and, what is perhaps as bad, the fear of unemployment, can scarcely be exaggerated.

The International Labor Office has from the beginning of its existence recognized the transcendent importance of unemployment as an industrial hazard, and has devoted much time and expense to the study of the amount of unemployment, its incidence, the results, the causes and the suggested means of ameliorating or preventing it. The serious study of all the influences and forces related to the facts, the results, the causes and the proposed cures for unemployment, goes far beyond the field of labor and industry. It goes to the very foundation of the existing social, political and economic order in all countries.

I do not expect a very important real contribution to the understanding of the causes of and remedies for unemployment will come out of the first preliminary attempt to study the problem internationally. I do rejoice, however, that there exists in the world today the League of Nations and the International Labor Organization—official, public, international agencies charged with the duty and vested with authority to make upon an international scale this investigation into unemployment, as well as any other investigation having a bearing upon the forces which make for discontent, misunderstanding and war.

Clutches in Machine Tools

By Frank C. Hudson

From several sources have come complaints of clutches used in connection with machine tools or their countershafts. These complaints are of two kinds, criticisms of the clutches themselves and also of their location. The first are directed at the action of the clutches, either because of their failure to carry the load or the difficulty in disengaging them when necessary.

The experience of the automobile builder should be of incalculable value in all questions pertaining to clutches and his experience is available to all who desire to profit by it. Automobile clutches have been developed to the point where little is to be desired. They are subjected to constant use and abuse at the hands, or feet, of millions, many of whom are without the slightest idea of how or why they act. Automobile clutches receive almost no attention and yet rarely fail to function. And their life is remarkably long when the service and abuse is considered.

Disk clutches, either single or multiple and wet or dry, have all worked out well. The tendency of larger cars is to use the single-plate dry clutch, but there are several million Fords with clutches running in oil, which transmit a maximum of 22 hp. Larger cars transmit up to 100 hp. with a single disk clutch so that the machine tool buildier has plenty of designs from which to choose.

The location of the clutches is a different matter and here the main complaint is inaccessibility for adjustment or repair, particularly the former. It is quite possible that this would cease to be such a vital question if the clutches were as good as those used in automobiles. For clutches in motor cars are seldom adjusted, if we can judge from the experience of the average user and driver.

Location of clutches is, however, an important matter and get-at-ability should be one of the first considerations. This may require considerable redesigning at times but the results are worth the effort. Customers appreciate machines which can be easily adjusted when necessary. For ease of adjustment means a shorter time for a machine to be out of commission, and idle time is coming to be one of the phases of production to be carefully considered.

Spiral Bevel Gears Which Can Be Hobbed

By NIKOLA TRBOJEVICH
Mechanical Engineer, National Twist Drill & Tool Co., Detroit

A new theory of bevel gearing—How a tapered hob can be employed—Method of determining the action of the gearing—The machine for doing the work

MANY attempts were made in the last twenty or thirty years aiming at the solution of the interesting but difficult problem of bevel gear hobbing, but so far no one has produced a correct solution to the problem. The following is a description of a new process of this kind which was developed and patented by the National Twist Drill & Tool Co., of Detroit. It is believed that this development represents a full and correct solution of the problem of bevel gear hobbing.

It may be stated right at the beginning that the problem is mathematically rather difficult on account of the three dimensional displacements and rotations which generally must be considered in such computations. In that respect the problem seemed to be almost hopelessly complicated at the beginning, and it was not possible even to approach it mathematically until certain kinematical peculiarities and short cuts were discovered, which greatly simplified the mathematical formulation of the proposition.

Until now it was generally accepted that a pair of bevel gears are theoretically correct if they are capable of meshing in an "apex-to-apex" position, that is, with a rolling engagement similar to that of a pair of spur gears having parallel shafts. However, after a brief reflection a conclusion may be formed that the possibilities of bevel gearing should not be exhausted by any means, by that one kind of meshing alone. For, a conical system of gearing should not be inferior in any respect to a cylindrical or spur system. In fact, if anything, it ought to be superior, because in a conical system the cone angles of the individual gears may be selected at will to suit any particular requirements, while in spur gearing all gears must necessarily have the same or zero cone angle.

Thus, the correct bevel gears ought to do, at the least, the following four things: (1) Mesh among themselves with a screw engagement when their axes are non-intersecting and non-parallel; (2) mesh with a straight rack element of constant pitch; (3) have a worm gear modification; and finally (4) mesh with a

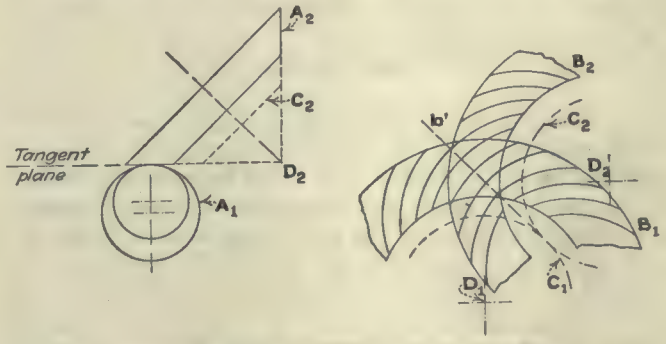


FIG. 1—DIAGRAM OF BEVEL GEARS HAVING A SLIDING ENGAGEMENT

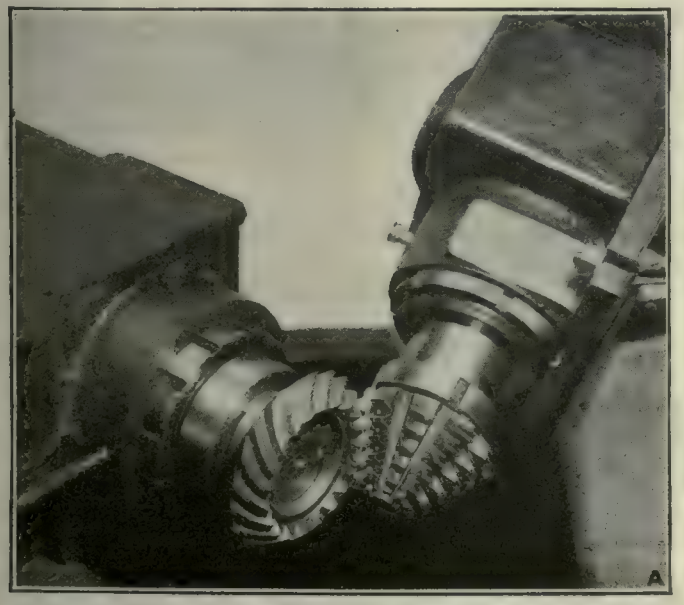


FIG. 2A—RIGHT-HAND TAPERED HOB TAKING A FINISHING CUT IN A RIGHT-HAND SPIRAL MITER GEAR

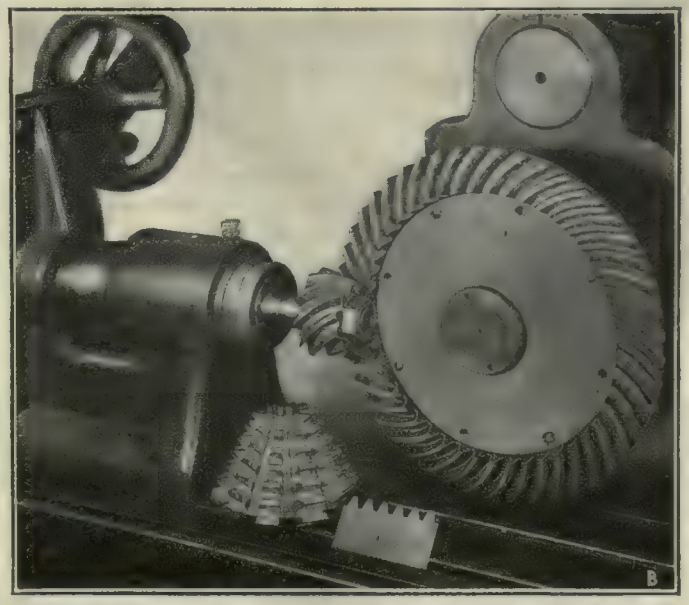


FIG. 2B—AUTOMOBILE REAR AXLE GEAR AND PINION OF THE EXTENDED INVOLUTE TYPE

screw of constant lead, so that they can be generated by the hobbing process. We have found that such a system of bevel gearing exists, and it has a worm gear modification also—the new *hyperboloidal gear* having spiral teeth.

Referring now to the possibility of hobbing such gears, we may reach the following *a priori* conclusions without much difficulty. If a spur gear is hobbed by a spur hob, a conical gear ought to be hobbed by a conical

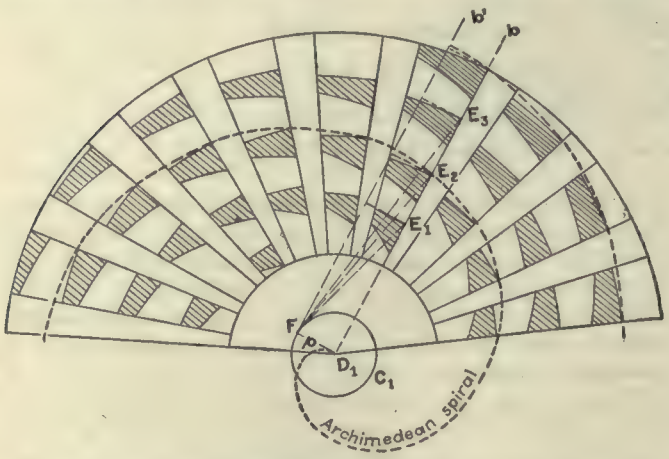


FIG. 3—PLANE DEVELOPMENT OF THE PITCH CONE OF THE NEW TAPERED HOB

hob. Now, as the straight-toothed bevel gear does not mesh with a screw of any description, and cannot be hobbed, the desired bevel gear must have spiral teeth.

We can now push the reasoning one step further. We already know that the hob is conical, and that the gear must have spiral teeth. Evidently when the hob touches the gear these parts must have a common tangent plane, to which the pitch cone of the hob and the gear are tangent on opposite sides. When the hob is rotated, its teeth or threads must slide longitudinally along the spirals of the gear. From this fact follows that the developments of the two pitch cones in the common tangent plane must also slide with respect to each other; that is, they must be distinct, in contrast with the developments of two bevel gears (or crown gears) meshing with the conventional rolling contact, in which latter arrangement the two developments are identical and are fully superposed in the tangent plane.

Approaching the Problem Mathematically

This kinematical peculiarity gave the much desired opening for approaching the problem mathematically, because the meshing of the imaginary developments of the hob and the gear in the common tangent plane is a distorted picture of the actual nature of the contact taking place between the two elements. In that distorted picture such characteristics as the lengths of arcs of the longitudinal spirals, the angles of intersection, and the sliding element of engagement in its full numerical value, are fully preserved; while the rolling element is lost, as well as the factors governing the secondary contact or interferences between two conjugate spiral surfaces. The last two factors must, therefore, be calculated separately, while the really difficult part of the problem, the question of the "odontical conjugacy" of the mating pitch helixes, may be satisfactorily studied from the plane developments only; that is, by means of plane geometry.

Suppose now that two bevel gears A_1 and A_2 in Fig. 1 mesh with a sliding engagement. In that case the two corresponding developments B_1 and B_2 will also rotate about their apexes D_1 and D_2 at a constant ratio, while the base circles C_1 and C_2 will touch each other and roll together like the pitch circles of two mating spur gears. In order that the engagement be correct, the two series of spirals in the developments B_1 and B_2 must therefore be conjugate; that is, the spirals B_1 must be rolled off by means of a certain roller curve from the circle C_1, and the spirals B_2 by means of the same roller from the circle C_2. If the locations of the apexes D_1 and D_2 as well as the ratio of rotation, and the equation of the spiral B_1 were all known, the spirals B_2 could be mathematically determined.

The Tapered Hob

In Fig. 2A a view of the new tapered hob is shown. The hob has an axial rack section and a constant helical lead. The cone angle is 30 deg., while the pressure angle of the rack teeth may vary from 15 to 25 deg., 20 deg. being the preferred angle. Such hobs may be accurately and comparatively easily manufactured in standard machine tools, and they also may be ground on the thread after hardening. It should be noted that the cutting teeth are relieved radially in a direction perpendicular to the side of the cone; that is, at an angle of 60 deg. with respect to the axis of the hob.

At *B* in Fig. 2 are shown set up for testing purposes a spiral bevel gear and pinion for use in the rear axle of an automobile. The gearing is of the extended involute type that will be explained later, the normal

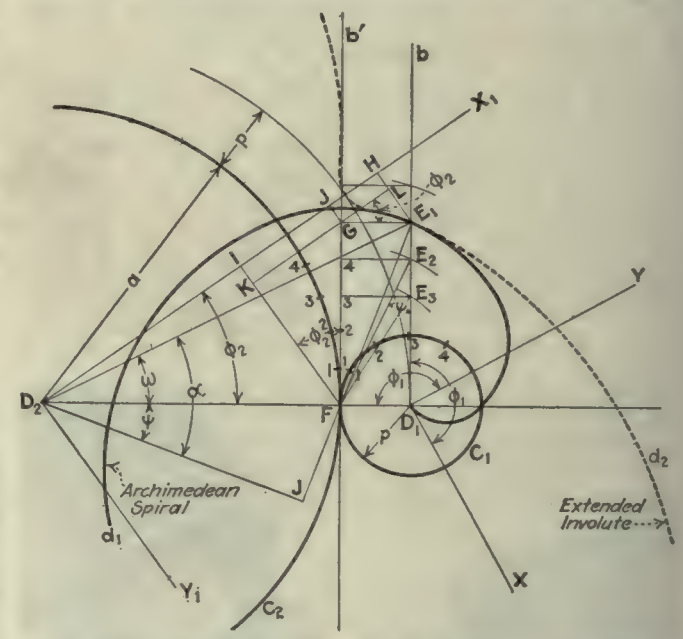


FIG. 4—THE NEW GEAR SPIRAL IS ODONTICALLY CONJUGATE TO THE HOB SPIRAL IN PLANE DEVELOPMENT

diametral pitch is 6, and the ratio 10 to 46. The hob that did the work can also be seen.

The diagram in Fig. 3 shows the plane development of the pitch cone of the new hob, in which the conical helix of constant lead develops into a number of plane spiral segments of constant lead (the so-called Archimedean spirals), while the axial rack sections caused by the gashes become radial lines converging in the apex D_1. It follows from the well-known properties of these spirals that the normals at the equally spaced points E_1 and E_2, etc., on the rack generator *b* all meet

at the same point F, and that the distance $FD_1 = p$ is the so-called "polar subnormal" of the Archimedean series, which distance is always perpendicular to the generator b at D_1. It is also known from geometry that the length of this polar subnormal is:

$$p = \frac{\text{lead of spiral}}{2\pi} \qquad (1)$$

Our immediate object is now to generate the Archimedean spiral series in Fig. 3 by rolling alone; that is, to find the conditions under which the Archimedean spiral may become an odontic curve. Furthermore, the

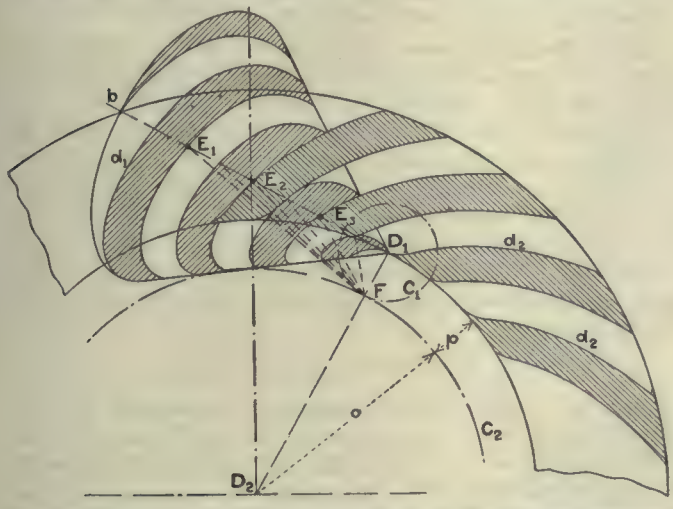


FIG. 5—CORRECT SUPERPOSITION OF THE NEW CROWN GEAR UPON THE TAPERED SCREW, THE GEAR SPIRALS BEING TANGENT TO THE TAPERED SCREW SPIRALS AT ALL POINTS ALONG THE RACK GENERATOR b

roller must contain the entire rack generator b; that is, the series of equi-spaced points E_1, E_2 and the like.

We have found that the new roller by means of which Archimedean spirals may be odontically generated is a parallelogram of width p, one side of which parallelogram is tangent to the FD_1 circle while the opposite side is the rack generator b. Thus, if we roll the line b' without slipping on the circumference of the circle C_1 and assume that the generator b is rigidly attached to former, the points E_1, E_2, etc., will describe Archimedean spirals, having a lead equal to the circumference of the base circle C_1.

This important kinematical property of the Archimedean spirals (which property we believe we are the first to discover) forms the foundation of this method of gear cutting. As already pointed out, the new tooth spirals must be conjugate to the hob spirals in the same sense as two such series of tooth curves of a pair of mating spur gears are conjugate; that is, they must be described by the points E_1, E_2, etc., when the b' side of the b-b' parallelogram rolls on the circumference of an assumed base circle.

The New Gear Spiral

The method of generating the new tooth spirals will best be understood from Fig. 4. The base circle C_2 of the proposed new gear having a radius a is drawn tangent to the base circle C_1 of the Archimedean spiral, having a radius p. The equation of the latter spiral d_1 is evidently

$$r = \pm p\phi_1 \qquad (2)$$

where $r = D_1 E_1$ is the radius vector, and ϕ_1 the vectorial angle.

The conjugate spiral d_2 is traced by the point E_1 when the line b' rolls on the circumference of the C_2 circle, carrying with it the rack generator b. In order to determine its equation with respect to the X_1-Y_1 system of coordinates, we proceed as follows:

$$x = D_2H = D_2I + IJ + JH$$

But, $D_2I = a \cos \phi_2$

$IJ = KG = FG \sin \phi_2 = a\phi_2 \sin \phi_2$

And, $JH = GL = p \cos \phi_2$

From which,

$$x = (a + p) \cos \phi_2 + a\phi_2 \sin \phi_2 \qquad (3a)$$

And similarly,

$$y = (a + p) \sin \phi_2 - a\phi_2 \cos \phi_2 \qquad (3b)$$

The spiral defined by the equations (3a) and (3b) is what we have termed a modified involute of a circle, and has four distinct geometrical forms depending on the value of the modification p. Thus, for $p \gtreqless 0$, the spiral is correspondingly an extended, a common or an abridged involute. A subclass of the last (the abridged) form is the Archimedean spiral for the values $p = -a$. We are interested in particular in those spirals which are capable of meshing with the Archimedean spiral, and hence with the tapered screw of constant pitch.

The base radii of all those spirals may be selected at will, but the modification in each case must be equal in absolute value to the polar subnormal p of the adopted Archimedean spiral. Thus, they may be extended involutes having $+p$ modification, or abridged involutes having $-p$ modification. In the former case the base circles C_1 and C_2 of the gear and hob touch

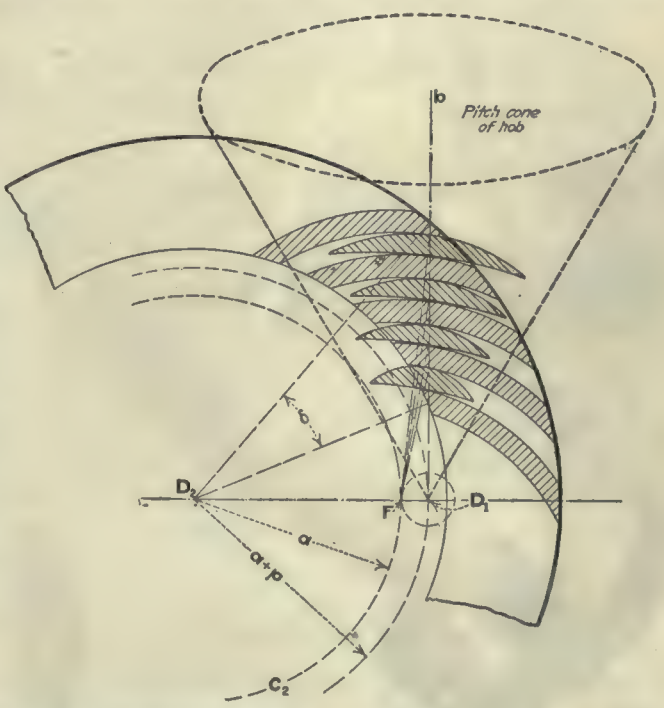


FIG. 6—CRESCENT-SHAPED CUTS OF INCREASING RADII ARE PRODUCED BY THE HOB AT EVERY INSTANT ALONG THE RACK GENERATOR b

each other externally, and both spirals are of the same hand (either right hand or left hand); while in the abridged combination the base circles touch each other internally, and the hands of the spirals are opposite (one right hand and the other left hand). For prac-

tical purposes, we prefer the first or extended combination on account of a more favorable cutting action, because there the spirals d_1 have a maximum amount of sliding with respect to the spirals d_2.

This condition is somewhat analogous to that found in common hobbing governing the hands of hobs and of the generated helical gears. It is a well known fact that in the best practice right-hand helical gears are generated by right-hand hobs, and left-hand gears by left-hand hobs. In that case the rotation of the blank is always opposite to the rotation of the hob, which is a desirable condition in milling. The helix angle α of the new spirals d_2 may be readily determined for any pitch cone radius $D_2 F_1$ from Fig. 4, and is equal to $\omega + \psi$, where,

$$\cos \omega = \frac{a+d}{R} \qquad (4)$$

and,

$$\tan \psi = \frac{p}{r} \qquad (5)$$

where R and r are the pitch cone radii of the gear and the hob, respectively.

It was seen from Fig. 4 that the new tooth spirals d_2 are odontically conjugate to the Archimedean spiral in development. In Fig. 5 the Archimedean spirals d_1 are wrapped on the surface of a cone (the new hob) and a crown gear of the extended involute type is correctly superposed in a tangential relation with the pitch cone of the hob, this relation being determined by the kinematical conditions of the mutual conjugacy. That is, the (highest) rack generator b of the hob is at a distance $(a + p)$ from the gear apex D_2, and the apex

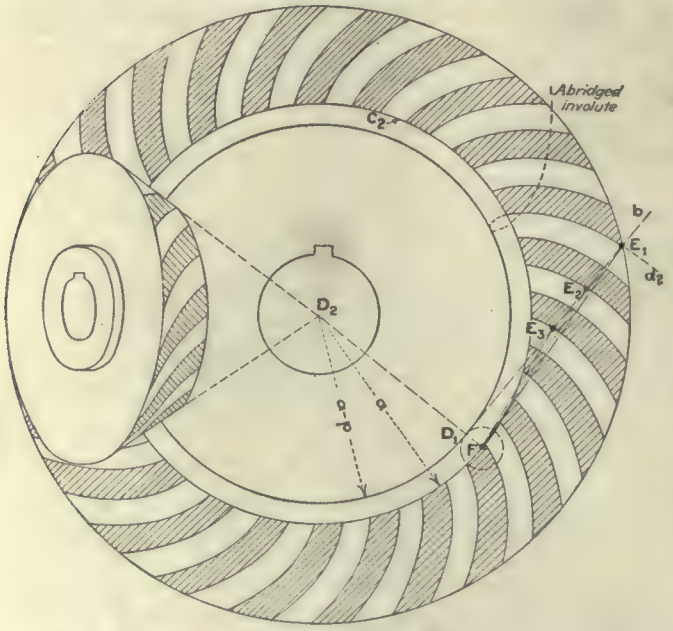


FIG. 7—MESHING CROWN GEAR AND PINION OF THE ABRIDGED INVOLUTE TYPE

of the hob D_1 lies on the circumference of the $(a + p)$ circle.

Now, when the hob and the crown gear are rotated at the proper ratio, the portions of the hob thread in the neighborhood of the points E_1, E_2, E_3, etc., along the generator b will envelop the gear spirals d_2 in their full length. The common normals to the two systems of curves d_1 and d_2 all meet at the point F, the point of tangency of the two base circles.

In this method of gear cutting it is essential that the contact between the hob and the imaginary crown gear be strictly localized along the line $D_1 E_1$, as otherwise a secondary contact would develop between the spirals d_1 and d_2 at some distance from the acting rack generator b, and the generated tooth surfaces would consequently be partially destroyed through interferences. We have accomplished this localization by properly selecting the cone angle of the hob with reference to the customary pressure angles used in practice, and also by taking into account the maximum permissible helix angle of the gears on the large end and the minimum width of gear face deemed necessary to make this type of gearing commercially successful.

Thus, the hob has a cone angle of 30 deg., the pressure angle ranges from 15 to 25 deg., as already stated, while the helix angle of the gear is about 27 deg. on the small end and 45 deg. on the large end, permitting of employment of a width of face from 20 to 25 per cent of the pitch cone radius of the gear, and also permitting of the full or standard depth to the rack teeth. It is of interest to note in this connection that the conical shape of the hob is absolutely necessary, as hobs either of the spur or the crown gear type would mutilate the spiral tooth surfaces.

Characteristic Cuts

In Fig. 6 the crescent shaped cuts produced by the novel conical hob in a crown gear, are shown. The small end of the gear (near the base circle) is cut away in order that hobs of a truncated cone shape may be used. An idea of the actual sizes of the new hobs may be formed from the dimensions of a 6 normal pitch hob used for cutting rear axle pinions and gears for automobiles of medium weight. This hob has a diameter of 5 in. on the large end and 3¼ in. on the small end, a width of face of 2¾ in. (measured along the side of the cone), a single thread and 10 gashes. The length of the polar subnormal p of such a hob is only 0.167 inch.

We have now shown that crown gears may be correctly generated by a timed rotation of the gear and hob alone. For generating spiral bevel gears of a cone angle less than 90 deg., the timed rotation alone is no longer sufficient, and the blank must be rolled over the imaginary crown gear, through an angle δ in Fig. 6. When this rolling occurs, the large end of the hob first engages the large end of the gear blank (while both are rotating) and the contact between the hob and the blank gradually progresses toward the small ends of the hob and blank. When the small end of the blank is reached the blank is fully completed; that is, the teeth are fully generated on their both sides and through their entire lengths. Thus, the method of generation is very simple, as it consists of following three steps only:

(1) Adjust the hob and the blank on their respective arbors so that they will be tangent to a common tangent plane, and the pitch cone apex will be at a distance $(a + p)$ from the gear apex, as shown in Figs. 4, 5, and 6.

(2) Rotate the hob and the blank in a timed relation.

(3) Feed either the hob or the gear about the gear apex D_2 in a circular path through an angle δ.

In Fig. 7 a meshing crown gear and pinion of the abridged involute type are shown. The abridged form of spiral (with the loop) is, however, very seldom used in this system of gearing.

In Fig. 9 the plan view of the new hobbing machine developed for cutting the gears is diagrammatically

shown, disclosing the gear trains and means for adjustment necessary in such a machine. The hob *A* is mounted on a spindle intersecting the common tangent plane *B-B* at an angle of 30 deg., resulting in the fact that the side of the hob facing the gear blank is always parallel to this tangent plane. The hob spindle is mounted in the cutter head *C*, which latter is eccentrically mounted on the face of the large feed cylinder *D*, and is pivotable about the shaft *E* from which the hob is driven. The hob spindle is also longitudinally adjustable in the cutter head *C*.

Thus, the hob may be swiveled about the pivot *E* and also adjusted lengthwise, so that its pitch cone apex may be set to any distance $(a + p)$ from the center line of the machine, as required by the theory. The feed cylinder *D* is rotatable in the main frame of the machine and is driven by the large feed wormgear *F*, acting through the three large screws *G* housed in this gear and engaging the corresponding nuts in the cylinder *D*. The end thrust caused by the cut of the hob is taken up by the accurately finished sides of the wormgear *F*, which act as thrust bearings in their housing.

The object of the three screws *G* is to provide a longitudinal adjustment of the feed cylinder *D* with respect to the tangent plane *B-B* prior to generating. When the machine is cutting bevel gears the screws are tightly clamped to the feed cylinder *D* in a position corresponding to the desired depth of cut, and the blanks are completed by the rotary feed alone. However, when either crown or hyperboloidal gears are generated, the rotary feed is discontinued and the hob is fed slowly into the gear to the required depth by operating the handwheel *H* acting upon the screws *G*.

Thus, the movements of the new machine are the following: The hob *A* is driven from the pulley through the speed change gears *I*, a pair of miters, the spur gears *J*, and the shaft *E*, as shown. The feed cylinder *D*, or rather the large feed wormgear *F*, derives its rotation from the pulley through the worm and wormgear *K* and the feed change gears *L*. The work is rotated by means of the spider of the differential *M* and the index change gears *N*. There is also an equalizing geared connection between the feed cylinder *D* and the work in the form of the roll change gears *O* and the differential locking worm and gear *P* acting upon the sun gear of the differential *M*. This feature makes it possible to change the feed gears *L* at will, or employ a hand feed by rotating the hand wheel *Q*, without disturbing the correct meshing of the hob and gear.

The work head *R* can be swiveled on the top of the semi-circular table *S*, and is also longitudinally adjustable in its slide. When in a cutting position, the pitch cone of the blank must always be tangent to the plane *B-B*, while the apex of this cone must be in line with the axis of the feed cylinder.

A very attractive feature of this method of gear cutting is that all the necessary data in the design of gears, the setting up of the machine, and the selection of change gearing, may be fully and exactly determined by comparatively simple calculations, and correct gears may be produced at once without any previous experimenting or guess work. The polar subnormal *p* is stamped on each hob, as well as the length of the hob pitch cone radius from a given reference or gage circle ground in the large end of the hob. The base radius of

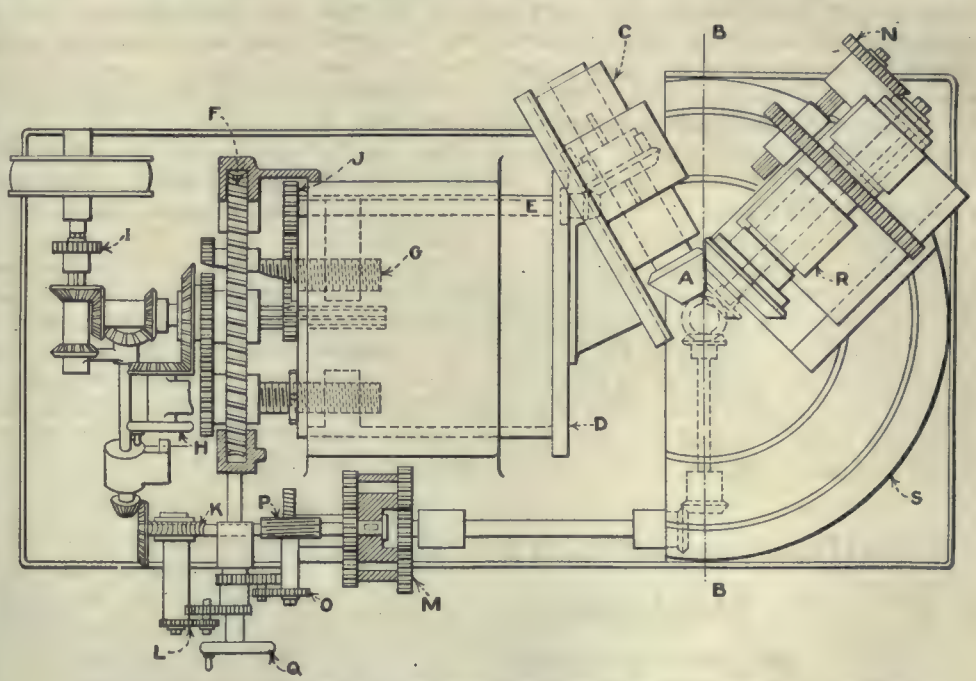


FIG. 8—DIAGRAMMATIC PLAN VIEW OF THE NEW HOBBING MACHINE FOR SPIRAL BEVEL GEARS

the gear may be determined from the following formula:

$$a = \frac{n}{2P \sin \beta}, \qquad (6)$$

where *n* is the number of teeth in the gear, β the cone angle, and *P* the diametral pitch of the hob, or the rack element. Thus, the hob arbor may be swung to the required $(a + p)$ distance from the center line of the machine, to the right (looking from the large end of the hob toward the center of the machine) when right-hand gears are cut, and to the left when left-hand gears are cut, and the hob apex also may be brought into the rquired exact tangential position. The outside cone of the blank is usually accurately turned parallel to the pitch cone, and may be used as a gaging surface for locating the blank with reference to the tangent plane and for determining the depth of cut which the hob is going to take.

The dimensions of the gear blank may also be very simply determined by consulting the lay-out shown in Fig. 4. In order to find the pitch cone radius of the gear on the large end of the blank, the helix angle

$$\alpha = \omega + \psi$$

is first assumed. As the quantities *p* and ψ in the equations (4) and (5) are usually very small, these two equations may be simplified, and the correct helix angle on the large end of the blank approached within one or two minutes by using the formula

$$\cos \alpha = \frac{a}{R} \qquad (7)$$

From which

$$R = a \sec \alpha \qquad (8)$$

If the maximum helix angle α equals 45 deg., the equation (8) becomes

$$R = a\sqrt{2}, \qquad (9)$$

giving the length of the pitch cone radius.

By this process correct spiral bevel gears may be simply, economically and rapidly generated in one continuous operation. The hob is of such a form that it may be manufactured and sharpened with great precision and at a reasonable cost. The teeth of the new gears have an increasing twist of spiral from the small toward the large end of the gear, a uniform depth, and practically the same normal thickness everywhere. Therefore, the new gear is usually stronger than a straight-toothed bevel gear of a similar size, as the helical form of the teeth has been obtained without a sacrifice in the strength.

As both sides of the teeth, both for the gear and the pinion, are finished during the same cut without the need of resetting the hob or the blank, the operation of the machine is very much simplified. The same class of operators now employed for running the common spur hobbing machines, may be entrusted with the operation of the new machine. The new gears when correctly cut have a contact all over, as the concave and the convex pitch helixes on the mating teeth are exactly alike, and also the transverse tooth curves are correctly generated by an involute rack element. There is a considerable latitude permissible in assembling a pair of such gears owing to the fact that the tooth surfaces are of an involute character both ways.

The new bevel worm and the hyperboloidal worm-gears open a new chapter in the art of gear cutting, and the writer believes that the discovery of those new machine elements will revolutionize our present notions on worm gearing. The two outstanding features of the new worm gearing are that, first, the sliding element of contact may be decreased greatly below that of the 45 deg. helix angle spur worm drive (which form represents at the present state of the art the maximum obtainable theoretical efficiency), and second, the backlash between the worm and gear may be adjusted without changing the center distance.

[Note—This paper constitutes a notable contribution to the art of cutting gears. Valuable work along the same lines has been done by the Gleason Works and by H. E. Taylor, chief engineer of Hotchkiss & Co., Coventry, England. Patents bearing on the subject were granted to J. E. Gleason and A. L. Stewart in 1917 and in 1920; to E. H. Wingquist, a Swedish inventor, in 1918; and to Nikola Trbojevich in 1923.—Editor.]

Recollections of an Old Time Mechanic

By John James Grant

WHEN I had finished my three years post graduate job in Old Bill Clapp's shop in Northampton, Mass., a friend had a place for me as tool maker in the Florence Sewing Machine Co.'s shop. This company was the outgrowth of an old shop formerly making turbine water-wheels and other *accurate* machinery. The manager who was there when I arrived was certainly in a class by himself, as he had no more idea of what was wanted in the matter of tools to manufacture sewing machines, than a fifteen year old boy. One of his hobbies was to come around and measure with a two-foot ivory rule, graduated to $\frac{1}{8}$ in., some fine piece of work on which we had used a vernier caliper and say, "Well that will do but we must improve on it."

Our machine tools were mostly ones that had been sent in from the manufacturing department to be rebuilt but we managed to keep them. There were no universal milling machines or grinding machines, and small tools were all home made. The first good lathes we had were two 13 in. and two 16 in. with Dwight Slate's taper turning attachments. They were the first lathes sent out from the Pratt & Whitney shop and were at that date the acme of perfection in design and workmanship. I had the honor of setting them up and a short time afterward had the pleasure of meeting both Mr. Pratt and Mr. Whitney. The acquaintance with these men changed the whole course of my life and there was never a break in our friendship.

I often look at the fine tools in the windows of first class hardware stores and wonder how we succeeded in doing accurate and difficult work with the makeshifts we had. I am not exaggerating when I say it would be a wonder if out of one hundred good machine shops of that day, you could find two 1-in. plug gages that would measure alike, although called standards. The vernier caliper was at that time the universal standard and there were as many differences in any particular size as there were men that set the vernier. The micrometer changed the whole of that, as the general mechanic can set it to one ten-thousandth of an inch.

Those were stirring times and at the closing of the civil war, attention was given to the development and manufacture of many new and accurate labor saving small tools, most of them emanating from gun and pistol factories and the men who had been there employed.

Morse, of twist drill fame, with whom I worked at the Florence shops, had designed machines to manufacture twist drills. After he had gone to New Bedford, Mass., and started a small shop for making the drills, he came to the Florence shop and brought drills of the sizes used there, for trial. It would be laughable today to hear the comments of the tool makers on the drills, and the probable failure of the business of making and selling store drills. After testing the drills for several days as to accuracy, wearing qualities, etc., Morse went back with a good sized order and no more drills, except special ones, were made in that shop.

Soon after that Ed. Beach brought out the Beach drill chuck which was a marvel of accuracy and has never been excelled in workmanship.

The late James M. Carpenter of Pawtucket, R. I., and my humble self left the Florence shop on the same day (I think the first day of April, 1864) without either knowing what the other intended to do, but with the same purpose in view. It has been a question ever since who put the first taps and dies on the market. I started a shop in Northampton, Mass., and Carpenter started one in Pawtucket, both of us making taps and dies. A short time after, I moved my business to Greenfield, Mass., and invented the Grant screw cutting die and the Lightning screw plate. Shortly after that I organized the Wiley & Russell Mfg. Co. which was the nucleus of what is now the Greenfield Tap and Die Corporation.

Standard Machines for Quantity Production

By RALPH E. FLANDERS

Standard vs. special machines for quantity production—Special purpose machines from standard units—Disadvantages of completely special machines—Standard machines for special tooling

THE Production Meeting of the S.A.E., held in Detroit last year, was one of the most interesting technical sessions ever held by any society from the standpoint of the builder and user of machine tools. The program committee, whether from good fortune or design, hit upon one very important general subject—the question of the merits of standard vs. special machines for quantity production.

Two of the papers which resulted called attention to certain factors which limit the usefulness of highly special machines, adapted to the manufacture of a single part only. Among the factors mentioned were the high first cost of special machinery, difficulty of insuring proper functioning of a new machine as compared with one built in quantities over a number of years, difficulty in training operators and repair men to properly care for and adjust a wide variety of non-standard machines, and delay in shifting a shop over to a new design of product together with the expense of the special machinery discarded in the process.

These and other difficulties are real ones, as the members of this society well know. There have been several cases of large losses from the improper functioning of special machines, and still larger losses from unexpected changes in design of product.

This paper presents the machine tool builders' viewpoint, but it also sets forth the lines of progress which would seem to very nearly meet the conditions of the user's problem. It is hoped that an interchange of views may result in benefit to all parties.

A broad statement of the problem is about as follows: How can machine tools be so designed and built that the user will have the advantage of a machine of proved excellence and low cost, without losing the advantage of special adaptability and economy which the ideal special machine will give? There are at least two methods of approach to a solution. One lies along the lines of building up semi-special types of machines out of standard units. The other consists in the design of a more or less universal foundation machine which is adapted to the making of a particular part by highly specialized tool design.

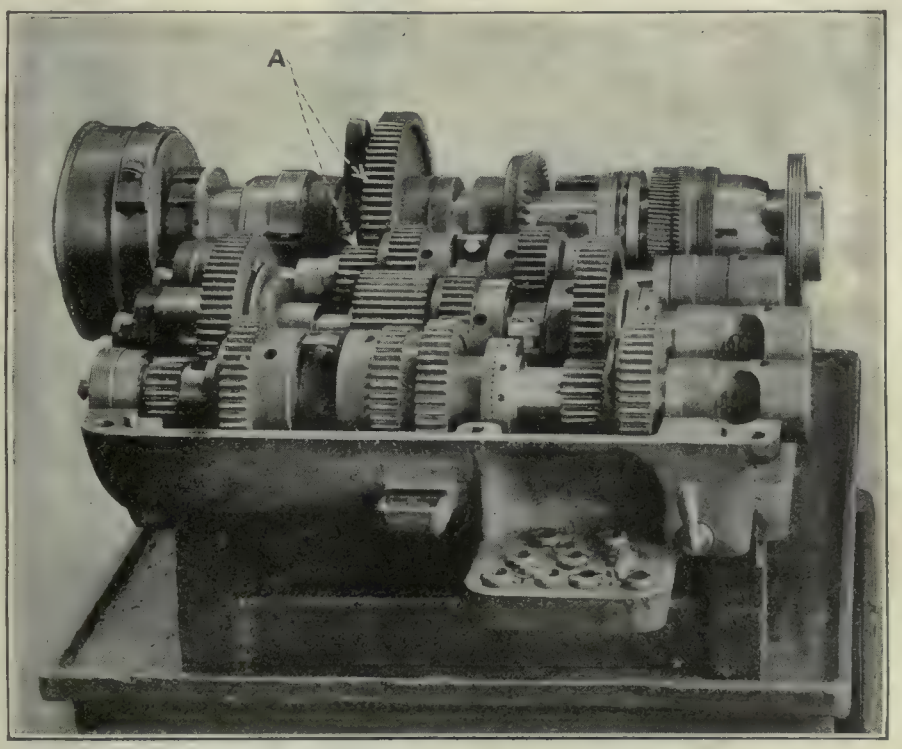


FIG. 1—A TURRET LATHE HEADSTOCK BUILT OF STANDARD UNITS

The failure of hastily designed and built special machinery may come from a number of causes, such as faulty order of operations, unsuitable location and clamping of the work, etc. The most usual cause of failure, however, lies in the weakness or improper lubrication or rapid wear of some essential parts of the mechanism, such as the clutches, feed gears, sliding surfaces, or main bearings. It is difficult for the most skilled machine designer to be completely successful in these features in a new design.

There are some operations where the completely special machine with its attendant difficulties is unnecessary, even when it is desired to have a machine completely adapted to a particular operation on a particular part. For milling operations on cylinder blocks transmission cases, etc., and for multiple drilling opera-

A paper presented at the Production Meeting of the Society of Automotive Engineers, Cleveland, Ohio, Oct. 25, 1923.

tions on similar parts, special machines may be built up from standard units.

Milling machines, for instance, will vary considerably with the design of the product. They will consist in general of a planer type bed, together with housings which carry vertical and horizontal spindles as required by the part to be manufactured. In the case of V-type crankcases spindles must be set at an angle. Such machines as these should be, and usually are, built up from standard units. The spindle, with its drive and housing, need not vary greatly from machine to machine. The feed mechanism may be the same and even the bed and work table may be built in standard lengths and widths. Since these standard units are of tested and approved design, no fear need be felt for the failure of the machine. It may even be possible to rebuild it to fit a change in the design of the part manufactured, at a cost less than the purchase price of a new complete machine.

Perhaps I may be permitted to interject here a criticism of one common feature of these machines, though it is aside from the subject. They are often built with tables much too long, in order to take in a long string of work. If we double the length of the table we do not double the output, because it takes twice the length of time to feed, twice the length of time to change work, twice the number of fixtures, and somewhat more for the cost of the machine and the floor space occupied. Sometimes a little is saved by dividing among several pieces the time it takes to get the full depth or width of cut, but this is usually inconsiderable. The long table is probably a relic from planer practice, where the planing of long strings of complicated work is sometimes advisable, in order to divide the tool-setting time between several pieces.

The same principles as given for special milling machines apply also to multiple drills. The spindles themselves, their connection with the driving mechanism, the feed and driving gearing, etc., are proper subjects for standardization; and this may be done and still provide a special machine part. Unless the drill spindles are adjustable in position, however, there is not so much chance of economically rebuilding the machine if the design of the work is changed.

As an example of this first scheme of standardization I am using one of the products of my own company as an illustration. The "J & L" turret lathe is now being built to meet the requirements of a wide range of specific machines to meet specific purposes, but built up in each case from a small range of standard units.

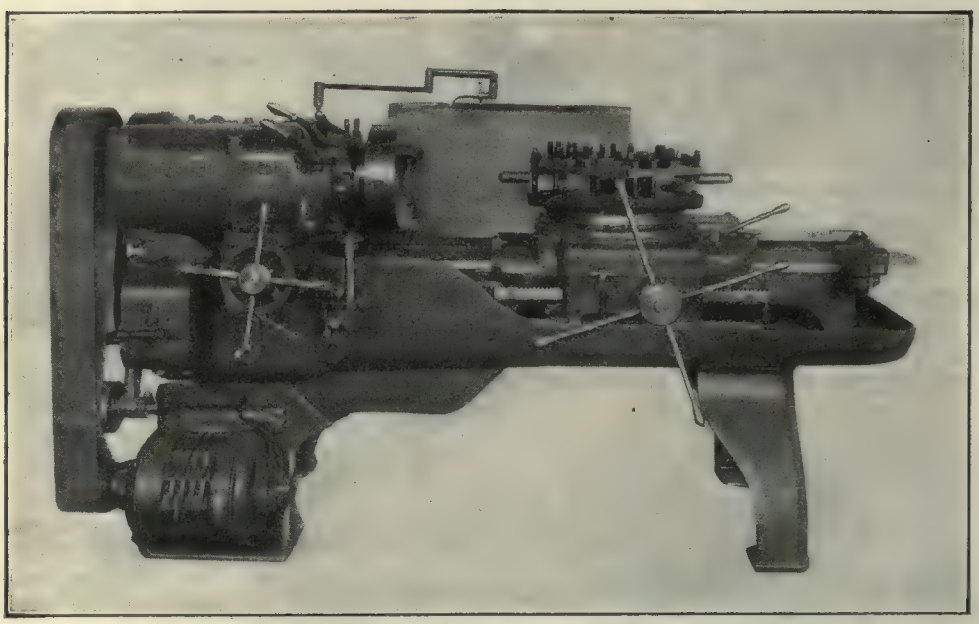


FIG. 2—JONES & LAMSON 15-IN. CHUCKING TURRET LATHE

Built up of headstock mechanism shown in Fig. 1 together with standard feed works, cross feed and apron, and heavy bed, saddle and round turret.

The headstock shown in Fig. 1 is, briefly, composed of ball-bearing transmission shafts, carrying multiple-disk friction clutches and heat-treated gears, all running in oil. The same construction is used for small-diameter high-speed work as for large-diameter heavy-duty work by changing the gear ratio at *A*. This gives a more powerful drive than is needed for the light machine, but it does no harm, and on account of the large production of this standardized drive it can be furnished to the customer at less cost than a lighter but special drive. Except for a minor attachment on one shaft, any shaft complete with all its members can be lifted from one headstock and put in another. The same is true of the spindles.

Three forms of turret are provided. One is small and quick acting for light cuts and another, shown in Fig. 2, is heavier for the most severe service. A square turret is also provided to carry two sets of tools for a double-spindle machine, or one set of tools properly supported for large-diameter work. A plain saddle or tool table for simple operations may be provided.

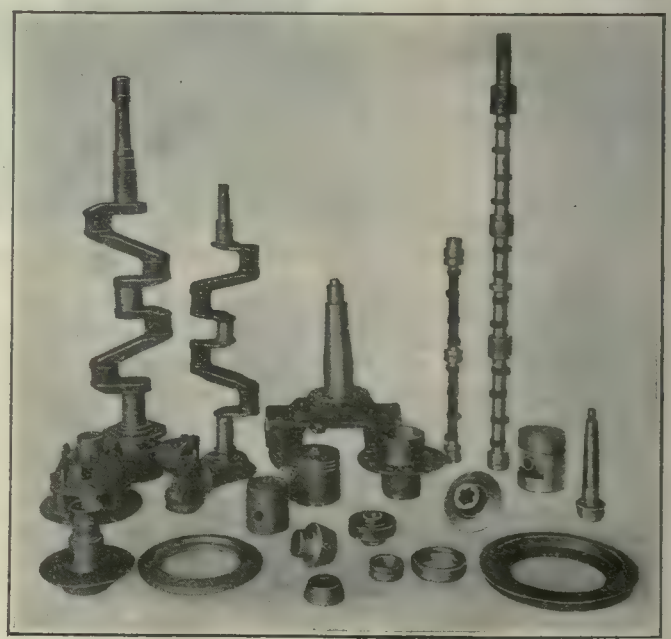


FIG. 3—GROUP OF AUTOMOTIVE PARTS SHOWING WIDE RANGE POSSIBLE ON ONE STANDARDIZED MACHINE

without the turret, on either the single- or double-spindle machine.

The following standard elements are employed:

3 Beds
2 Headstocks
1 Driving mechanism
3 Spindles
1 Feed mechanism
1 Apron
3 Saddles or turret slides
3 Turrets

In various combinations these elements produce the following special adaptations:

(1) 2¼x24-in. bar turret lathe
(2) 3x36-in. bar turret lathe
(3) 12-in. chucking turret lathe
(4) 15-in. chucking turret lathe
(5) 17-in. chucking turret lathe
(6) 10-in. double-spindle turret lathe
(7) 10-in. double-spindle production lathe

This scheme of design and construction is capable of wide application, and will result in advantages to both maker and user.

In Fig. 3 is shown a group of automotive parts on which a large amount of lathe work is to be done. There are included cam shafts, crown gears, pistons stem pinions, steering knuckles, and cluster gears. Some are large in diameter and short; some are small in diameter and long. Some have holes in them and some are solid. It would seem quite difficult to devise a machine capable of satisfactorily performing the turning operations on all these parts, with the standards of accuracy and production required for intensive manufacture, yet a considerable measure of success has been obtained by following the second of the two principles stated earlier in the paper.

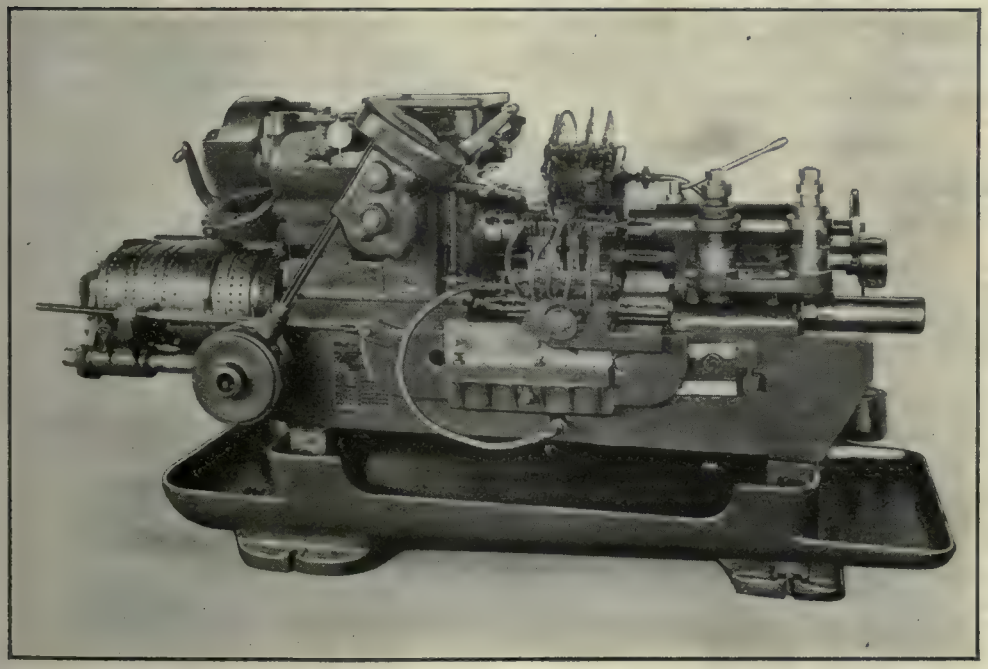


FIG. 4—FAY AUTOMATIC LATHE WITH STANDARD BED

The Fay automatic lathe, shown in Fig. 4, is a machine which has been developed over a period of years from very primitive beginnings. This development has been a true evolution, in that it has been determined by the character of the work offered to it, instead of being the result of careful predetermination on the part of the designer. The fact that it was possible to adapt it to the wide variety of work indicated is the interesting feature of the machine, and a most important one it is for the user.

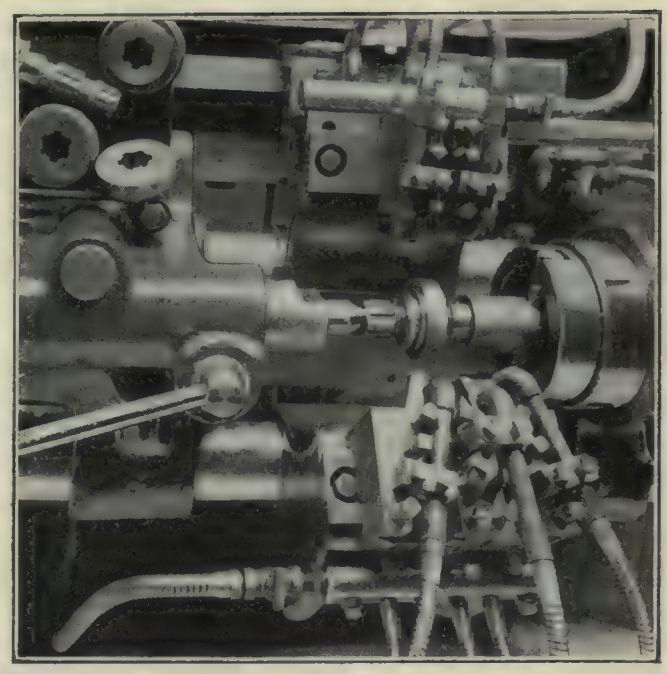


FIG. 5—FAY AUTOMATIC LATHE SET-UP FOR TRANSMISSION GEAR. STANDARD TOOL HOLDERS USED

In the first place the machine is made in three lengths of bed. The standard bed is shown in Fig. 4 and is used for short forgings and work held on arbors. A short bed machine is used for chucking operations, and a long bed machine for long shafts and forgings. The latter carries two carriages and two or more back arms when necessary. With the exception of the bed, front slide, etc., these machines are identical in mechanism and in all their separate parts, and a wide variety of work is handled on one standard design of machine.

As necessary steps in the standardization process the following should be noted:

1—Rigidity of structure and strength of drive and feed mechanism sufficient for the heaviest work it is planned to do. This will make a machine more powerful than needed for the smaller work, but the quantity production of this standard machine will permit a price to be quoted in competition with lighter machines.

2—Universality of tool movements is provided. Note the mounting of the carriage on a swivelling bar, and its control by the sliding former at the front of the bed. The back arms are likewise mounted on bars and controlled by formers so that combinations of turning and feeding movements are possible. Almost always higher production, or better finished work, or both, are

obtainable by movements a little more complicated than the simple "turn and face" motion. Certain operations may also be done which would otherwise have to take a separate operation.

3—The development of standard toolholders which are adaptable to a wide range of work. Fig. 5 shows a set-up for machining a typical sliding transmission gear, standard toolholders being used.

4—The development of standard attachments which vary and extend the capacities of the machine so that specially designed mechanisms or machines are unnecessary.

The Fay automatic lathe, it seems to me, in its present standardized development, offers an apportunity for the proper relationship between the machine designer and manufacturer on the one hand, and the automotive production engineer and tool designer on the other. It is the office of the machine man to furnish a strong, reliable, versatile mechanism as a foundation, and to do this requires years of development with some trial and error. It is not to be done in a day, or to order for quick delivery, if satisfaction is expected.

It is the normal function of the user to mount upon this standard mechanism special equipment which shall make the machine, to all intents and purposes, a special machine for the particular operations and product desired. This tooling likewise demands judgment and wide experience, but it is capable of much more rapid development than the machine itself and, unlike the machine, may be altered from day to day.

It is one of the standing grievances of the machine builder that this special tool design is so often left to him, when it could best be done in the shops of the user. As between two men of the same ability and experience, the one working where the tools are to be used has the advantage. Working conditions, methods of inspection, condition of forgings, all affect the ultimate tool design in ways which it is difficult for the absentee engineer to take account of. It is true, of course, that the tool designer on the staff of the machine builder has the advantage of being a specialist on that machine, but that is his only point of advantage. If the user will concentrate on a small variety of standard machines, his tool engineer may become a specialist also, instead of spreading his activities over a hundred sizes, types and designs.

The advantages thus far urged for the standardized machine tool are, therefore, perfected design, a better machine for the money, and this last point of permitting the tool engineers to specialize and thus do better work.

The fewer kinds of machines needed with standardization bring the following benefits also: Greater familiarity of staff with upkeep and adjustments. Fewer repair parts to carry in stock. Greater flexibility in assignment of work and shop layout. Less expense in changing design of product.

From the standpoint of management of employees there are the following advantages: Fewer kinds of operators to train for repair, adjustments and for operating. A man once trained can be used on a greater percentage of the machines in the shop. Training can be standardized and men taught more easily.

Some of these advantages affect the direct labor cost; others affect the overhead. The wise manager is giving particular attention to the latter division of the cost of manufacture, for of the three primary elements in cost—labor, material and overhead—it is the latter which is the most susceptible of improvement; and it is this same element which is most favorably affected by the standardization of machine-tool equipment along the lines we have mentioned.

Precautions for Cast Helical Gears

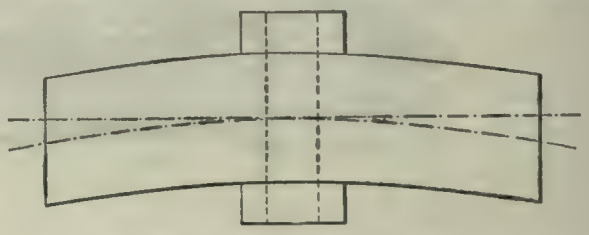
JOHN S. WATTS

When a design calls for a pair of helical gears with cast teeth, that is, the teeth are not to be machine-cut, there are certain precautions which should be taken to insure a satisfactory job, over and above those necessary for plain cast gears.

While the pinion will generally be a good casting, truly circular and running true sideways, the gear, especially if large in diameter, will practically always be warped. The accompanying sketch shows, exaggerated, the way the casting will warp. Although the warping is generally not so bad as to be noticeable when the gear is at rest, it can be detected while the part is in the lathe being machined. This warping is practically unavoidable, as it is due to the side which is on top in the mold cooling more quickly than the side which is underneath and which, being buried more deeply in the sand, is bound to retain its heat longer.

The effect of this warping in a helical gear is that only one-half of the width of the tooth will be in action, and that the working half will be alternately on one side of the gear and then on the other as the gear revolves. Further, as the pinion wears more quickly than the gear, the pinion teeth will be worn away from the true pitch rather than the gear teeth wearing down to a true bearing, and hence the pair of gears will become worse with wear.

Where it is desirable to use helical gears, but not commercially practical to cut the teeth, it is essential that this unavoidable warping be allowed for, which can best be done by allowing a slight longitudinal motion of the gear or pinion, or both. Generally, the pinion should be the sliding member, as being much lighter it will move more freely The total weight to be moved will be only that of the pinion and its shaft, which should be made as short as possible. I do not mean to



WARPING OF A CAST GEAR

have the pinion slide on its shaft, but to have the shaft free to move longitudinally in its bearings.

Whether it is best to have the gear or the pinion do the sliding can only be determined by a study of the question for each machine, but it is evident that the less the weight to be moved, the better. Allowance must be made for the fact that the gear will move sideways only twice per revolution, while if the pinion is to slide it must do so as many times more per minute than would the gear, as the ratio between the gear and the pinion.

Some Ideas for the Planer Department

By Donald A. Hampson

A SIMPLE means of protecting the planer table against the scoring it too often receives from rough casting being shoved over its surface is shown in Fig. 1. Many shops use planks and boards for this purpose but a collection of such is unsightly, takes up a lot of room and often the planks or boards will be shoved along with the casting and allow the latter to do practically as much damage as if the boards were not there.

The bars shown are of ⅜-in. square section, or larger,

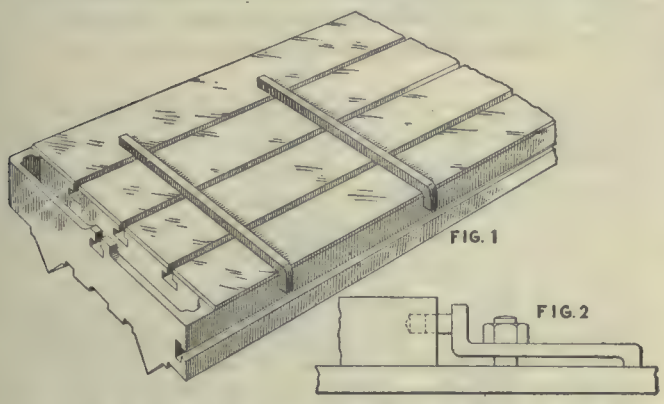


FIG. 1—BARS FOR PROTECTING THE SURFACE OF THE TABLE. FIG. 2—FINGER CLAMP FOR LOW WORK.

and have one end turned down to stop against the side of the table and thus prevent them from being shoved along with the work. Being square, they will not roll over and become displaced as would round bars. Their height is sufficient to allow any irregularity of the casting to clear the surface of the table, yet they are low enough to permit the planer hand to ease the casting down upon the table without difficulty when they are to be removed. Two of the bars will suffice for any but the largest castings, and when they are not in use they may be hung up out of the way.

One of the most useful accessories around a planer is a small pinch-bar, and for the setting of heavy work it is indispensable. For castings that do not weigh over one or two tons a bar 15 in. long of ⅝-round or flat-sided stock of equivalent section, is large enough. The forged end should be flattened to a comparatively thin edge and this edge should be kept in good shape by frequent grinding or redressing as it becomes rounded by continued use.

One of the worst habits of the average planer hand is that of collecting great quantities of material—packing, clamps, odd bolts, etc. These, with the necessary working tools, litter up the surface of the table and end pockets and often overflow the shelves and cupboards provided for storage. Roughly speaking, four bolts each of a half-dozen lengths should suffice. Two posts in front of the work are better than a dozen bolts and clamps that hold by friction only. Strict adherence to this principle makes it unnecessary to keep a hundred odd bolts around and the same policy may be advantageously applied to clamps and blocking.

Drop forged clamps, now obtainable on the market, are much superior to the home-made kind and for supporting work, good jacks are far better than setscrews tapped into any old piece of cast iron. For packing, there should be a supply of sheet metal shims and these, to be most useful, should be kept in a case having separate pockets for each thickness. A number of small wedges will also be found very useful.

When the planer is used almost entirely upon low work, clamps of the kind shown in Fig. 2 are best to use. With such clamps the nuts of the holding bolts are below the level of the surface to be planed and thus much time is saved that would otherwise be lost in arranging tool clearances, grinding tools and repairing bolts after an accident.

There need be but four or five articles kept upon the table of a planer. These should be: a brush of generous size, a small shovel or scoop for removing chips, the pinch bar before mentioned, and a double-end wrench to fit the nuts of the clamping bolts, reversing dogs of the table, and clamps of the tool holder. Contrast this with the untidy appearance too often presented by the table surface where the planer hand is obliged to clear the way for a new job in much the same fashion as he would shovel a path through new fallen snow. The time wasted in pawing a way through unnecessary equipment increases as the square of the number of pieces, and a careful study and elimination of superfluous junk will sometimes produce astonishing results.

Broad cuts are usually applied to the finishing of surfaces of cast iron, with feeds ranging from ½ to 2 in., and to conserve the sharp edge of the tool it is desirable to lift the latter over the work on the return stroke. There are many devices for doing this automatically but they are quite likely to be misplaced, out of order, or to necessitate too long an overrun of the tool; therefore a careful operator relies to a large extent upon the hand method.

To avoid the long reach necessary on wide work and to make the lifting less laborious, a stick can be thrust under one of the tool clamps and requires no time to set up, while with its assistance the operator can lift

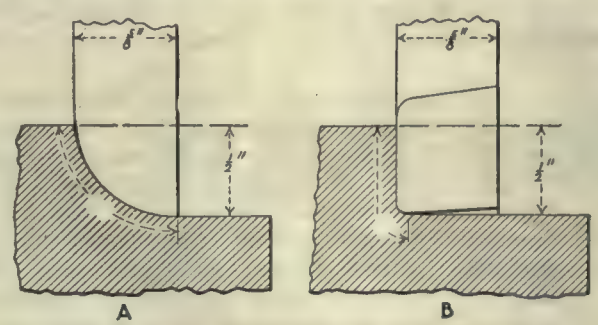


FIG. 3—RIGHT AND WRONG SHAPES OF TOOLS

the heaviest tool block with ease, even at the farther side of the table.

Much has been written about the shape of tools for cutting metal, but it is still true that many machinists who grind their own tools do not grind them intelligently. The shape of a tool may influence production and finish to a marked degree.

Two ways are shown in Fig. 3 to grind a tool for the rough planing of cast iron. At *A* is shown the common way. Though the tool may have been ground correctly in the first place, successive sharpenings have reduced it to the form shown, where the cutting edge follows around the bit from side to heel in a sweeping curve. If side rake is desired on such a tool it can be secured only at the expense of top rake or by the inclination of the tool bit in the holder.

A tool ground thus will work all right in many cases but if the casting is frail it will spring badly, while the tool will eat up a large percentage of the power without a corresponding increase in the rate of production. The form shown at *B* is correct.

It will be noticed that both tools shown in Fig. 3 are of the same size and are taking the same cut, but under equal conditions the one at *A* will consume more power than required by the other because the length of the chip is about 25 per cent greater. Further, there is a downward component to the thrust that springs the work unduly when passing over unsupported parts of the casting.

That the partial loosening of bolts before taking the finishing cut over a casting will produce a true surface is a fallacy that is deeply grounded in the minds of most machinists. Loosening the bolts is a step in the right direction, but it is only a step. Moreover, it is a tacit admission that the work was not properly supported in the first place.

Every casting springs after the surface skin is taken off, and may spring more when deeper cuts are made. Usually, the whiter the iron (the harder the casting) the more it will spring. After *completely* loosening the holding bolts the casting must be repacked and then clamped without further springing. An inadequate support never produced a true surface.

What Is Your Export Ratio?

By W. H. Rastall

Chief of Industrial Machinery Division, Department of Commerce

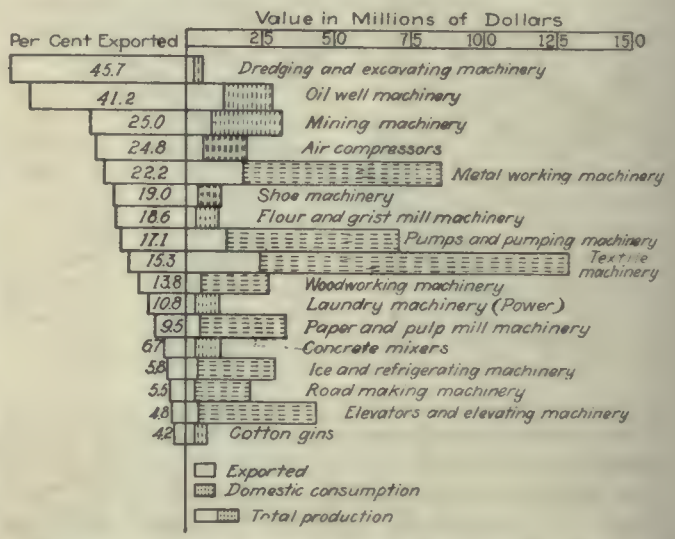
WHY should manufacturers of air compressors have better export business than manufacturers of concrete mixers? At first thought one might expect the advantage to lie with the concrete mixer manufacturer because of the nature of the work and the surroundings under which his product is commonly employed.

Why should the percentage of export orders secured by a manufacturer of excavating machinery be twice as great as that of a manufacturer of machine tools? American excavating machinery usually represents a very high state of engineering development. These units are frequently very costly and one might expect that the labor conditions in most foreign countries would make it unnecessary to employ machinery of this character, while machine tools are necessary for a great number of manufacturing operations and would seem to be in more general demand.

A great many similar questions naturally arise in considering the accompanying chart, which indicates the total volume of production and the percentage exported, applying to certain classes of American industrial machinery. It is interesting to speculate whether the situation illustrated by this diagram is the result of fundamental conditions or merely expresses the comparative business ability and sales effort manifested by the managements of these different producers of machinery.

Conditions have now reached a point where American machinery manufacturers should give very careful attention to their export business. Unusual opportunities are to be found in these foreign fields because Germany appears to be almost eliminated as a competitor. Before the war Germany furnished perhaps 45 per cent of the machinery that went into international trade, and since the Armistice there have been times when the depreciated condition of the mark gave German manufacturers a peculiar advantage in this trade. That situation has now passed, and in great measure German prices already exceed world market levels. Experience shows that deliveries from German manufacturers are slow and frequently uncertain, and in a great many ways it is difficult for foreign buyers to buy in Germany on a basis that is at all satisfactory. Business that formerly went to Germany will more and more fall into the hands of others.

Although there are a number of countries in the world that produce machinery for export, the countries of most outstanding importance at present are Great Britain and the United States, and the indications are that the large volume of machinery business formerly



PRODUCTION AND EXPORTS OF CERTAIN CLASSES OF INDUSTRIAL MACHINERY IN 1921 AS DETERMINED BY THE DEPARTMENT OF COMMERCE

secured by German manufacturers will now be awarded to either British or American producers.

American engineering and American machinery are distinguished in the world's markets for their superiority. Americans are noted for their engineering achievements; but because of this superiority American machinery is usually higher in price than similar equipment secured from foreign sources, and must be marketed on a quality rather than a price basis. In other words, this trade that formerly went to Germany will now pass to British manufacturers, unless American products are supported by constructive sales effort of such character as to demonstrate that American equipment is worth the price asked—and more. Manufacturers should now organize their sales effort along such lines as will accomplish this result.

Export business is becoming more and more essential to the prosperity of the individual manufacturer. The accompanying chart shows that it is vital for manufacturers of dredging and excavating machinery. The difference between a satisfactory and an unsatisfactory export ratio can easily represent the difference between profit and loss on the year's balance sheet. Manufacturers have a very definite opportunity to improve their export ratio, and it remains for them to make the sales effort necessary to secure these results. The present international situation provides an unusual opportunity.

American Grinder Co. Spur Gear Grinding Machine

By A. J. OTT and C. L. OTT

A recently developed machine of the pure generating type—Grinding wheel functions as one tooth of an imaginary rack—Automatic relative motion of wheel and work

As THE plain cylindrical grinding machine is now in such general use for grinding interchangeable cylindrical parts to limits, so after years of development work, a spur gear grinding machine has been perfected that will grind involute teeth on a production basis, produce precise duplication of tooth contour, accurate spacing and smooth finish, so that these ground gears assemble interchangeably and run quietly.

This machine is now being built and marketed by the American Grinder Co., 6543 Benson Street, Detroit, Mich. Its capacity ranges from 2- to 8-in. pitch diameter, and any pressure angle up to 25 degrees.

This machine is of the pure generating type, the action being that of rolling a gear along an imaginary rack with the grinding wheel as one tooth of the rack. The action of the gear and the imaginary rack is shown in Fig. 1, diagrammatically.

The machine, with water guard in place covering the wheel and work, is shown in Fig. 2. You will notice the general compactness, and the single self-contained pulley drive. The wheel spindle is journaled low on the wheel slide column, thereby getting the heavier and high speed member down to terra-firma. It has a lateral feed adjustment of 1½ in. and is provided with double end thrust ball bearings. The main bearings are Lumen bronze, tapered on the outside for wear adjustment. The feed is controlled by the 12-in. handwheel, which is provided with a micrometer adjustment and positive stop.

Method of Truing Wheel Surface

The flat surface of the grinding wheel at right angles to the wheel spindle does the grinding, and is kept true with a double worm and worm wheel driven truing device. The reduction is such that, while rotating the hand wheel at a moderate speed, the movement of the diamond is slow, which is necessary to secure a smooth and true grinding surface. This design of wheel allows 1¼ in. deep surface wear or truing.

The wheel head is arranged to swivel to right or left of the center up to 23 deg. This is particularly advantageous on pinion gears, that is, gears with stems, since the stem is located in the holding arbor while grinding either the drive or coast side of the teeth. Without the swiveling feature, special outboard centers would have to be used, a rather inconvenient arrangement and in some cases not at all practical. The swiveling is also a very desirable feature on some cluster gears. The wheel, of course, is reversed as is also the diamond holding arm.

The wheel head is shown swiveled to the left through 14½ deg. in Fig. 3, and is grinding an 18-tooth, 6-pitch stem gear on the coast side. This is the position in which the wheel head is mostly used, especially on all gears that can readily be reversed in the arbor. You will notice that the gear is above the wheel at a suitable loading height and very accessible. The water guard has been lifted and rocked up out of the way.

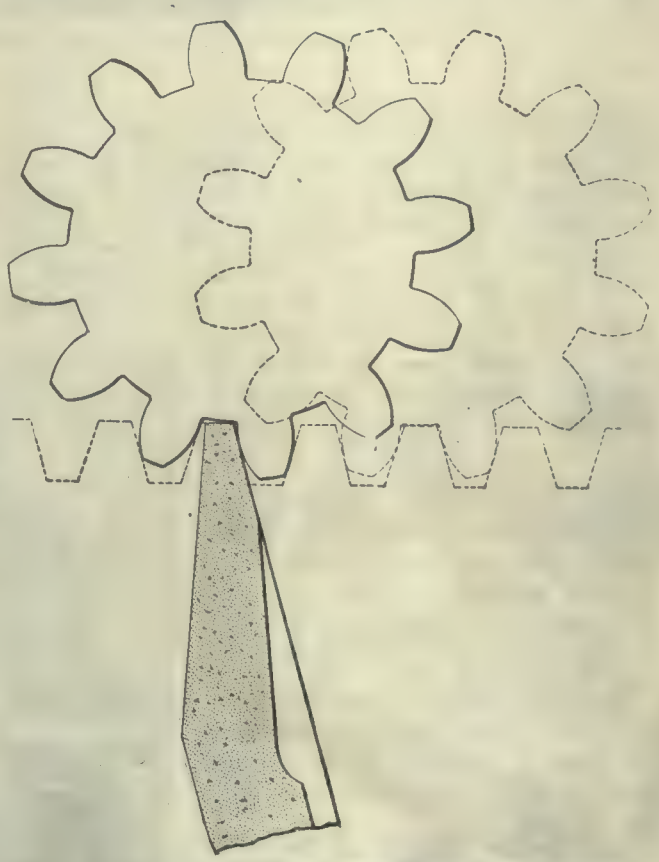


FIG. 1—DIAGRAM SHOWING GENERATING PRINCIPLE OF GEAR GRINDING MACHINE

The clocklike mechanism automatically stops the work carriage when the last tooth of a gear has been ground, and also the wheel if desired. It is quite customary to set the stop at twice the number of teeth

Abstract of a paper presented at the Production Meeting of the Society of Automotive Engineers, Cleveland, Ohio, October, 25, 1923.

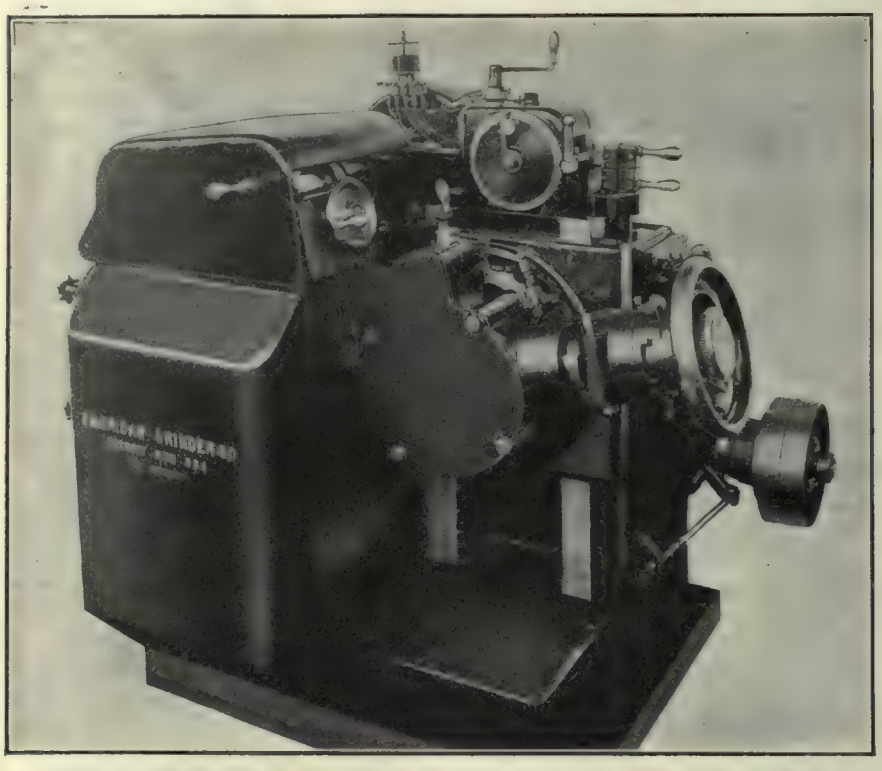


FIG. 2—AMERICAN GRINDER CO. SPUR GEAR GRINDING MACHINE

of the gear you are grinding, to allow the gear to go around twice and make what might be called a rough and finish grind. The wheel is sparking out, as it were, since it is not fed toward the work the second time around. As the last tooth is finished the carriage automatically stops, and wheel also if so set. This allows the operator to run two or more machines.

The carriage stops with the gear out of the wheel, that is, to the right of the wheel, so that the arbor can be loaded or unloaded without wheel interference. The gear must, of course, be located to mesh correctly with the grinding wheel and to do this quickly, a slotted locating ring is attached to the arbor as shown in Fig. 4. With a substantial knife gage inserted in the ring slot and between two teeth, the gear is positioned in proper relation with the wheel and the machine is ready to start grinding again.

The work spindle is taper journaled in Lumen bronze bearings with flood lubrication, mounted in a carriage which is driven by a drum cam located in the bed.

The general motion of the work spindle is obtained by means of thin steel tapes winding and unwinding on a pitch diameter circle or segment as the carriage is driven forth and back. This mechanism is at the rear of the work spindle. There is practically no load whatever on these tapes, since they simply oscillate the work spindle, and this enables the carriage to be driven at the same rate of speed for small pinions as for large gears. The tapes are 1¼ in. wide and only 0.008 in. thick. One end of one tape is attached to the segment and the other end to the tape bar, the other tape being attached in the reverse position. Screw adjustment is provided so that the tapes hug the segment snugly and produce uniform duplication of the tooth contour.

The index mechanism is very simple and is also located at the rear of the work spindle. Hardened and ground notched plates are used, having the same number of notches as the number of teeth on the gear to be ground. The notches are ground and lapped to very close limits to secure accuracy of tooth spacing. It requires less than a second to index from tooth to tooth and the grinding times vary according to the carriage change gears used. We usually supply two pairs of change gears to grind one side of the usual transmission gear tooth in 5 or 6 seconds, according to the accuracy, finish and production desired.

The groove of the carriage driving cam provides a smooth and suitable reversing drive, thus eliminating entirely load-and-fire reverse mechanisms, clutches, and their attendant troubles. The stroke or travel of the carriage is adjustable to suit the pitch of the teeth, also the position of the carriage in relation to the wheels.

Correct tooth contour of the meshing gears and accurate spacing with a smooth grinding finish produce quiet running gears. Slight variations of tooth contour can easily be made by giving more or less angle to

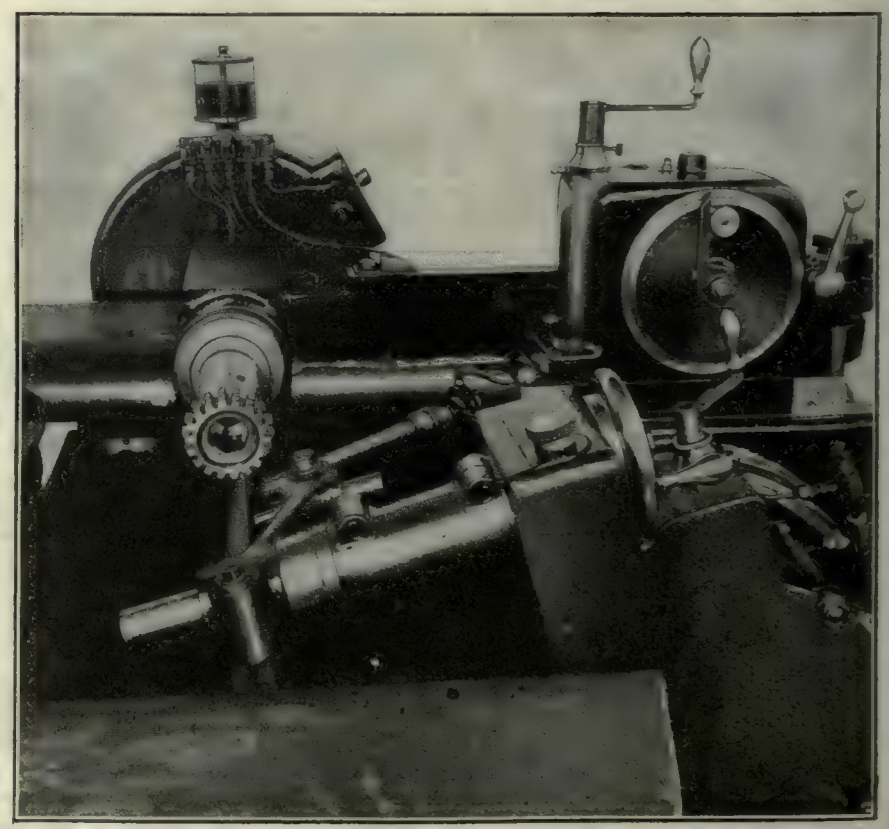


FIG. 3—GRINDING WHEEL HEAD SWIVELLED AT ANGLE OF 14½ DEGREES

the wheel, and also by varying the diameter of the pitch circle or segment.

Really economical production of transmission or similar gears is attained by roughing out the teeth to about 0.005 in. oversize tooth thickness depending on

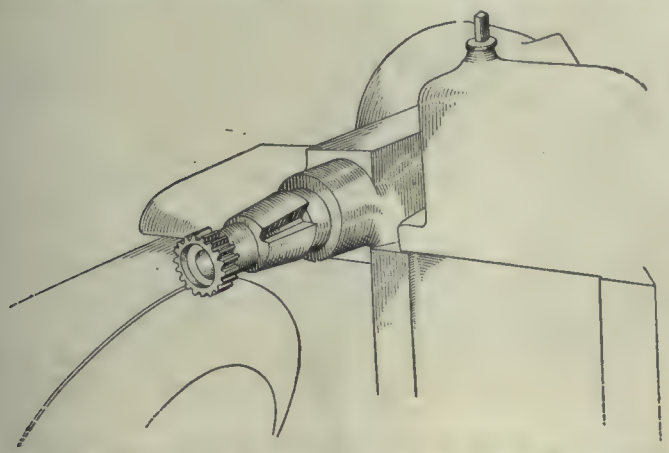


FIG. 4—SLOTTED RING USED TO LOCATE WORK ON ARBOR

backlash desired, hardening, grinding the hole or stem, then grinding the teeth. The pitch line will then be concentric with the hole or bearing. The finishing can now best be done by grinding after hardening, and in about the same time or even less time.

National Screw Thread Commission Considers Wire Gages

At a hearing held in New York on Oct. 8, the National Screw Thread Commission discussed with manufacturers and users of wires and sheets the feasibility of adopting the decimal gage series tentatively proposed by the Commission and published in the *American Machinist*, Feb. 15, 1923.

It was the consensus of opinion of those represented at the meeting that in the present use of wire and sheet metal gages much less confusion exists than is generally supposed by those not entirely familiar with trade practice; and that the introduction of the proposed decimal gage series would tend to confusion rather than simplification. It was believed that the suggested decimal sizes would not be adequate to replace the several gage series now in use, and that many of the suggested sizes do not appear in any of the gages now in use and would therefore be special.

Several speakers made the point that gage numbers should be used only to designate approximate or nominal size, and that in all specifications, orders, drawings, etc., the actual decimal diameter or thickness should be stated.

From the discussion it appears that in the nonferrous group the American (Brown & Sharpe) gage is in practically universal use; while in the case of ferrous products conditions are not so well standardized, several gages being used, each in a more or less well defined field.

The steel wire gage (Washburn & Moen), is used for a large percentage of the total tonnage in ferrous wires, and the U. S. Standard gage for sheets, several other gages are used on special products such as tubes, music wire, twist drills, and drill rod.

The Commission will study the situation further before making recommendations.

How Salesmen Can Meet the Price Obstacle

(Business Research Bureau, LaSalle Extension University)

"What's the price?" asks the prospective buyer, and then it is up to the salesman whether price is going to be an obstacle or not. If the salesman works correctly, price is not necessarily an obstacle; but if his practice is faulty or if he has not succeeded in arousing the desire to possess, he may lose the sale because the prospect may be unwilling to pay the price.

As a rule, when a prospective purchaser asks the price of anything it is because he is interested and because he is turning over in his mind the question of whether he is able to pay the price. If the salesman himself thinks his price is too high—and a good many salesmen do—his prospect is very likely to agree with him, because the salesman will be apologetic about his price. The salesman who thinks his price is too high is easy to turn down.

The first essential to the effective handling of the price problem is that the salesman thoroughly convince himself that his price is right. Then his attitude toward the price will not be shaken by prospects who say that they can buy the same thing for less elsewhere. He will often correctly size up this statement as no more than an attempt either to get a lower price or to get rid of him, or as showing that he has as yet not convinced the prospect of the merits of the proposition.

Most standard products and commodities today are priced on a basis of their cost to produce, handle, and sell. The salesman who feels that the cost of what he sells is higher than it should be is usually deluding himself. No price is too high if the service rendered by the article or the profit achieved through the article justifies it. The salesman should investigate his prices and find out how they are arrived at, which will justify them in his own mind and convince him that the price is fair. Then when he talks of the price, his voice will have a ring of confidence which will go a long way toward convincing the customer.

Selling on Production Rather than Price

There is only one basis upon which price should be judged, and that is that the price is never too high if the customer can secure a net gain by purchasing the goods. The initial cost may be high but the net gain to the purchaser, even if spread over a period of time, is justification for the expenditure. In order to convince the prospect on this point the salesman must satisfy him by actual test, demonstration, and comparison of figures. Arguments that appeal to his reason and good judgment should be advanced and he should be convinced that the benefits he can or will secure through purchase of the product really outweigh the price.

The second essential to effective handling of the price problem is to make sure that the prospective purchaser knows what he is going to get in exchange for the price before he is told what the price is. If the prospective buyer has a basis on which to make a comparison between the price and what he will gain through buying, it will be easier to convince him of the net gain than if he were told what the price is without having such a basis for comparison. When he is thoroughly convinced of the net gain (service or profit greater than the cost) to be secured by buying, he will buy—provided that he is able to pay the price.

Book Reviews

Foundry Work. By R. E. Wendt, Head Instructor in Foundry Practice, Purdue University. Two hundred pages, 5x8 in., well illustrated, cloth boards. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York City. Price $2.

A text on the elements of foundry practice suitable for schools, colleges and foundry apprentices. The author has adhered to his aim of treating only the elements of foundry practice, although careful study of the text, a complete mastery of the problems it contains, and supplementary reading, observation and catalog study will give a good general working knowledge of foundry practice. Although the author does not say so, it seems evident that he aimed to keep away from preparing a large book of appearance forbidding to the student eye, certainly a point worthy of consideration in selecting a school text.

There is a noticeable absence of unessential detail that the student would in all probability forget or find confusing. However, the treatment of essential subjects is complete and, when taken in connection with the exercises, provides a working knowledge of foundry fundamentals.

There are three divisions: Fundamental Principles; Exercises and Problems; and Melting and Mixing Metals. Each division is concluded by a group of questions. The book contains also several tables of practical use to the foundryman, a bibliography, and a glossary of foundry terms.

Mechanics of Machinery. Mechanism. By Robert C. H. Heck, Professor of Mechanical Engineering in Rutgers College. Cloth binding, 749 illustrations and charts, 507 pages, 6x9 in. Published by the McGraw-Hill Book Co., 370 Seventh Ave., New York City. Price $5.

The first characteristic of this book which appeals to the reader is its completeness. It is written for the student and in text book style, but the addition of suitable explanations, illustrations, diagrams and sample problems tends to make it a very valuable treatise on the subject. It is an important addition to engineering literature and an accurate portrayal of the art of the machine designer and builder, not abstract or hazy in language or development, but practical and concise.

This first book, predominantly on Mechanism, is to be followed by a second volume dealing with Kinematics and Dynamics of Machines, since the whole field of motions and forces in machines is too big to be covered in one volume.

The material has been arranged and divided according to the kind of problems presented, rather than by relating it to different kinds of machines. In general, two methods of presenting the material have been used; first, by the use of a number of typical examples; second, by taking a simple principle or purpose and showing a large number of ways in which it is applied or realized.

Based upon kinematical considerations, the main division of the book is into machinery for uniform motion, for intermittent motion, and for cyclical or reciprocating motion. The first chapter is largely given over to descriptions of elementary machine elements of various forms and definitions of the important kinematic ideas.

Machinery for uniform motion is taken up by means of belt and rope gearing and various gear trains. Intermittent motion mechanisms include ratchets and escapements, clutches and reverse and stop mechanisms. The examples of the various devices are exceptionally numerous and the descriptions are excellent.

The section devoted to gear trains for speed variation deserves especial commendation for much of this material has not previously received adequate presentation in elementary and systematic form. This applies particularly to the various forms of the geometric-series gear train as used in machine tool drives, and the quick-change screw-cutting and feed trains.

Cyclic and differential trains are treated in the fifth chapter and are followed by a presentation of linkage mechanisms and movements. The diagrams in this section are numerous and assist greatly to a clear understanding of the various valve movements and other slide actions. The method for finding velocities by means of instant centers is clearly explained.

The remainder of the book is devoted to the important matter of gear teeth and covers the items of form, action and production. Of particular note is the discussion of the flexible involute system and the presentation of the hobbing method for helical teeth.

Cost Control for Foundries. By F. C. Everitr and Johnson Heywood. Edited by William R. Basset. Cloth boards, 225 6x9-in. pages. 91 facsimile forms. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York. Price $3.

Probably no business uses more guesswork in attempting to determine costs of production than does the average iron foundry. Castings are sold by the pound and, as the price is generally set by competition, it behooves every foundryman to know accurately what his costs are, so that he may take only that class of work upon which he can make a profit.

This book deals with the fundamentals of cost finding and the authors have wisely made the systems advocated so elastic that they can be adapted to both large and small foundries.

Each step in cost keeping is so thoroughly explained that no prospective user of any of the systems set forth in the book, need have any fear of not being able to master the subject. The forms are plain and the terms used are shop terms, so that any man with brains enough to run a foundry should have no difficulty in following the idea of the authors.

Condensed Catalogues of Mechanical Equipment 1923-24. 678 pages 9x12 in. Published by the American Society of Mechanical Engineers 29 West 39th Street, New York City. Price $5.00.

This is the 13th annual volume and is the most complete yet issued. There are over 2,000 illustrations in the 471 pages of catalog data carried by 393 firms. The Mechanical Equipment Directory now contains over 30,000 separate listings. The book is printed on thin paper and bound in flexible covers so that it is very convenient to handle in using as a reference of mechanical equipment.



General View of Plant

Where Machine Tools Are Made

The R. K. LeBlond Machine Tool Company

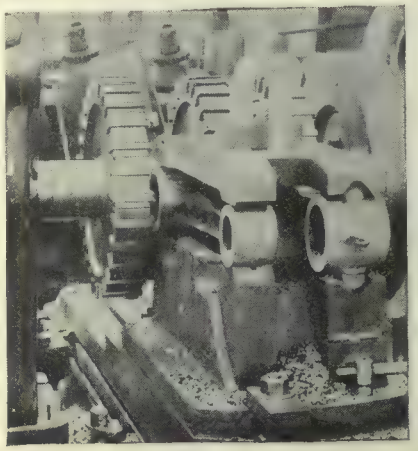
Founded 1887

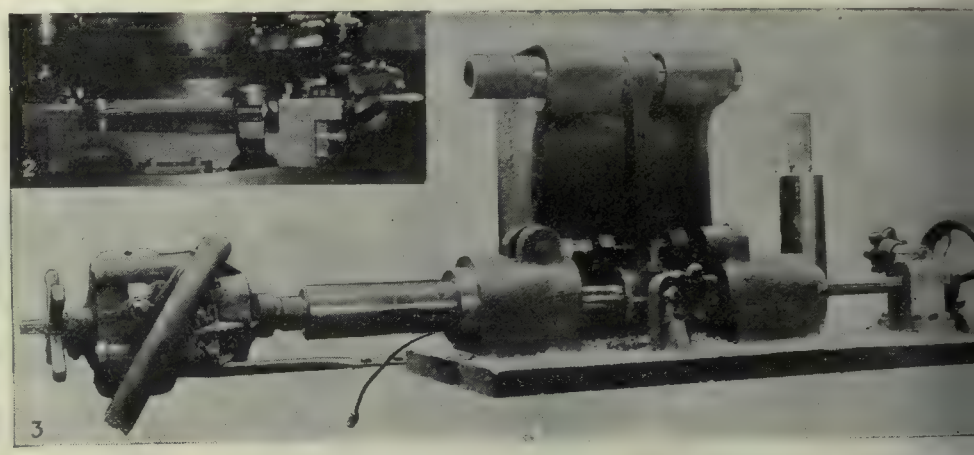
Views of Drafting Room, Wash Room and Main Assembly Bay

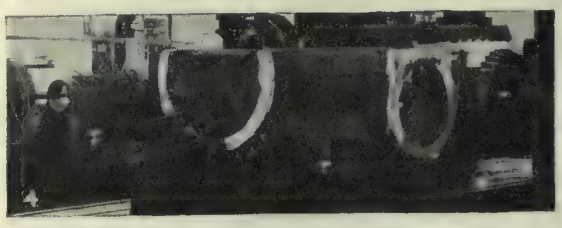




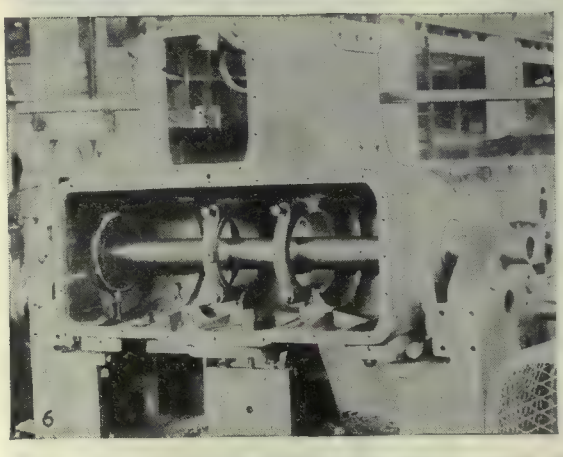












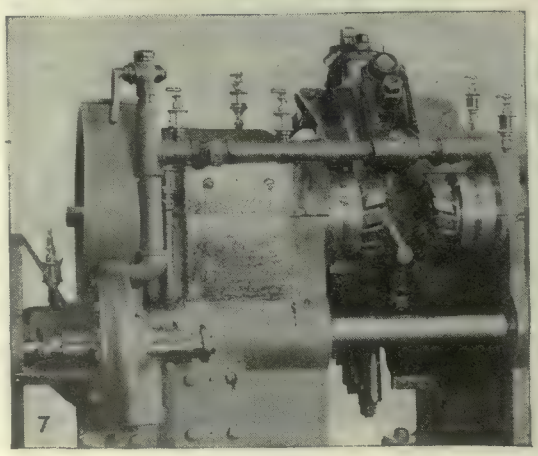
Machines and Methods Used

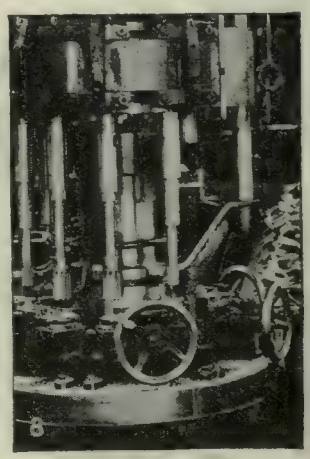
THE use of the large tractor is not common in the east and one is apt to be surprised at the number under construction in such plants as that of the C. L. Best Tractor Co., San Leandro, Calif. This company has not only studied production methods carefully but has designed and built a number of special machines for handling some of its work at low costs. Special fixtures are also largely used, one being shown in Fig. 1. This machine mills the ends of two connecting rods with three cutters. Fig. 2 shows a fixture with a quick-acting geared clamp for holding the rods while being drilled at each end under a multiple spindle machine. The final boring of the large end bearing is done in the fixture shown in Fig. 3, a Little David air drill supplying the power required. Drive shaft cases are milled with large cutters as in Fig. 4, drilled as in Fig. 5 and the bearing seats bored as in Fig. 6.

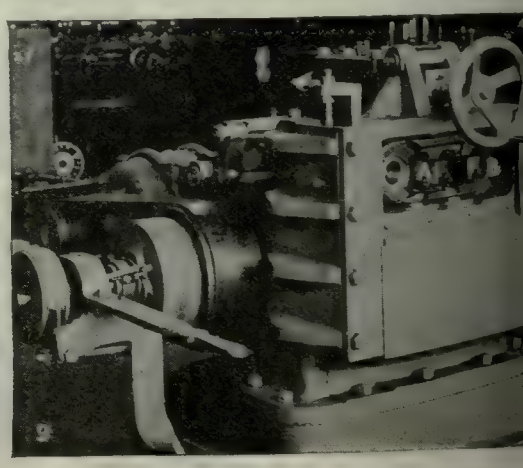
The track links are largely handled in special machines, Fig. 7 being a double head continuous milling machine, Fig. 8 a vertical, station type machine for drilling and reaming the pin holes, and Fig. 9 a special shaper for machining the insides of the links. The shaper ram carries the two cutter bars *A* and *B*.

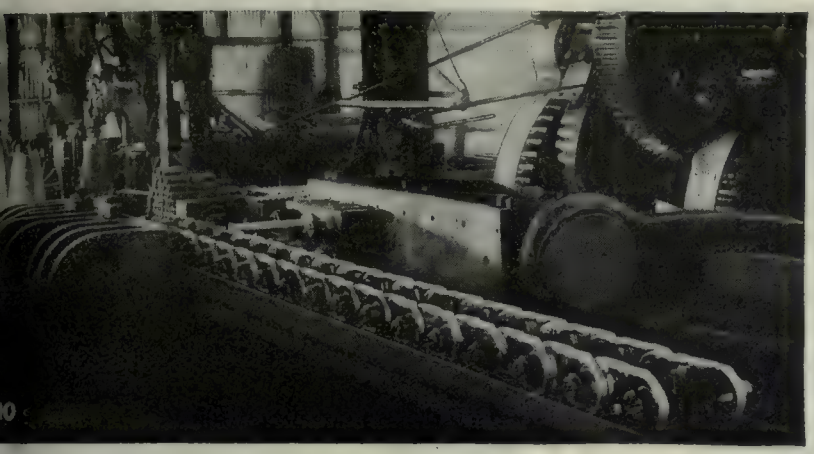
The links are assembled into tracks on the large bulldozer shown in Fig. 10. The thimbles, or distance pieces, are shown piled up beyond the plunger, or ram, which forces the pins through the links and the thimbles. The pins are threaded and have castle nuts and cotters in the end.

More continuous milling is shown in Fig. 11, this being a cylinder head job. Three fixtures are mounted on the revolving table on a special milling machine equipped with two vertical spindles, although only one spindle is being used in milling the cylinder heads, as can be seen by referring to the illustration.









In Building Large Tractors

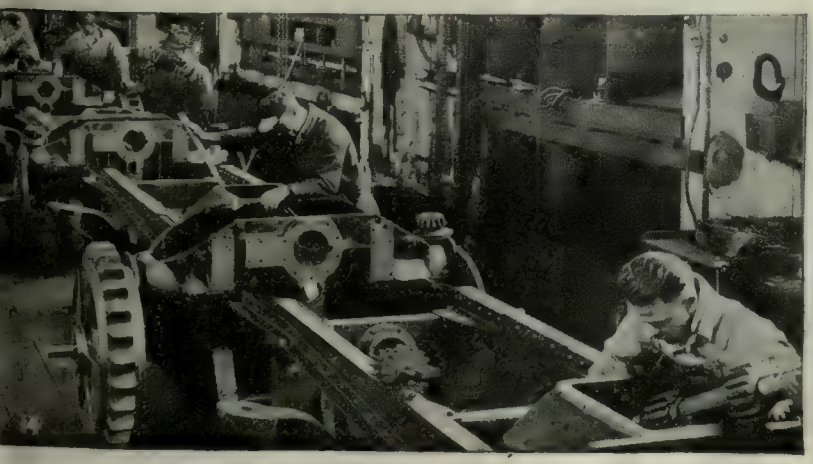
The cylinder heads lie inside the frame of the fixture and are located by the screws at the ends and sides.

Perhaps the most interesting special machine is shown in Fig. 12. This is for turning the treads of the wheels which carry the track. A finished wheel is shown in front of the machine. The wheels are forged steel and are bored before coming to this machine. They are held on a mandrel having expanding jaws with serrated teeth. The jaws are tightened by the drawing in of a taper plug with the nut shown. The heavy cut taken makes it necessary to grip the wheel very firmly to prevent slipping.

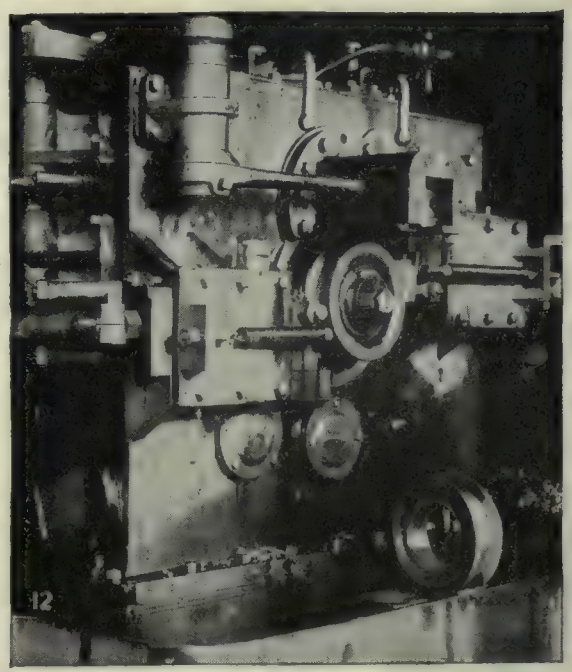
With the wheel firmly in place the machine is started and the tool carriages begin feeding in from each side, taking a heavy forming cut the full shape of the wheel tread. The machine is semi-automatic and releases the feed after the proper depth has been reached. The construction of the machine is very rigid as can be seen. The time for turning a wheel is about 4 min. during which time 19 lb. of metal is removed.

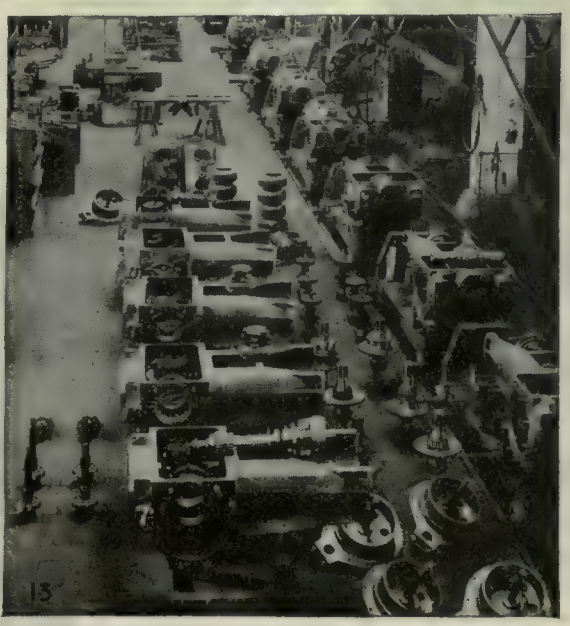
Figs. 13 and 14 show parts of the assembly line. The first gives a good idea of the number of tractors going through the plant and also shows the way in which trucks are used to secure continuous or progressive assembly. The tractor grows as it passes down the line, the parts shown standing beside the track being added as the trucks move down the long line of track. At the left are frame castings and parts ready to be placed on trucks and join the procession toward the finishing end.

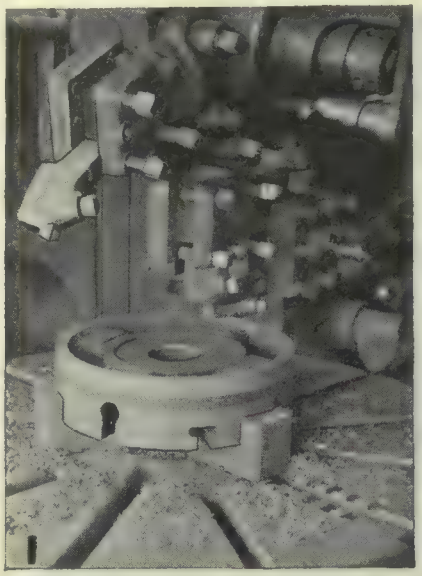
Fig. 14 shows a close view of another type of truck, this having a frame built up of structural steel. A large sprocket wheel for driving the track is shown at the left. An idea of the size of the transmission gears can be had at the extreme right.

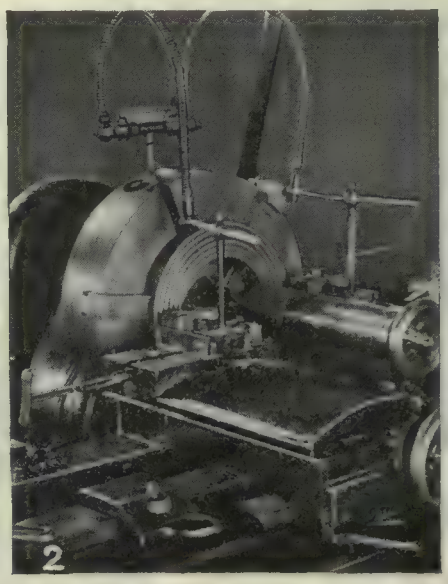




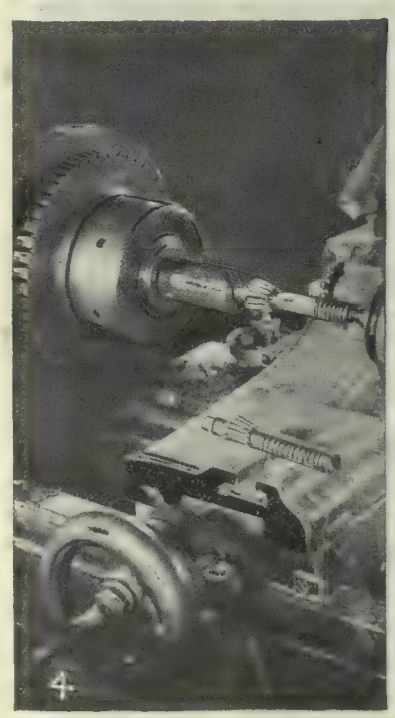








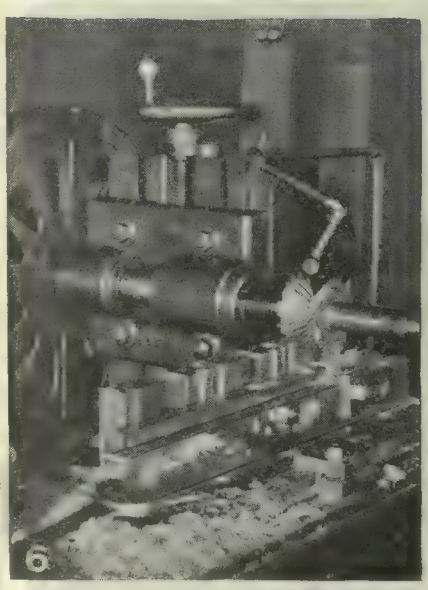


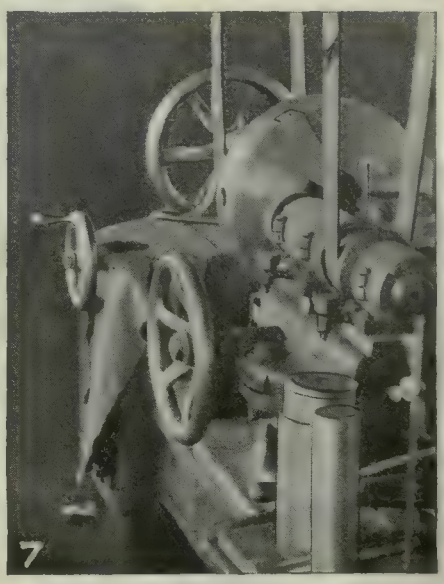


Some Operations on Horton Chucks

Fig. 1—Turning chuck bodies
Fig. 2—Cutting scroll plate
Fig. 3—Serrating jaws
Fig. 4—Threading jaw screws
Fig. 5—Cutting back of scroll plate
Fig. 6—Milling ends of jaws
Fig. 7—Grinding insides of jaws
Fig. 8—Reaming screw bearings









Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

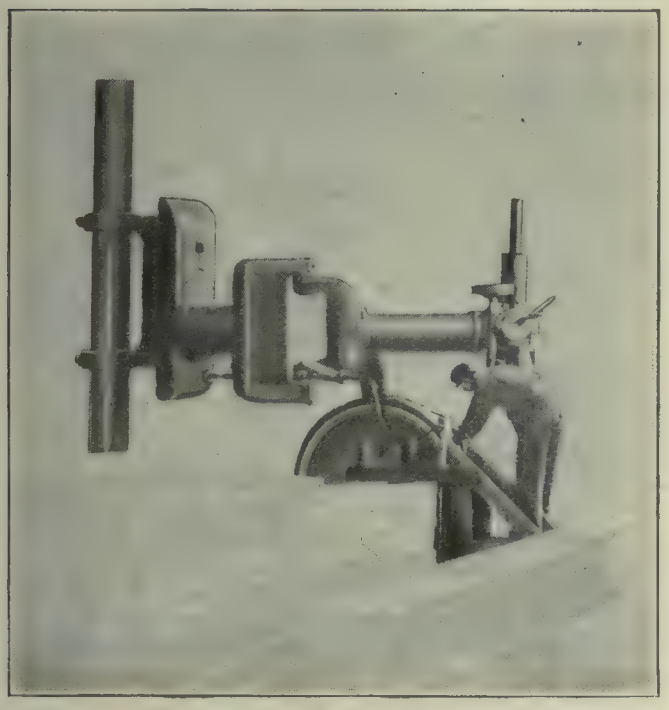
A Large "Elbow" Radial Drill

By Herbert Crawford

Here is a type of radial drill which is occasionally found in small sizes, but I have never seen one of anywhere near the dimensions of the one built by the Llewellyn Iron Works, Los Angeles, Calif., for its own use.

The arms are supported by a column made of two pipes, one inside the other. The outer pipe is turned to 15 in. in diameter and reinforced by a 10-in. pipe. Both pipes are 20 ft. long but are sunk 8 ft. in a concrete foundation, leaving 12 ft. above the floor.

The main support is bored to a sliding fit on the



A VERY LARGE "ELBOW" DRILL

column and has clamping bolts so that it can be locked at any desired height for various work. When necessary to move the support on the column, either to raise or lower, the overhead crane is used, as the weight of the arms runs into tons.

The drilling arms are joined both at the "elbow" and on the column support so that the machine is very flexible when it comes to reaching different parts of the work. The arms have a total length of 10 ft. with the swing joint at the center. All joints have ball bearings so that the drilling head is easily moved into any desired position by one man. The maximum radius of operation is 10 ft. and the drill can be moved through an arc of 270 degrees.

The drilling head at the outer end of the arm has a vertical movement of 12 in. It carries a Van Dorn electric drill with a motor rated at 2 hp. and running 600 r.p.m. The feed is 1 in. in depth for each 183 revolutions of the drill. This machine is used exclusively for drilling boiler and similar plates, with holes up to $\frac{15}{16}$ in. in diameter. The plates are usually stacked to give a total thickness of approximately 6 in. A switch controls the starting and stopping of the motor and the drilling spindle.

Automobile Piston Clearances—Discussion

By Douglas P. Muirhead
Glasgow, Scotland

On page 65 of the *American Machinist* I notice that O. M. Burkhardt does not agree with the particulars given in my chart for piston clearances appearing on p. 344, Vol. 58, as he considers the clearance above the top ring to be too small. This is a subject on which no two designers seem to agree, as I have found from the large number of engines which I have measured at different times. In order to show that this is the case, I submit the accompanying table giving

TABLE SHOWING CLEARANCES ABOVE TOP RING ON PISTONS OF EUROPEAN AIRPLANE ENGINES

Cylinder Bore, Inches	Piston Clearance, Inches	Piston Material	Cooling	Clearance per In. of Diameter, Inches
4.500	0.022	Cast iron	Water	0.0048
4.724	0.020	Cast iron	Water	0.0042
3.937	0.027	Cast iron	Air	0.0060
5.118	0.031	Steel	Water	0.0060
5.590	0.031	Steel	Water	0.0055
5.708	0.040	Aluminum	Water	0.0070
4.500	0.020	Aluminum	Water	0.0044
4.724	0.031	Aluminum	Water	0.0060

particulars of piston clearances above the top ring for a few of the most successful European airplane engines.

It will be noted that practically none of the makers agree with each other as to what should be the correct amount of clearance for the different piston material and methods of cooling. It will be found that there is the same difference of opinion regarding clearances for automobile engines, and it is therefore difficult to employ any definite means of calculating the clearance when so many variables exist. I therefore think that experimental evidence is much more valuable.

I notice that Mr. Burkhardt states that the piston-head temperature has been found to be 800 deg. F. Here again a difference crops up, as Professor Hopkinson in this country found that the piston-head temperature in an ordinary four-cylinder automobile engine reached 932 deg. Fahrenheit.

I therefore maintain that the figures given in the chart are satisfactory for all practical purposes, and for probably 80 to 90 per cent of the engines on the market. It does not necessarily follow that the clearances given will be suitable for special high-speed, high-compression engines.

Appliances for Bending Steel Panels for Railway Cars

By A. Eyles
Manchester, England

The accompanying illustrations show appliances that I have recently designed for the purpose of bending steel-sheets and plates, embodying combinations of curves which could not be secured satisfactorily upon standard bending machines. The plates were to be used as panels along the sides of steel railroad-cars of various types.

Such panels were formerly made of wood from $\frac{3}{8}$ to $\frac{1}{2}$ in. in thickness, bent to the desired shape. Wood panels, however, have the disadvantage of shrinking, after a time, and causing the paint to crack. Also, in the case of accident, wood panels might be burned, or else so badly split that they could not be repaired, whereas in most cases a skillful worker can flatten out a dented or damaged steel panel.

Improvisations and appliances for manipulating sheet and plate metal work were an important feature in our shop, mainly for the reason that our orders were usually for a limited number of pieces, and it was often the case that effective results could not be obtained by the use of standard bending and forming machines. It was therefore necessary to devise such appliances in order as would effect results uniformly and expeditiously.

Referring to Fig. 1, *A* and *B* show the side and end elevations respectively of a cast-iron bending appliance, designed to form the corresponding curves of the panel shown in the same figure. This panel was made of Siemens steel, 0.098 in. thick.

To obtain the desired shape, one end of the steel plate is first put through the standard bending rolls and curved to a templet as at *C*. It is then taken out, the opposite end put in the groove *D* of the bending appliance and the metal bent over the form as far as possible, where it is clamped at *E* on both sides of the form. The curved part is then suitably worked over the form to the desired contour.

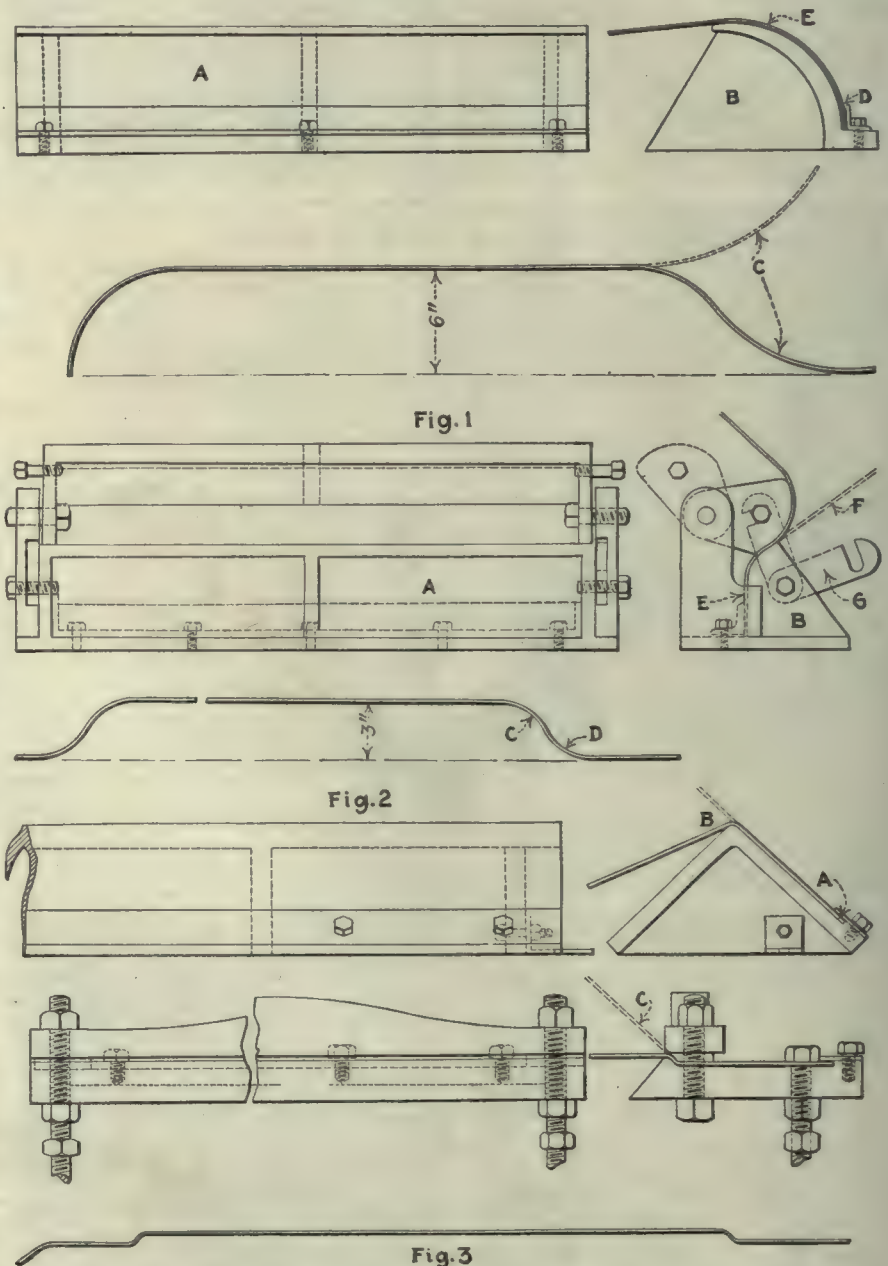
Orders for this type of panel are usually obtained in lots of 100 and it is needless to say that each curve is completed on the whole lot before proceeding with the next operation. Countersunk holes for wood screws are made in the plate before the bending operations are started.

In Fig. 2, *A* and *B* show the side and end elevations of a cast-iron bending appliance that proved extremely useful in forming the double curvatures *C* and *D* on a number of panels of 0.0625 in. Siemens steel. To bend the panel to shape, one end of the plate is put in the groove *E* and worked over as at *F*. The top portion of the appliance is then brought over and firmly secured by the fastener *G*, when the metal is worked over the form to complete the double curvature. It is then taken out and the opposite end treated in a similar manner.

Fig. 3 shows the side and end elevations of bending appliances employed to form another panel in which the radius of curvature was very short, necessitating the use of two appliances to obtain exactness of contour.

One end of the work is first put in the groove as at *A* and the plate worked over as at *B*. It is then taken out and placed on the form as at *C*, where the top portion of the appliance is screwed down to hold the metal while the remaining portion of the curve is being formed. It is then taken out and the other end bent in the same way.

Generally the surface close to the bend requires flattening and this is best done while the plate is still in the bending appliance. Care should be exercised that the hammer blows are delivered evenly and uniformly,



FIGS. 1, 2 AND 3—STEEL PANELS FOR RAILROAD CARS AND THE BENDING APPLIANCES FOR PRODUCING THEM.

as the result of irregular hammering will show up badly when the panels are painted and varnished. To prevent marking the metal, a block of wood of suitable size and shape should be used.

A Tapered Bearing Problem Solved by Right Triangles

By Karl G. Keck

A machine-tool spindle *S* in Fig. 1, assembled in its tapered barrel *W* mounted in housing *R*, revolved at a high rate of speed, and the driving belt running over pulley *K* repeatedly climbed up onto flange *F* of the pulley. As the belt which was being used happened to be of a woven material, the edges of it soon became frayed, causing the belt to rapidly wear narrower and narrower until the breaking point was reached. The

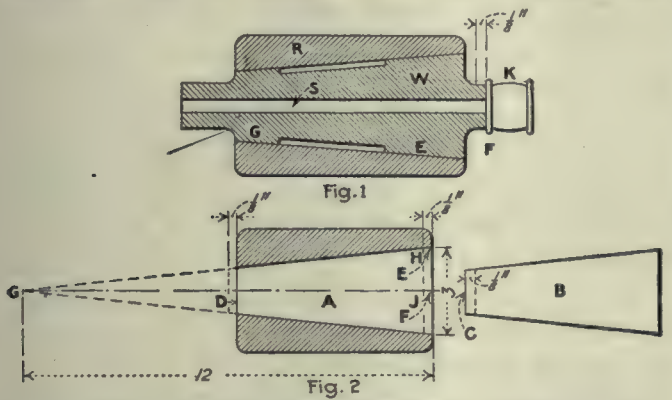


FIG. 1—SPINDLE ASSEMBLY REQUIRING ALTERING. FIG. 2—FINDING THE DIAMETER OF BARREL REQUIRED

extremely short life of the belts used on this drive soon attracted the attention of the superintendent of the shop in which the spindle was running; and an investigation followed to increase the life of the belts, which were expensive, and to eliminate also the frequent changing of the belt itself, which consumed quite a bit of time.

It seemed after careful consideration that, if flange *F* were placed nearer the housing *R*, the trouble would be eliminated and the fraying of the edges of the woven belts would stop. Therefore the superintendent instructed his men either to bore larger the hole in the housing *R*, or to turn down the tapered diameters *G* and *E* of the spindle barrel *W*, so as to permit of inserting the spindle and barrel assembly further into the spindle housing. The men decided to turn down the barrel diameters enough to allow moving the spindle and barrel assembly $\frac{1}{8}$ in. deeper in the housing than had been the practice—and here a snag was encountered.

No one seemed to know just how much the tapered spindle-barrel diameters should be turned down so as to allow the barrel to enter $\frac{1}{8}$ in. further than before. The engineering department and shop mathematics books were consulted, and by the use of trigonometry and higher mathematics the problem was solved.

The actual calculations involved in the solutions that were offered did not, however, appeal to the men who had been given the job of turning down the diameters of the spindle barrel, so these men persisted in finding a more simple solution, and one whose calculations they themselves could understand and learn for future use. Finally, the following plan was hit upon, and it proved the simplest and quickest of all those offered.

Hole *A* in Fig. 2 which represents the bore through the housing for the spindle barrel, was found to be tapered 3 in. to the linear foot, included angle. Normally *B*, which represents the spindle barrel, fitted into hole *A* so that end *C* came flush with the housing at the small diameter *D* of the hole.

Completing the figure for one-half of the bore, the similar right-angle triangles *GEF* and *GHJ* are obtained. In solutions of similar triangles the corresponding sides are proportional. Thus

$$GF : EF = GJ : JH$$

$$\text{Or, } 12 : 1.5 = 11.875 : JH$$

$$JH = \frac{11.875 \times 1.5}{12} = 1.4843 \text{ in.}$$

$1.5 - 1.4843 = 0.0157$ in. to be removed from one side.

$2 \times 0.0157 = 0.0314$ in. stock to be removed from the maximum diameter.

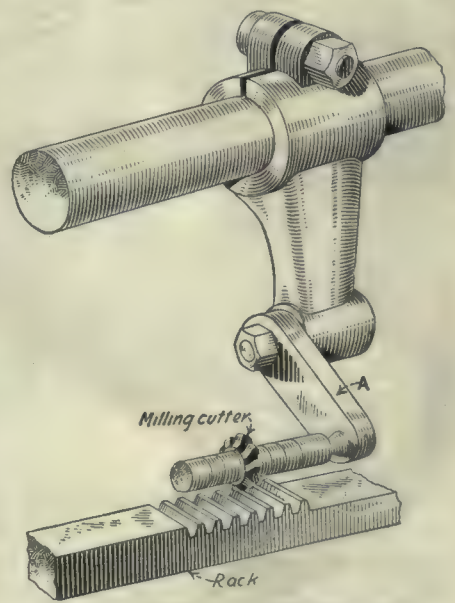
Thus the barrel will protrude 0.125 in. at the left and the flange *F* in Fig. 1 will be moved the same amount toward the housing *R* when the barrel is turned to the same taper as before, but with a maximum diameter 0.0314 in. smaller.

The real reason for the value of this method of figuring the result lies in the fact that the calculations are based on the taper of the bearing and are quite simple. It is thus not necessary to make a separate calculation for each size of bearing. No matter what the diameter be, it is merely necessary to remove the amount just calculated, in order to bring the barrel $\frac{1}{8}$ in. further into the housing.

Auxiliary Milling-Machine Center

By R. R. Joseph

It occasionally happens that the lower end of the outer support on the overarm of a milling machine is too large to allow the table to be brought up so that small cutters can be used. The cutting of a piece of rack is an example in point. By using a small strap or auxiliary arm, as shown at *A*, it is possible to get very close to the work. This strap *A* is simply a substantial piece of steel with a steel center in the end for supporting the outer end of the cutter arbor. The diameter of the center in the end of the strap should be no larger than the diameter of the spacing collars on the arbor and the strap should not project beyond the large diameter of the center. This device will be found very useful in many cases, and can be made up in advance, so as to be available at any time.



SMALL AUXILIARY CENTER FOR OVERARM ON MILLING MACHINES

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors
November 1, 1923

There Are Real Dividends In Modern Equipment

A CERTAIN shop manager took a machine tool salesman into his plant not so long ago and showed him one of the machines he represented that had been running for 25 years and was still on the job. The manager was trying to please the salesman, of whose machines he was genuinely proud. Imagine his consternation when the salesman told him that he ought to be ashamed to let anybody know that he had kept a machine on production work for 25 years.

The sequel to this story is not yet. But that salesman has the figures to show that the old machine is losing money for the manager every day and it is safe to predict a replacement soon.

The salesman is going to show the amount of total added investment in buying the new machine, which will include the cost of the machine with standard tools plus the cost of special tools, minus the second-hand cash value of the discarded machine. He will then show the saving per year due to the new machine, figured from the time saved per piece, the production per day, and the number of working days. From the saving per year he will deduct for the depreciation of the machine and standard tools and will write off all of the special tools, in that way arriving at his figures for net saving. Finally he will divide the net saving by the cost of the additional investment to obtain the earning power in per cent. The manager of the plant will quickly awake to the perils of his 25-year-old machine, if the figures are anything like some that the salesman has already produced, which run from 50 to 145 per cent.

It was pointed out on this page some weeks ago that "the best way to show faith in the stability of your own business and in your management is to invest in the best machine equipment that can be had to handle your work." Investments that will return anything like 50 to 145 per cent are indeed scarce. The men who sell production tools ought to be able to put it all over the bond salesmen with their very ordinary 6 to 8 per cent.

Automobiles and Prosperity Go Together

TRANSPORTATION has always been a vital factor in civilization. Without any motive power all business would be confined to an area limited by a man's walking ability. And the transportation of merchandise would be almost out of the question.

Consider the transport facilities afforded by the motor car in both the passenger automobile and motor truck. It is little wonder that the desire for individual transportation facilities has become so widespread. In spite of predictions of dire disaster due to the extravagance of owning motors, the results seem to reverse the case. For we find that localities having the most automobiles are the most prosperous.

An analysis of the situation lends credence to the belief that the states with the greatest wealth have the most automobiles because the use of motor transport helps materially in creating the wealth with which they are purchased. The development of outlying districts is greatly aided by motor transportation and the rapid movement of both passengers and goods in turn increases the wealth of the community.

Because of the automobile all manufacturing industries have learned much in the way of large scale production, of maintaining accuracy at ever lowering costs. Machine tools have been developed for the building of motors which are now available for machinery of different kinds.

Bearing in mind that transportation is the key of civilization, the automobile deserves more consideration as an aid in production of wealth than it usually receives. It is in most cases no longer a luxury but as much a necessity as the telegraph and the telephone. And the benefits it has brought to other businesses far outweigh any just charges of extravagance on the part of some of those who use it.

Research and "Digging" in the Gear Industry

THERE was a sound, constructive suggestion made by E. W. Miller in a paper before the American Gear Manufacturers Association last week. He wants the association to do some research work in locating new uses for gears. Digging up opportunities for new applications isn't generally dignified by the term "research," but it may well be; at any rate the digging process will open up the way for a great deal of research that will have a splendid throw-back on the industry.

Up to the present the members of the association have been directing their energies to finding new methods of making gears and to learning how to make them accurately, both necessary to prevent wasteful effort in finding more uses for gears. But development of accuracy and process is now so far along that a part of the energies of the association may be directed to finding new uses, in other words more business. Whether by research engineers employed by the association, or by industrial firms, the association would decide. Nor would the work be entirely selfish. As was pointed out, it should in no case be the intention or the fact to recommend the use of gears where better results could be obtained without them.

This matter of research gives rise to another line of thought. What wouldn't thorough "digging" do to keep away dull times? Some of the gear manufacturers know that they can keep their output on about a level line if they dig hard enough to get orders. As they put it, the business is there if it is only hunted up. Following out Mr. Miller's suggestion would be going after it harder than ever.

Shop Equipment News

The M.-G. Production Unit

The "M-G. production unit" is the name applied to a recently developed machine tool by its makers, the Meldrum-Gabrielson Corp., West Fayette and Niagara Sts., Syracuse, N. Y. The machine is adapted for the production of large quantities of parts such as used in the manufacture of automobiles. It can be applied to drilling, reaming, tapping, boring, turning, milling and other operations.

By referring to the accompanying illustration, it will be noted that there are two columns independent of each other; the only connection between the two machines are the base and tie-bar. The arrangement provides a very compact machine, making it easily possible for the operator to serve both spindles without moving from his position. The center distance between the spindles is 33 inches.

The machine illustrated is the No. 2 size, and is capable of driving a 2-in. drill through nickel steel with a feed of 0.015 in. per revolution. The mechanism in each column is driven by means of a single pulley mounted between the columns. These pulleys are 4½x16 in. in size and run at 450 r.p.m. When desired, individual motor drive can be employed, with a 5-hp. motor mounted on the back of each column.

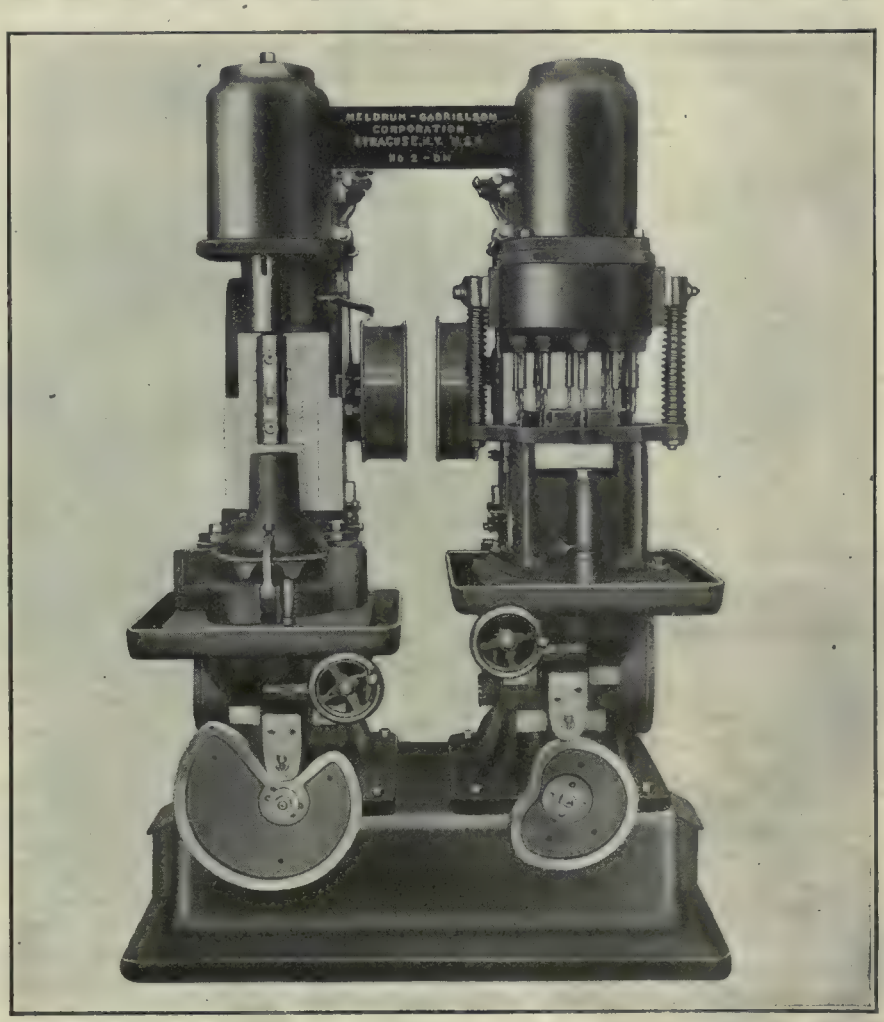
Before going further, it would be well to note construction of the column. It is of box form and made in one piece from the base to the spindle head. The absence of a joint at the bend provides rigidity. The average section of the column is 9x12 in., and the throat depth is 12 in. The full height of the machine is 6 feet.

The work is held on the table by a special clamping fixture best adapted to it. The table, in turn, is mounted on a slide secured to the front of the column and provided with a vertical feed. The motion of the slide is obtained by means of large cams that can be seen at the front of the machine near the floor. These cams can be provided to give a maximum drop of 10 in. In addition the table can by means of the handwheels be adjusted 13½ in. on the slide to suit the height of the work.

The cams are employed instead of screws for the feeding motion, as by means of them the speed of the motion can be varied throughout the cycle to suit the work. It is thus necessary for the operator only to start the machine; the rest of the cycle is carried on automatically until completed, at which point the machine stops.

The mechanism employed for driving and feeding is completely enclosed in the column, so that dust cannot reach it. Inside each driving pulley is an expanding ring clutch that is operated by means of a lever on the side of the head. From the pulley shaft another horizontal shaft above it is driven by means of gears. The gears on the pulley shaft slide on splines, and are arranged so that two speeds can be obtained, with a ratio between them of 1:1.2. Sliding the gears is done by a lever on the outside of the column.

This second gear shaft is provided at its outer end with a removable change gear that meshes with a similar gear on a shaft placed above. Access to the change gears can be obtained by removing the cover plate on the side of the column. By interchanging the removable gears, together with the two quick changes of gears, four spindle speeds are obtainable. By selecting change gears to suit the work, any speed necessary can be had.



M.G. PRODUCTION UNIT

From the upper change gear shaft the drive is through bevel gearing to a shaft placed at an angle and passing through the bend of the column. The upper end of the shaft connects through bevel gearing with the upper end of the spindle. The spindle is mounted in three ball bearings, two double-row radial thrust bearings and one single-row, all being ample in size to carry any load within the capacity of the machine.

The face of the spindle is flush with the head. Extensions can be provided to suit the particular type of machining operation, and they are mounted on the face of the spindle by a tongue and groove joint. It should be noted that the spindle has no feeding motion.

The feeding mechanism, which is entirely independent of the drive, is below the pulley shaft. The feeding motion goes first through gears to a horizontal shaft below the pulley shaft, and then to another horizontal shaft carrying both a bevel gear and at its outer end a pulley to drive the pumps. A frame pivoted about this shaft carries a vertical shaft driven through bevel gears. At the lower end is a worm meshing with a bronze wormwheel. To start and stop the feed the frame is swung, thus putting the worm in and out of mesh with the wormwheel. This motion is controlled by a small lever on the head.

Feed Gearing and Cam

The wormgear shaft carries change gears in a box on the outside of the column. By alternating the gears two rates of feed can be obtained; and by using different gears any required feed can be obtained. The lower shaft of the pair for the change gears carries another worm inside the column. This worm drives a large bronze wormwheel on the same shaft which carries the cam that can be seen on the front of the machine. The cam follower mounted on the slide can also be observed, so that it should be clear as to how the vertical feed is obtained.

A pump mounted on each column forces the coolant to the work and floods it over the cutting tools. Provision is made on the table to care for the coolant, which is returned from the table to the reservoir.

A feature of the machine that deserves particular attention is the arangement for oiling the bearings and gears. Each column has its own oil pump mounted on the back of the column and taking oil from a 7-gal. reservoir in the bottom of the column. The oil is pumped to the top of the head and flows over the spindle bearings. From here it runs down over all the gears and bearings in the driving and feeding mechanisms. Deflectors are placed where necessary so as to guide the oil and cause it to cascade over all the frictional surfaces.

One of the main characteristics of the machine is its rigidity and strength, suiting it for continuous operation under heavy cuts. The weight of 6,500 lb. is sufficient to prevent excessive vibration. All the gears and the shafts are made of chrome-nickel steel and are heat-treated and ground. None of the gears are fastened to the shafts by keys, but in every case the gears are broached and the shafts machined with six splines.

Ball and Bronze Bearings

New Departure ball bearings are employed for every shaft in the machine with three exceptions. These shafts are the bottom ones in the feed mechanism, and carry the worm gearing that was previously mentioned. At this point the speed is very low, so that bronze bearings can be employed to advantage.

We can now give more attention to the method of mounting the work, and to the different operations that can be performed. The flexibility of the machine should be noted particularly, as a great many operations can be done. On one spindle roughing might be done, and finishing on the other. By changing the fixtures, one machine may be made to serve for a great variety of operations.

A typical part, and the one for which the machine was originally developed, is the carrier employed in the differentials of automobiles. There are five units employed on the work, each doing its own special operation. They differ only in the work holding fixtures, in the cams and in the tools fitted to the machines. In the illustration this carrier itself can be seen on the table at the left.

The work is held by means of an air chuck. A stabilizer or brace not shown steadies the top of the casting. The machine is equipped with a boring bar that is roughing the pinion bore for two diameters and facing the end. Operation 2, shown in the set-up at the right, consists in drilling twelve holes in the flange and four holes for the caps. The work is held in a swinging fixture, which enables its easy replacement. As the table rises, the work is clamped from above by the spring-pressure plate. On the head of the machine is mounted a special drilling head fitted with sixteen spindles.

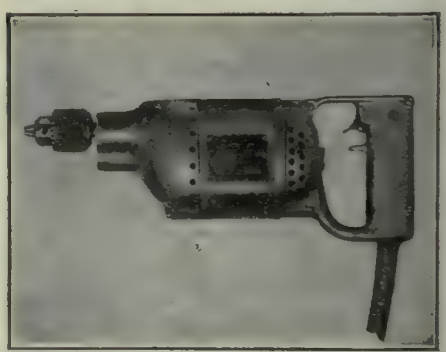
The other four units, required to finish the part, perform the operations of the rough and finish milling of the flange and the cap seats, tapping four ½-in. holes for the cap, spot facing the twelve bolt holes, roughing and finishing the cross-bore, and tapping the cross-bore.

The variety of the above operations, together with the fact that they are all done on the same machine or unit, using proper tools and cams, shows the versatility of the machine. The five units, run by three operators, have effected a considerable economy as compared with the methods formerly employed. The estimated time for completion of this part was 15 min., but the time has been further decreased in practice.

Black & Decker 5/16-In. Portable Electric Drill

A recent addition to the line of portable electric tools manufactured by the Black & Decker Mfg. Co., Baltimore, Md., consists of an electric drill with a capacity up to ⅝ in. in diameter in steel.

This tool is similar to the ¼-in.



BLACK & DECKER ⅜-IN. PORTABLE ELECTRIC DRILL

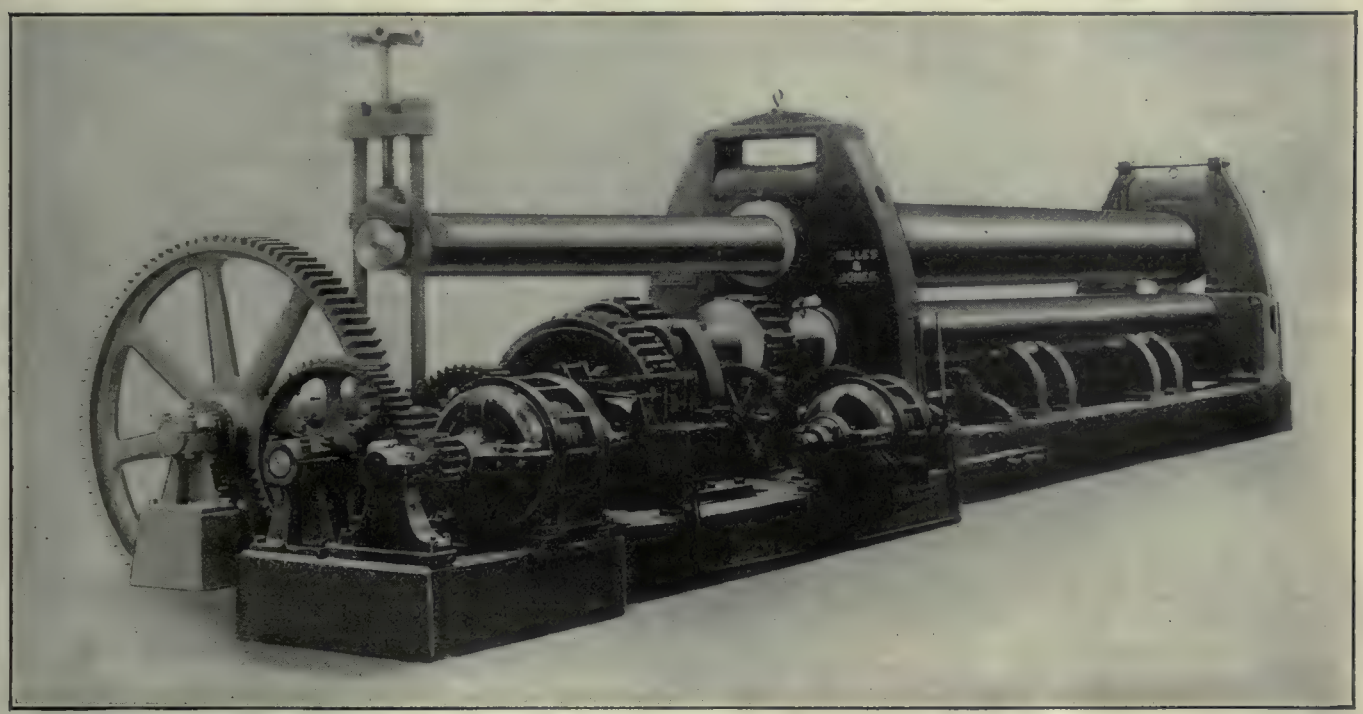
drill made by this company and previously described on page 742, Vol. 55, of the *American Machinist*, but has a more powerful motor and is proportionately heavier. It is equipped with the pistol grip and trigger switch found on other tools of this line.

The 3-jaw gear nut chuck is adapted for straight shank drills. The tool weighs 7 lb., and the no-load speed of the motor is 1,400 revolutions per minute.

Hilles & Jones No. 9 Bending Roll

An exceptionally large boiler plate bending roll has recently been completed by the Hilles & Jones works of the Consolidated Machine Tool Corp. of America, 17 East 42nd St., New York, N. Y. This machine is shown in the accompanying illustration and was built for the Heine Boiler Co., to handle plates up to 1⅝ in. thick and roll them to relatively small diameters. This machine has been designated No. 9, and is of the heavy-duty, hinged-housing type.

The distance between the housings is 26½ ft. so that plates up to 26 ft. long can be handled by the rolls. Two interchangeable upper rolls are provided, 30 and 36 in. in diam., respectively. The 36-in. upper roll is used for rolling the heaviest plate to comparatively large diameters, the smaller roll being provided to roll plates to diameters as small as 36 inches.



HILLES & JONES NO. 9 BENDING ROLL

Mounting for Lower Rolls

The lower rolls are each 22 in. in diameter and the roll bearings in the housings are bushed with bronze. All the rolls are made of open hearth forged steel, and the upper rolls have a solid forged extension which counterbalances the roll when the back housing is dropped down for the removal of plates rolled to full circles. The housings and all driving gears are steel castings, the housing bed plates and gearing bed plates being semi-steel castings with a box section.

The upper roll is supported from the roll necks which are fitted in trunnions having bearings bushed with bronze. The trunnions are carried in yokes, the back yoke being a steel casting while the front yoke, which supports the upper roll when counterbalanced, is a steel forging machined to shape. The raising and lowering of the roll is accomplished through a worm and worm wheel drive, which is so designed that both ends of the upper roll may be raised or lowered simultaneously, or one end held stationary while the other end is raised or lowered.

This arrangement for operating the upper roll is necessary in rolling plates to conical shapes, and is often found advantageous in ordinary boiler shop practice. The worms are machined cast bronze and run in enclosed bearings designed to provide for lubrication with either heavy oil or grease. The worm wheels meshing with the worms are made of cast steel and have teeth cut from the solid.

The driving pinions on the lower roll necks are steel castings shrouded to the pitch line. These pinions are both driven from a wide faced cast steel gear also shrouded to the pitch line, and this driving arrangement conveys power directly to both lower rolls. The machine is geared for two speeds; a slow speed for handling the heavier plates, and a high speed for handling lighter plates. The control of the speeds is by hand levers direct to positive clutches.

Roller Supports for Lower Rolls

Two substantial roller supports are provided for the lower rolls and each support carries four forged steel rollers finished to 7⅛ in. in diameter. The rollers are carried in closed end bearings, which design provides for lubrication of the rollers by means of large grease cups, and this arrangement not only insures lubrication but also keeps scale and dirt from clogging and stopping the action of the rollers.

All high-speed shafts have bearings bushed with bronze, and substantial outboard bearings are provided to carry the outer end of all driving shafts so that there are no overhanging gears. All these bearings are provided with oil cups for effective and ample lubrication.

The machine is operated by two motors, a motor of 125 hp. being used for driving the lower rolls, and a motor of 60 hp. for raising and lowering the upper roll. The large motor is located at the front end of the machine as shown in the illustration, the other being placed near the front roll housing. The weight of the machine is 415,000 pounds.

"Rapidor" Metal Sawing System

The "Rapidor" machines for metal sawing, manufactured by Edward G. Herbert, Ltd., Manchester, England, have recently been placed on the market by the Tinius Olsen Testing Machine Co., 500 North Twelfth St., Philadelphia, Pa.

The feature of this metal sawing system is an unusual design of

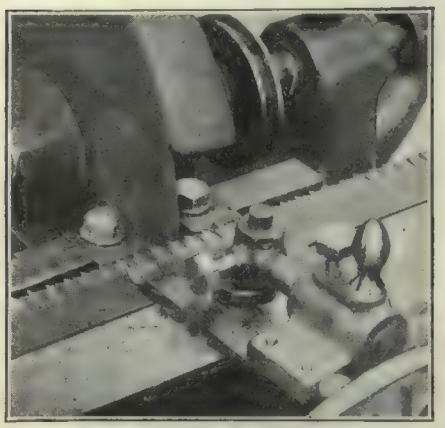


FIG. 1—"RAPIDOR" GRINDING MACHINE WITH BLADE IN POSITION

hacksaw blade in which the teeth have a set which extends below the bottom of the teeth, making it possible to sharpen the blade until after the original teeth have been entirely ground away. To handle these blades a special grinding machine and an improved sawing machine have been developed.

The grinding machine is shown in Fig. 1 with a blade in position to be ground and the special design of

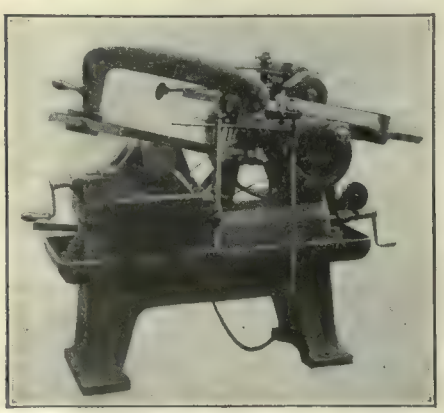


FIG. 2—"RAPIDOR" SAWING MACHINE

the blade is illustrated. The teeth are automatically ground to the correct shape, the blade being moved up to the wheel in contact with models of the correct tooth contour. The teeth are ground on both faces. A diamond truing device is provided for dressing the wheel to the correct angle. This machine, though designed especially for the "Rapidor" blade, will grind any hacksaw blade to considerable advantage, and the special blade may also be ground on other machines.

These blades are made of high speed steel containing 18 per cent tungsten and are hardened throughout. It is stated that they can be ground as many as 20 times, the cutting speed increasing after each grinding. It is claimed that the average time required per cut is halved by the use of this blade, and that the output per blade is increased more than seven times.

"Rapidor" Sawing Machine

The sawing machine shown in Fig. 2 possesses all the features of the "Rapid" sawing machine manufactured by this company, the detailed design having been revised in many particulars to take advantage of the speed and power of the special blades. The machine is made in two sizes, one with a capacity up to 6-in. rounds or squares, the other handling rounds up to 10 in. in diameter and other sections to 12x8 in. in size.

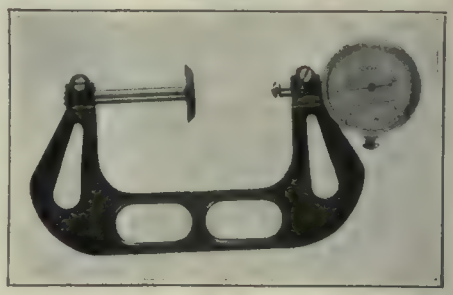
The sawing machine can be operated at a speed of 170 r.p.m. and applies a heavy pressure to the blade. The main shaft and crank pin are hardened and ground. A mechanical system of lubrication is provided, the oil being supplied to all parts of the machine from a central reservoir. The saw holders have a device which indicates when the saw is strained sufficiently, and intended to prevent breakage of saws through incorrect tension.

Federal Round Stock Gage

The Federal Products Corp., 15 Elbow St., Providence, R. I., has added to its line a gage, or comparator, for checking the diameter of round stock up to 4 inches. The tool consists of a skeleton yoke, an adjustable anvil and a standard Federal dial gage with reset dial and clamping screw.

The design of the yoke is such as to combine lightness with strength and at the same time provide a convenient grip for the operator's fingers. The anvil has a mushroom head with a flat surface of ample size to insure a proper bearing of the work upon it. The edge of the anvil is bevelled and the end of the measuring spindle rounded so that the gage may be pushed over the stock readily.

The gage is first set to a size block or trial piece by clamping the adjustable anvil in the required position



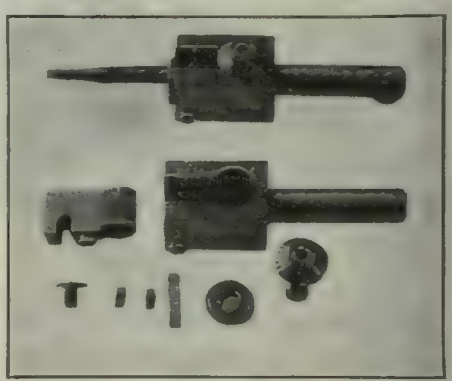
FEDERAL ROUND STOCK GAGE

and setting the dial so that the pointer will stand at zero. Variations in the diameter of succeeding pieces of stock above or below size are thus read directly from the dial in thousandths of an inch.

Art Tool Co. Adjustable Offset Boring Tool

The small and accurately adjustable offset boring tool holder for tool and jigmakers' use, shown in the accompanying illustration, is made by the Art Tool Co., 16 Montgomery St., Bridgeport, Conn.

The body of the tool is made of



"ART" ADJUSTABLE BORING TOOL

mild steel, pack-hardened and ground. The shank fits the ½-in. collet of the toolroom or bench lathe. The cross-slide is made to fit the apparently round hole in the body, but this hole is not round below the counterbore for the dial; it is so shaped as to present two flat parallel bearing sides, against which the slide is held by the pressure of the two small coil springs.

The dial is so graduated as to read in thousandths of an inch upon the diameter of the hole being bored. Tools made of drill rod are used, and are held in the slide by a hollow head setscrew. The screw that binds the

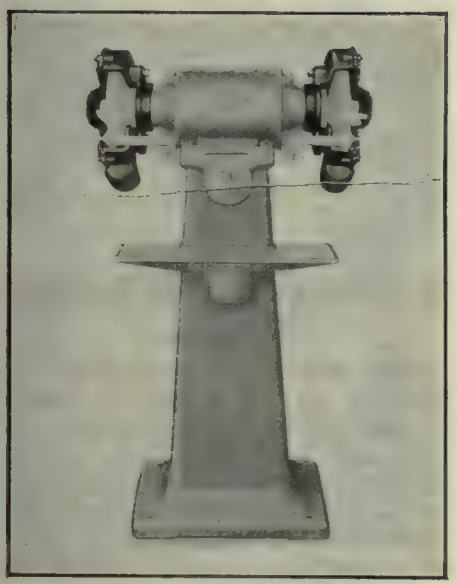
cross-slide after each adjustment has a hollow head also, but is made like a fillister head screw and is tapped into the opposite side of the yoke in such manner as to draw the sides of the yoke together. This gives a firm hold upon the slide.

One wrench is used to manipulate both set and binding screws, as well as to turn the adjusting screw.

Hisey-Wolf Grinder Improvements

The line of grinders manufactured by the Hisey-Wolf Machine Co., Cincinnati, Ohio, are now furnished with an improved design of combination wheel guards, and a form of motor starter which is superior to the former switch.

A machine with these features is shown in the accompanying illustration. The wheel guards are interchangeable with the standard open-type guards, and are fitted with removable end covers and exhaust pipe connections. They are adjustable to any angle, making them adaptable to a variety of work. As the wheel wears the guard may be moved back on its bracket to give full access to the wheel, with maximum guard protection.

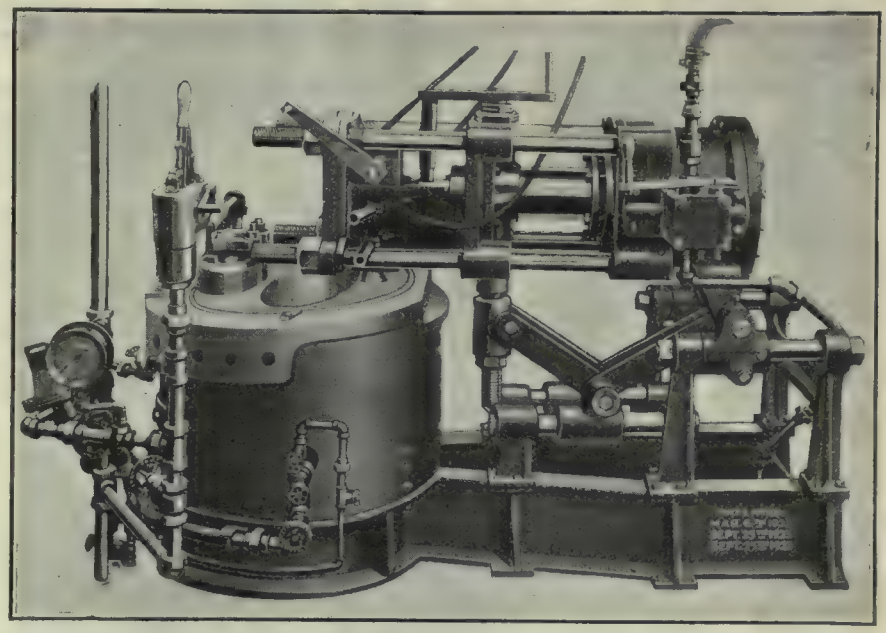


HISEY-WOLF GRINDER IMPROVEMENTS

The motor starter consists of an operating or control button conveniently located at the front of the machine and the switch proper completely enclosed in the base. This method of mounting insures protection and permits access to the switch by removing a cover plate.

Dollin Die Casting Machine

A die casting machine, designed for high production and simplicity of operation, is now being marketed by Edgar N. Dollin, 6 Church St., New York, N. Y. The machine is air-operated, a pressure of 200 lb. being used in the cylinder which operates the die and 400 lb. for shooting the metal.



DOLLIN DIE CASTING MACHINE

The accompanying illustration shows the machine in the closed position. The die sections are fastened to two plates, one of which is held by the four rods attached to the cylinder, the other being fastened to the end of the piston rod. The vertical distance between the centers of the rods is 16 in. and the horizontal spacing is 19 in. The stroke of the cylinder is 10 in., and the greatest over-all die depth is 18 inches.

The die carriage cylinder is 14 in. in inside diameter and carries at one side the valve mechanism for operating the dies. This mechanism is a feature of the machine as it is arranged to provide a back pressure of 100 lb. per sq.in. in the cylinder as the dies are closing, thus insuring steady action. To close the dies the handle is moved from the right to the center.

When the dies have closed the valve is moved to the position shown in the illustration, the back pressure is removed and the full 200 lb. per sq.in. pressure is available to hold the dies together against the pressure of the metal. It is claimed that this action in the die carriage cylinder results in a substantial decrease of the air required for operation.

The metal heating and shooting unit is attached to the base at the left, the pressure end of the goose-neck being at the left of the pot in which the metal is melted. The nozzle is at the right, directly under the die. The pot has a capacity of about 1,000 cu.in. The die can be closely adjusted to the nozzle. Vertical adjustment is obtained by means of the vertical screw and the horizontal adjustment by a rack and pinion at the die carriage pivot.

Goose-Neck Construction

The separate air valve for the goose-neck is located at the left of the pot. The dies are gated on the sides between the die surfaces, a feature which makes the extraction of the casting somewhat easier. The goose-neck is vertical and runs from the air valve under the pot and to the nozzle on the other side. The machine shown in the illustration is arranged to burn fuel oil but gas-burning equipment can be furnished if desired.

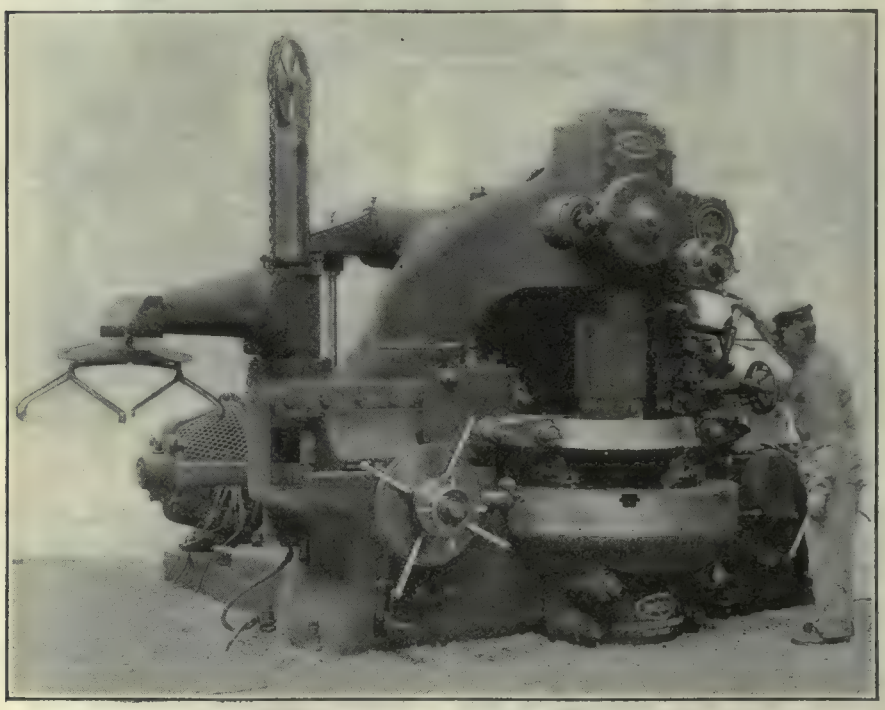
It is stated that the product is close-grained and well-finished due to the methods of heat regulation and air application, and the goose-neck construction. The machine may be used for large or small castings with a variety of metals at equal efficiency. Pots and dies can be easily and quickly changed.

The floor space required for the machine and two operators is about 9x10 ft. The shipping weight is 3,500 pounds.

Niles-Bement-Pond Vertical Car Wheel Lathe

A vertical, single-purpose car wheel lathe for machining rolled or forged steel car wheels has recently been placed on the market by the Niles-Bement-Pond Co., 111 Broadway, New York, N. Y. The machine is adapted to receive the wheels as they come from the hot-working operation.

The operations performed on this lathe consists of turning the contour of the tread and flanges, facing the hub and rim on one side, bossing eccentric hubs where such exist, undercutting the rim and scribing the wear line. All these operations are accomplished simultaneously with the exception of the last, which is postponed until the wheel is finished. The capacity of the machine ranges between wheel diameters of 33 and 42 inches.



NILES-BEMENT-POND CAR WHEEL LATHE

The contour of the tread and flange on a rolled wheel, as it comes from the hot-working operation, conforms roughly to that which it will assume when finished, and the hub has a rough hole hot-punched through its center. All the surfaces retain the minimum amount of stock necessary for producing a good finish.

It is stated that several of these machines are maintaining the record output of 60 wheels a day, about 525 lb. of metal being removed per hour. This amount of work, on the operations mentioned above, formerly required the services of ten machines, so that the reduction in number of machines used is nearly 60 per cent, an important fact when the labor costs are considered.

Some of the operations performed by this lathe are the same as those ordinarily done on the standard horizontal car wheel lathe, but this new machine is designed more on the plan of a heavy boring and turning mill. The horizontal rotary table and long square steel tool bar, adjustable vertically, bear out this rough similarity, but the absence of a cross-rail is a marked departure.

The square tool bar slides vertically in the main housing and carries a tool holder with inserted blades which face off the hub and boss eccentric hubs. A special motor provides this bar with power down feed and power traverse in both directions.

The main right-hand side head rough turns the flange and tread and is provided with power feed. It carries in addition an auxiliary tool head in which are secured the tools which face and round the rim and undercut it, and another tool which later scribes the wear line. Cross and vertical hand adjustment for these tools is also provided.

The left-hand side head makes the finishing cut on the flange and tread. This head has vertical hand adjustment and power cross feed. The feeds to all heads are independent of each other and have automatic trips which disengage the feeds at predetermined points.

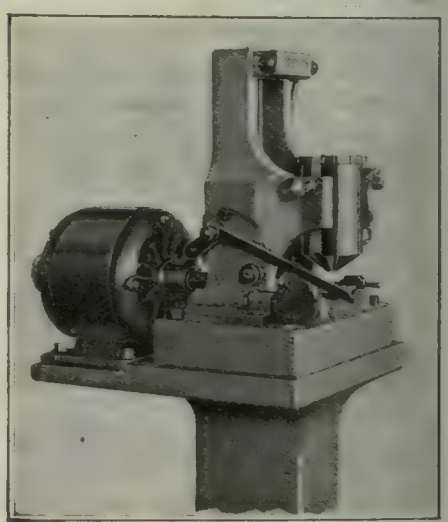
The main driving gear is a Maagcut spur gear twice the diameter of the table and with a 12-in. face. A variable speed motor with a 3 to 1 range is direct-connected to the machine.

Provision is made at all points for a liberal supply of oil. The lubricant for the table track and the spindle flows by gravity from a reservoir inside the machine, and to a tank from which it is returned by a pump to the reservoir. The main drive gears are enclosed and run in oil. Shaft bearings have sight-feed oilers.

A pneumatic crane for handling the work has three pneumatically operated jaws which expand in the center hole. Three serrated, quick-acting dogs hold the wheel on the table and drive it. The wheel is centered on the table by means of a roller held in the left-hand side head.

Pittsburgh Impact Testing Machine

The Pittsburgh Instrument & Machine Co., 40 Water St., Pittsburgh, Pa., is now marketing its continuous and alternating impact testing machine which determines, by means of a test specimen, the elasticity of a given kind of steel. In general, the operation consists in



PITTSBURGH IMPACT TESTING MACHINE

subjecting a standard shape of test specimen to repeated blows of a hammer, the specimen being rotated a certain amount after each blow and the number of blows required to fracture the specimen being recorded on a counter.

The machine is mounted on a pedestal which is furnished with it, and consists of a frame in which a hammer is arranged to be raised and dropped by the action of an electric motor. The specimen is mounted beneath the hammer and is turned by the pinion and rack device shown in the illustration. The turning device may be set to turn the specimen through a certain angle depending on the kind of test to be made.

For a "continuous" impact test the specimen is turned through 1/25 revolutions after each blow of the hammer, and for an "alternate" test it is rotated through 180 deg. The latter represents the stresses found in crankshafts and the former gives stresses such as develop in railway axles or automobile shafts.

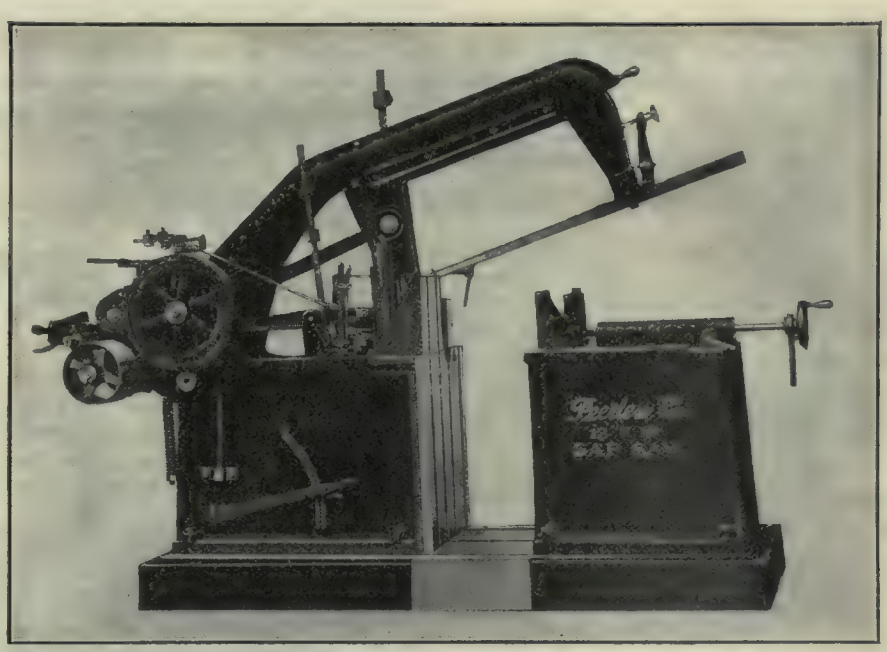
The test specimen is machined to a diameter of 0.5 in. with a round or V-shaped notch reducing the diameter at one point to 0.4 in. The notches must be well polished. A shaping tool, jig and micrometer for preparing the specimens can be furnished if desired.

The hammer weighs 9¼ lb. and the height of drop is 1⅞ in. A d.c. or a.c. motor to run at 1,750 r.p.m. is furnished with each machine. The net weight of the complete machine is 300 pounds.

Peerless 13x16-In. Gap Saw

A power hacksaw, which is called a gap saw on account of the unusual construction of the bed, has been recently placed on the market by the Peerless Machine Co., Racine, Wis. As shown in the accompanying illustration, the feature of the machine is the bed or frame, a section of which is arranged to be slid forward on a machined pad giving an excess work-holding capacity of 24 in. in height and 16 in. in width.

When the gap is closed the saw can be used for ordinary purposes. With the gap open a piece of steel 16x26 in. can be sawed in two by sawing through 13 in. and then meeting the cut by turning the piece over. The machine is also adapted for blocking out hammered forgings prior to the machining operations.



PEERLESS 13X16-IN. GAP SAW

The work can either be clamped to the vertical finished face of the bed where four T-slots are provided for the purpose, or directly to the base, in which three T-slots are machined. The blade holder will accommodate blades from 14 to 25 in. in length.

The base has a water trough extending clear around its perimeter which carries the coolant back to a reservoir located at the rear. From the reservoir a rotary geared pump forces the coolant up into the pipe which distributes it to the blade. The finished pad on each side of the base opposite the gap is for the convenience of the operator when locating work which is clamped directly to the base. The left-hand edge of the bed is also finished for measuring purposes.

The head and feed mechanism is the same as that used on the standard 13x16-in. saw manufactured by this company and previously described on page 790, Vol. 46, of the *American Machinist*. The head lifts on each return stroke and, at the bottom of the cut, the feed is disengaged and the head is lifted to its uppermost position by the usual arrangement of balance springs. Blade pressure or feed can be varied at will by raising or lowering the ratchet lever at the side of the bed.

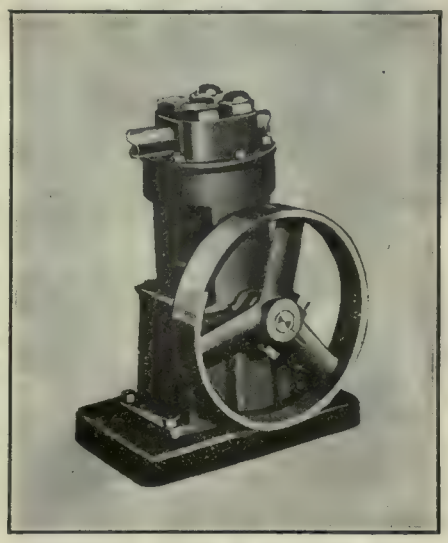
The machine shown in the illustration is equipped with the standard six-speed stroke mechanism, which is furnished when the materials to be cut require different cutting speeds. Either this attachment or the usual 2-hp. motor, or both, can be furnished with the machine.

The distance from the floor to the top of the base is 6 in., the top of the table being at a height of 30 in. The machine occupies a floor space of 30x80 in., and the net weight is approximately 3,000 pounds.

Ingersoll-Rand Type 15 Vacuum Pumps

The Ingersoll-Rand Co., 111 Broadway, New York, N. Y., is now marketing a line of small, vertical, belt driven vacuum pumps which are designated the Type 15. These pumps are of small capacities. Six sizes are included, ranging from 4x2 in. to 8x5 in. in the single-acting type, and with 10x5-in. and 12x6-in. machines of the double-acting pattern.

In addition to the standard belt



INGERSOLL TYPE 15 VACUUM PUMP

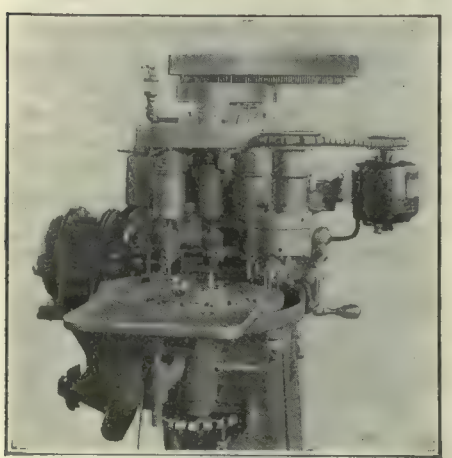
design shown in the accompanying illustration, each size is built as a self-contained, motor-driven unit, using a short belt arrangement or driving through a pinion and an internal gear. When motor-driven the pump and motor are mounted on a sub-base.

It is stated that these pumps will pull and maintain a vacuum of from 28.6 to 29.25 in. depending on the size. The single-acting pumps are air-cooled by an annular ring which encircles the cylinder, while the double-acting pumps are cooled by means of circulating water.

A "constant-level" system of lubrication is used in which the bottom of the pump base forms an oil reservoir. Above the reservoir and directly under the connecting rod is a constant level pan into which the connecting rod dips and distributes a quantity of oil sufficient for proper lubrication. The pan is replenished from the reservoir by a valveless oil pump operated by an eccentric on the main shaft.

Anderson Combined Drilling and Tapping Machine

The Anderson Die Machine Co., 544 Iranistan Ave., Bridgeport, Conn., has recently added to its line the combined drilling and tapping machine shown in the accompanying



ANDERSON COMBINED DRILLING AND TAPPING MACHINE

illustration. This machine is a development of others that have recently been shown in the *American Machinist*, but which were designed for tapping only.

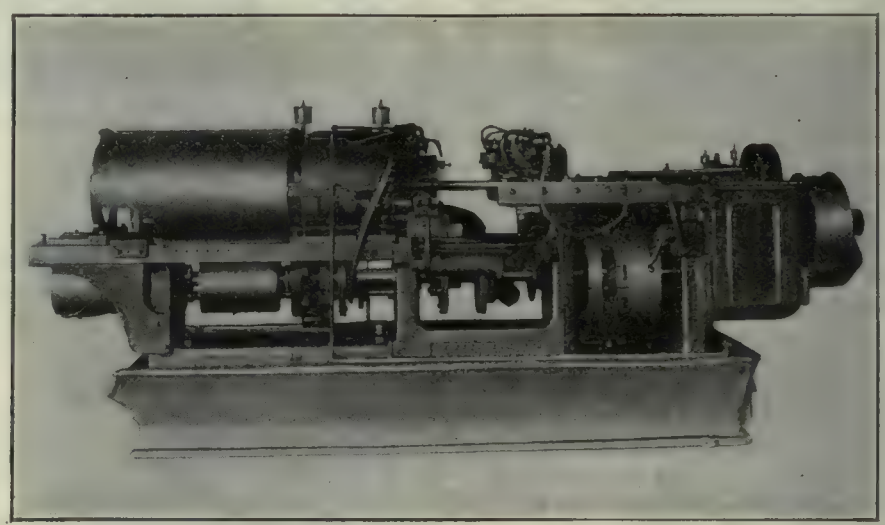
The machine is provided with a feeding dial for handling all kinds of work that comes within its range, has three reversing spindles for tapping, which are adjustable for position and operated by the oscillating segmental gear common to the Anderson type of machines. In addition there are two high-speed drilling spindles, driven by a belt from a separate motor. The motor is shown at the right in the illustration.

The addition of these drilling spindles enables the drilling and tapping of small parts to be completed in one cycle and thus eliminates one handling of the work, together with the necessary locating fixtures to ensure that the taps will enter holes drilled in a previous operation.

New Britain Six-Spindle Automatic with Long Feed

The New Britain Machine Co., New Britain, Conn., has recently made alterations in its regular 1⅝-in. bar machine to adapt it to the making of longer pieces, and has placed the lengthened machine regularly on the market. The changes have been brought about by the addition of an extra bracket at the turret end of the bed which allows the entire turret mechanism to be shifted endwise and, at the same time, provides space for a longer feed-slide and cam.

The capacity of the lengthened machine for bar stock is 1⅝ in. in diameter by 12½ in. long. The floor space requirement is increased by 2 ft. over that of the regular machine and the length is now approximately 11 ft. 9 in., while the width remains the same; 3 ft. 7 inches. The weight has been increased to 11,000 pounds.



NEW BRITAIN AUTOMATIC WITH LONG FEED

The alterations were made primarily to adapt the machine to the manufacture of armature shafts for small electric motors.

American Trade with India for Seven Months

Analysis by the Department of Commerce of the official Indian trade returns for 7 months ended July 31, 1923, compared with the corresponding period of 1922, shows that the United States is practically holding its market in clothing, general foodstuffs, hosiery, hardware, paints, and some iron and steel projects.

Gains have been made not only in petroleum imports from the United States, but in mining machinery, railway materials, telegraph and telephone equipment and automobiles. On the other hand much of the trade of 1921 has been lost in dyes, leather, boots and shoes, cutlery and paper. Previous to the war 2.5 per cent of India's imports came from the United States. Between 1914 and 1919 world economic conditions increased this percentage, and, when trade began to swing back to normal we were still furnishing 10 per cent of the imports. This was reduced to 9.5 per cent for 1921, 6 per cent for 1922, and 5.6 per cent for the 7 months ended July 31, 1923.

What India Sells Us

India's export trade with the United States rests very largely on the heavy sales of raw and manufactured jute, shellac, manganese, hides and skins, and tea. The total exports of Indian products to America for 1920 were valued at 395,311,000 rupees, for 1921 at 249,487,000 rupees, for 1922 393,328,000 rupees and for the first 7 months of 1923 at 221,380,000 rupees. For the same periods the credit balance on India's trade with America amounted to 74,077,000 rupees, 25,722,000 rupees, 61,815,000 rupees, and 189,000,000 rupees, respectively. This excessively large margin between exports to and imports from the United States is undoubtedly settled to a great extent, however, through triangular trade by way of Great Britain, Hongkong, and other reshipment centers.

News Section

Gary Predicts Six Months of Improving Business in All Lines

Elbert H. Gary, chairman of the board of the United States Steel Corp., called on the business men of the country to support and co-operate with President Coolidge in maintaining stabilized conditions in the industrial world in a speech delivered at the meeting of the American Iron and Steel Institute at the Hotel Commodore Oct. 25.

This was the twenty-fourth annual meeting of the institute, and it was attended by more than 2,000 members, including such prominent men in the industry as Charles M. Schwab and James A. Farrell. The Earl of Birkenhead and Mirza Hussein Khan Ali, the Persian Minister, were guests of honor.

In matters concerning the iron and steel industry Mr. Gary said the outlook was good and that a material increase in the volume of business might be looked for during the next six months. In congratulating the members of the institute, of which he is president, for abolishing the twelve-hour day he gave chief credit to the late President Harding for bringing about the actual inauguration of this step.

Mr. Gary deplored the chaotic conditions in Europe, but said it was his opinion that this country could not be of much assistance in restoring a condition of equilibrium.

In summarizing the conditions in the iron and steel industry at the present time, he said:

"For the calendar year the iron and steel industry will show considerable profit, though not as much as the capital invested should produce. The new orders are not up to productive capacity, but together with those heretofore accumulated, have resulted in large shipments. In some lines the demand for immediate consumption has been, and still is, in excess of the ability to supply.

"It may be stated with confidence that the outlook is good. Inquiries for iron and steel are unusually large, many of them urgent. Purchases for railroad and general building purposes, for oil development and production, for canning purposes, for the automobile trade and many other lines are now very large as a total and from appearances may be expected to materially increase in volume during the next six months, unless something unforeseen and unwarranted shall be precipitated."

Johansson Joins Ford Motor Company

Carl E. Johansson, manufacturer of gage products, which are standard instruments of exact measurement throughout the world, has arrived in Detroit and has assumed his new connection with the Ford Motor Co.

His gage plant at Poughkeepsie, New York, where the standard instruments are made, was recently purchased by Henry Ford, who is rapidly securing control of the manufacture of everything needed in the production of Ford cars and tractors.

Mr. Johansson's headquarters will be at the Ford plant in Dearborn and when the new Ford laboratories are completed his experts who came to this country with him from Sweden, will join him here.

Executives in the automotive center believe that his connection with the Ford Motor Co. is one of the most important steps taken in this line by any Detroit manufacturer in some time.

Professor Roe Speaks on Management

Management is entering a period of revolutionary development due to the invention of methods of measurement, Prof. Joseph W. Roe, head of the Department of Industrial Engineering in New York University, and member of the executive board of the Federated American Engineering Societies, declared in an address at the Engineering Societies Building on Oct. 23.

Industry must set up practicable standards of measurement for managerial functions to avoid mistakes which become more disastrous as production increases and to meet widening world competition, said Prof. Roe. "To compete with foreign labor," he added, "American productive facilities must be used to maximum advantage."

The meeting, arranged under the auspices of the American Society of Mechanical Engineers and other organizations, was one of a series of Management Week gatherings which are being held in the principal industrial centers of the country.

Alexander Talks to Business Publishers

Magnus Alexander, chairman of the National Industrial Conference Board, was the speaker at the annual meeting of the New York Business Publishers Association held at the Machinery Club, New York City, on Oct. 22. Mr. Alexander has but recently returned from a trip through Europe where he studied economic conditions in Germany, Austria, Hungary and France. His lecture concerned the present European situation and America's attitude toward it.

Edwin A. Scott, president of the Edwin A. Scott Publishing Co., was elected president for the coming year. George Griffiths, *Hardware Age*, was elected vice-president, and J. H. Moore, Robbins Publishing Co., secretary. Edgar J. Buttenheim, *American City*, was re-elected treasurer. The board of directors includes the present officers and three newly elected: J. H. Bragdon, *Textile World;* Edward Mehren, McGraw-Hill Co., Inc., and Franklin Johnston, *American Exporter.*

Textile Mills Buy in the South

Atlanta machine tool jobbers advise that the volume of sales experienced a slight increase the last two weeks of October as compared with the first half of the month, but state that there is still room for a great deal of improvement, and that conditions in October were not as satisfactory as indications portended they would be about six weeks ago. October sales of machine tools were off somewhat on a comparative basis with September, but with most of the larger distributors proved to be a little better than they were in October, 1922, though the reports of the dealers vary widely, one reporting a substantial betterment, a second only a slight improvement, and still a third stating sales were about the same. Nearly all of the leading distributors agree, however, that the outlook is quite promising throughout the Southeast, due to the fact that industrially and from an agricultural standpoint, the district is in better shape financially than for several years.

Improvement Evident

Quite an improvement has been noted the past month in sales to the textile industries, with the smaller machine shops still proving active buyers as they have for some months past.

However, where heavier machine tools have not been in as active demand as the trade had anticipated, smaller tools, machine tool parts and kindred mill supplies have been in substantially better demand the past two weeks, with this business about the best it has been in several months, and the outlook portending a continued steady demand through the rest of this year and into the early part of 1924. Nearly all the dealers handling supplies of this type seem agreed that there has recently been a substantial improvement in sales of this nature.

The cotton crop is now being gathered, and while it will not be the largest the South has ever produced by any means, with the present price close to 30 cents per pound it is certain to net the producers the largest gross sum they have ever realized from the sale of the staple, possibly excluding the inflated times that prevailed during the latter part of the war. And as business and industry always are closely rooted to the fortunes of cotton in the South, this condition will undoubtedly mean a period of industrial and commercial activity.

A. G. M. A. Puts Through Constructive Program at Mohonk

LIVING up to its past record the American Gear Manufacturers Association carried through at its Fall meeting at Lake Mohonk, N. Y., Oct. 25, 26 and 27, a long, constructive program without flagging interest. There is a spirit about the A.G.M.A. that marks this young association as one of increasing influence and which is having a beneficial effect, not on gear makers alone, but on the metal working industries at large. Ably directed, the association and its committees are meeting the serious problems of its own and allied industries with inquiring minds. Each member who attended at Mohonk went away a better gear man and more truly understanding industry, and it is regretable that not more than the hundred and twenty-five or so who attended could have been there.

Mr. Markland Optimistic

George L. Markland, Jr., the new president, conducted the sessions like a veteran, as was expected of him. In his opening remarks he sounded a note of optimism that met with approval when he said, "You will recall that two years ago the pessimist and the croaker were busy working overtime, and their tribes were legion. Whereas today he is still in evidence, there is less of him and he sings rather small; his voice is not loud and raucous. I wish I could imbue you all with a smiling optimism, which, while recognizing the necessity for caution in your business ventures, refuses to be cowed by the howling voice of pessimism. . . . Consider our own business, that of making gears. There will always be gears to make and in increasing quantity."

Most of the time during the four general sessions was given to the reading and consideration of reports of the committees and sub-committees, whose work along standardization and other lines represents an immense amount of effort on the part of the individuals composing them. Very satisfactory progress has been made, of which a résumé will be given in a later issue of the *American Machinist*.

Member-Companies Elected

The following new member companies were elected: Western Gear Works, Seattle, Wash., R. C. Frankie, representative; United Engineering and Foundry Co., Pittsburgh, Pa., Lane Johnson, representative; Universal Gear Works, Detroit, Mich., Frank J. Brown, representative; Automobile Machine Co., Cleveland, Ohio, J. Kreusler, representative; Barber-Colman Co., Rockford, Ill., F. G. Hoffman, representative; David Brown and Sons, Ltd., Huddersfield, England, Francis Edwin Brown, representative. Myron A. Allen was elected as an additional representative of the Brown-Lipe Gear Co., of Syracuse, N. Y. I. W. Sprink was elected as associate member from the Automotive Gear Works, Inc., Richmond, Ind., in place of W. H. Lyman, resigned. Judge Leo J. Doyle and John T. Kerwin were elected as the new representatives of the Foote Bros. Gear and Machine Co., of Chicago. T. C. Roantree was present as a new associate member from the Westinghouse Electric & Manufacturing Co.

The report of E. S. Sawtelle, of the Tool Steel Gear & Pinion Co., Chairman of the Industrial Relations Committee, was warmly received, an indication that the gear men are recognizing the importance of proper personnel relations in industry. In part Mr. Sawtelle said: "Modern business depends more upon men than upon dollars. Given the opportunity of investing in a business with abundantly strong financial resources but with questionable management, and a struggling business but with high grade and trained management, any intelligent man would take the latter as having the best chance for the future. In Europe where business is conservative and old standards are adhered to, initiative is not so important a factor; but in America, the land of opportunity, we find it also the land of the opportunist and the man who forges ahead rapidly is the man just one jump ahead of the rest, seeing things just a little bit sooner than his competitors, flexible in his mind and flexible in his organization so that he is able to keep apace with the swift moving trend of our modern American business.

"No one man can provide all of the ideas or advancements necessary for an industry and if he is able to thoroughly organize his industry from top to bottom with sympathetic, alert co-operation from each and every employee, he has to a large degree solved his problem of personnel. Ways and means to accomplish this should be the primary function of any industrial relations committee. . . . Let us reiterate that no two personalities are the same, no two shops are the same, and that industrial relationship is 99 per cent a matter of applied personality. Hence this whole question is one that each man must solve for himself and we believe that as he approaches a solution he will be working not only for the benefit of his own industry but for a more permanent stability of our whole nation."

Major Earle Buckingham, of the Pratt & Whitney Co., read a paper which he had prepared in conjunction with Ernest Wildhaber, on the analysis of milled gears. This paper, which proved to be of a great deal of interest, will be printed in full in the *American Machinist*.

Education Discussed

That the members of the association are sincerely interested in educational matters was indicated by their reception of the talk by John P. Kottcamp, head of the Department of Industrial Engineering of Pratt Institute, of Brooklyn. Mr. Kottcamp's experiences and observations evidently had been the experiences and observations of many members of the association. His talk was to the effect that just as a good gear cannot be made from inferior raw material, a man capable of filling a responsible position in industry cannot be made from the boy who, through faulty education and improper selection of vocation, has not the proper foundation for the task at hand. The remarks were constructive in every way.

After the association dinner on Friday, S. L. Nicholson of the Westinghouse Electric & Manufacturing Co. told of business conditions in New Zealand and Australia. R. M. Hudson, of the Division of Simplified Practice, Department of Commerce, read a paper on simplified practice as service to American industry. His examples of waste in industry that has been eliminated by simplification, must have furnished considerable encouragement to the hard working sub-committee of the association.

At the final session E. W. Miller, of the Fellows Gear Shaper Co., Springfield, Vt., read a paper on the development of the gear industry. Mr. Miller's purpose was to show new applications of gears and to indicate the possibilities of greater gear business to the alert manufacturer.

A discussion by the industrial group followed the last general session. Announcement was made that the Spring meeting will be held April 28, 29 and 30 in Buffalo at the Lafayette Hotel. It was announced also that a cup will be given the member making the best golf score at the Buffalo meeting.

Management Week Held in Chicago

From Oct. 22 to 27 Management Week was observed by Chicago engineers, the program having been arranged and carried out under the auspices of the local sections of the American Society of Mechanical Engineers, the National Association of Cost Accountants, the Society of Industrial Engineers, the Taylor Society and the Western Society of Engineers.

Good Speakers

The opening session, with a record overflow attendance, was held in the auditorium of the Western Society of Engineers. Bion J. Arnold presided. "The Story of an Automobile" presented in an excellent six-reel film showing the various steps in the making, assembly and testing of the Studebaker Light Six served as an interesting introduction, as it showed the equipment of one of the most modern plants in the country and the ingenious labor-saving machines and methods employed. W. C. Hoover, engineer of the B. F. Goodrich Co., followed with an address, "Multiplying Man Power by Mechanical Means."

On Thursday a dinner meeting at the City Club was devoted to "Non-Mechanical Means of Increasing Man Power," with W. L. Abbott, chief operating engineer of the Commonwealth Edison Co., acting as chairman. Four speakers were allowed twenty minutes each to cover different phases of the major subject. J. D. Cunningham, speaking for the American Society of Mechanical Engineers, urged the engineer to analyze himself, to improve in salesmanship of his own abilities and to take the more active part in management that his qualifications warranted.

Hugo Diemer, representing the Taylor Society, outlined the different phases of industrial relations and personnel work and by numerous data and statistics showed how they had become vital factors in increasing man power. W. B. Castenholz offered a few concrete examples to show how the accountant helped in management. H. N. Stronck pictured the growing field of the industrial engineer.

Production Meeting of S. A. E. Proves Interesting and Instructive

THE second production meeting of the Society of Automotive Engineers was held at the Hotel Winton, Cleveland, Ohio, Oct. 25 and 26, both sessions being well attended. There were three sessions the first day devoted to machine tools, factory managers and scientific management.

During the first session, E. P. Blanchard of the Bullard Machine Tool Co., Bridgeport, Conn., gave an illustrated talk, "Fundamental Principles in Modern Production Machines." He pointed out that with a given tool and similar material, the actual cutting time of one tool was the same regardless of the machine in which it was used. He then traced the application of multiple tooling and the elimination of time between cuts as exemplified in the Bullard "Mult-Au-Matic" and "Continumatic," both of which are familiar to our readers. These, he pointed out, accomplished the two fundamentals of rapid production, division of labor, and transference of skill, the two essentials named by Adam Smith in his treatises. Questions were numerous, some of the inquirers desiring information as to the minimum number of pieces for which the piece can be tooled economically and others as to the accuracy which can be obtained.

A. J. Ott and his son C. L. Ott of the American Grinder Co. presented a very interesting paper on gear tooth grinding, showing their new machine, which uses a 30-in. wheel, placed below the work and capable of being swiveled so as to form both sides of a rack tooth in grinding either side of the gear tooth. The paper and the questions answered brought out the fact that an allowance of 0.005 in. would generally take care of the distortion due to hardening, while from 0.002 to 0.005 in. would usually clean up a tooth in grinding. The desirable amount of backlash was given as from 0.005 to 0.01 in. per tooth, or a total of from 0.01 to 0.02 in., depending upon conditions. About 60 teeth can be ground with one dressing of the wheel and at the rate of about 5 sec. per side of tooth. Wheels of 66 combination J or 66-50 J were recommended. It was generally conceded that grinding adds to the life of the gears.

Grinding in the Auto Shop

The developments in the automotive industry were reviewed very interestingly by Oscar A. Knight of the Norton Co. who traced briefly the developments and progress in grinding. He showed new machines and told of the effect of various elements on grinding finish. Gears, unbalance of wheel and other factors were discussed. Crankshaft grinding, piston grinding, etc., received much attention, Mr. Knight tracing the reasons why grinding crankshafts from the rough had, under present conditions, given way to rough turning. Wheel wear varies from 0.025 to 0.05 in. per crank on a rough forging, while on finishing pins the wheel loss per pin is only 0.0006 in. The development of the broad wheel, which is fed straight in was discussed.

The question of grades of finish and of polishing or lapping crankshaft bearings was brought up and Mr. Pletz, of the Morris Machine Co. told of the work of that company's machines in several large plants. One maker of motors polishes or buffs all his engine bearings in the direction in which they are to run, so as to lay any tooth or particles, no matter how small, in the right direction.

W. T. Jameson of the Cleveland Automobile Co. presented a paper, "Human Element in Production," a most timely subject. He pointed out the advantages of securing concentrations on the work and the bad effect of inertia on all of us. It was a careful study of the effect of securing interest of the men to the point where they felt they were working for themselves, but unfortunately he did not give any specific instances as to its application. He claims to have secured co-operation and increased results with no other incentive than a man's satisfaction in a job well done and the knowledge that he is a better man and better workman for having done it.

Conveyor Machinery

H. P. Harrison then showed how the installation of conveyor equipment had aided production in the plant of the H. H. Franklin Manufacturing Co. at Syracuse. He frankly told of the mistakes they had made in selecting the wrong type of conveyors for some places and said that for comparatively small production he did not favor power-driven conveyors for carrying work between operations. They had found gravity conveyors best for such places. Power conveyors were, however, used between departments.

Mr. Harrison also pointed out a very important fact in connection with the use of conveyors—the reduction possibility in the number of pieces in process at one time. In the transmission case installation the number had been reduced from over 700 to 150. The effect on the inventory is no small item. The use of conveyors also helps foremen to keep track of the production. Each case should be studied by itself.

Eugene Bouton of the Chandler Motor Car Co. told of the group bonus plan in use in the Chandler plant. A group is the number of men needed to complete one unit, such as a connecting rod. The groups range from three to 92 men. A straight piece work price is allowed for each complete unit. The men are divided into three day rates. The output of the group is divided by the rate which would have been earned at the day rate, the result being a factor by which each man's share is easily calculated as the men are paid pro-rata, according to their rate. The men can know in the morning their earnings for the day before, if they desire.

Interesting the Workmen

The plan outlined has reduced both labor turnover and scrap. In addition it puts the question of discipline largely up to the men themselves, as they watch production closely. It is to their interest to work as few men in a group as possible, to teach new men gradually and accurately and to weed out the slow men or the men who are apt to shirk on the job.

In the evening, Percy S. Brown, works manager of the Corona Typewriter Co. gave a detailed but very interesting account of the production control methods used in the Corona plant. A similar paper by the same author was published in the *American Machinist*. Mr. Brown was the representative chosen by the Taylor Society to speak at the S. A. E. meeting.

The first paper of the second day, "Standard Machines for Quantity Production," by Ralph E. Flanders, the newly elected president of the National Machine Tool Builders' Association, proved excellent. Reliability and comparatively low cost were pointed out as two of the reasons for using standard machines or semi-special machines made from standard units. The cost and unreliability of special machines built hastily from special designs were pointed out as factors to be carefully considered.

Standard Machines

In connection with the machines themselves, Mr. Flanders spoke of the design of special tools and fixtures and suggested that these could in many cases be best handled in the shops of the user. This was particularly true in shops which standardized its machine equipment as far as possible so that the tool designers could become thoroughly familiar with the characteristics of the machines used. He feels that this makes for lower first cost, fewer repairs, flexibility in production scheduling and the handling of operators and the securing of more satisfactory men. Mr. Flanders also made some valuable suggestions for the next production meeting.

Albert F. Shore presented a very painstaking paper on the standardization of methods of applying the scleroscope, replete with diagrams and laboratory tests. He took up the various problems connected with the use of the instrument and urged standardized methods of using so that the results obtained in one shop could be compared with those secured in others.

Machine Tool Data Sheets

Although not on the program, A. L. Evans addressed the meeting regarding the use of standard machine tool data sheets by all users of such machines. This subject is already being considered by the National Machine Tool Builders' Association and it is quite probable that the Society of Automotive Engineers will appoint a committee to work with the association first named.

The last paper was by A. H. Frauenthal of the Chandler Motor Co. on factors governing out-of-roundness measurements in which he showed some of the problems in measuring both regular and irregular variations. The "regular" errors may be classed as ovals, while the irregular errors are usually modified polygons with varying sides. He showed the use of amplifying gages in connections with standard 90-deg. V-blocks and also with special rests for detecting other errors.

Four visits were organized and the transportation problem was efficiently handled by the local committee. The plants visited were the American Steel & Wire Co., the Chandler Motor Car Co., the National Malleable Castings Co. and the White Motor Co.

The dinner was held at the Hotel Winton, H. W. Alden being toastmaster and R. H. Grant of the Delco Light Co. the principal speaker. Jack Raper of the Cleveland *Press* was also in evidence with a humorous speech regarding mass production.

October Sales Show Increase in the Chicago Market

Machine tool dealers continue to find business dull in the Chicago district. Used machinery has been in slightly better demand this week. A few dealers report a slight improvement. The Chicago, Rock Island & Pacific R.R. has purchased a 36-in. shaper and a 5-ft. radial drill. The Chicago, Indianapolis & Louisville R.R. has entered the market for a 300 cu. ft. air compressor; a double head bolt cutter to cut 1½ to 2-in. bolts; a 3-ft. radial drill; a 5-ft. radial drill; and a motor-driven wet and dry grinder. The Southern Pacific is in the market for three engine lathes for its Western shops. The Union Pacific R.R. has ordered a 5-ton self-supporting jib crane. The Chesapeake & Ohio R.R. has purchased six 150-ton steam wrecking cranes. The Pennsylvania R.R. has placed an order for a 100-in. boring mill; two 42-in. boring mills and a heavy 42-in. x 16-ft. planer. The Illinois Central R.R. is making inquiry for one 1½-in. to 6-in. motor-driven tube cutting machine for use at Vicksburg, Miss. and one 54-in. heavy duty motor-driven lathe for use at Waterloo, Iowa. The Pettibone-Mulliken Co., has purchased a multiple spindle press, a broaching machine, a heading and forging machine and a die sinking machine.

Sales of machine tools and machinery thus far in October are slightly in excess of sales during the month of September.

Structural steel demand is active in the Chicago district, with fabricators figuring on an unusually large number of projects. October business is showing a marked improvement over September, which was a quiet month in the shape market.

While a number of important projects in Chicago are still being held back, it is expected that the present month will be one of the best in some time. Most of the awards during the last few weeks have been small, but the aggregate tonnage is large.

Cleveland District Shows Gains

Significant of the predictions made a month ago for the last quarter of 1923 in things industrial, is the fact that these predictions are being realized in improved business conditions generally in the Cleveland district since the first of October.

From the machine tool manufacturer's viewpoint, the year will round out more satisfactorily than the most optimistic could have hoped for six or even three months ago. This is based upon the larger number of inquiries which are being received by Cleveland plants and distributors and which are being followed fairly consistently by orders. In the main this new business is confined to small equipment, for small producers, yet this is taken to indicate a return to more normal needs of the larger manufacturing interests later.

From the Cleveland machinery producer's viewpoint the most encouraging feature is the return of the railroads as buyers of rolling stock and motive equipment, which will reflect at an early date in orders to manufacturers of that class of requirement, and in turn to increased iron and steel needs. Already this last is showing itself in more orders though caution is manifested. Orders are small, and hesitancy still is the rule rather than the exception. Withal this angle shows a 20 per cent gain so far in October over September, and twice the showing made in August.

Automotive Activity

The influence of the automotive industry upon machinery interests cannot be emphasized too strongly, however, for it is here, if anywhere that the real improvement in equipment demand can be looked for.

Encouragement for the industry can be gleaned from the statements made by Alfred Reeves, general manager of the National Automobile Chamber of Commerce before the Cleveland Automobile Manufacturers Association last week, at which some machinery factors were present. Based upon the production of more than 3,000,000 motor cars during the first three quarters of 1923, Mr. Reeves predicts that the production will make the 4,000,000 mark during the last quarter, since absorption of the product has not diminished as in former years at this time. This will make for a 50 per cent gain over 1922, he points out.

In line with this comes the more definite figure that Cleveland automobile and automotive parts interests have increased their operating staffs 7 per cent in the last few weeks. This is amplified by like condition in Canton (normally considered in the Cleveland district) plants which serve the automotive industry. Most plants report gains in the last week or so for their particular products, so that they are operating now about 90 per cent of normal, while the eighteen Canton foundries are operating at about two thirds of their capacity, which is considered exceptionally good.

Expansions Noted in Indiana

In spite of pessimistic warnings, conditions appear to be improving throughout the entire Indiana territory. During the last few months expansion has been limited. Many men prominent not only in the machine tool and machinery business, but in those industries that are the biggest users of these commodities have been dubious about expansions of any nature. Warnings have been sounded by prominent bankers in Indiana. These warnings insisted that too rapid expansion was dangerous and the effect has been decisive. Now, with Winter almost present, trade volume holding its own, and with orders increasing instead of decreasing, there is a tendency to disregard these late Summer warnings and do what ordinary business men do when they receive orders, namely, fill them and as necessary make plant improvements in order to fill them.

Practically the only trade that is showing any present tendency to curtail production is the automobile industry. And this is being done only after one of the best Autumns in the history of the business in Indiana. With some judicious price reductions, the automobile plants—playing to the closed body trade—have had a wonderful season. Only within the last week have signs been seen indicative of a curtailment of orders. The demand for machinery, both used and new, in printing plants is rather remarkable. Machinery men here say that last month has seen a big increase in inquiries for this sort of machinery.

The plant of E. C. Atkins & Co., in Indianapolis, is busy filling back orders even though the lumber mills and similar factories are supposed to be curtailing their production. The woodworking factories, of which the furniture plants are the biggest buyers, are working to capacity with sufficient orders to keep them busy until in the Winter and they are buying specialized machinery to be used in their plants. The railroads are transferring their rehabilitation programs from outside to inside the shops now and tool trade is said to be very good in the several shops here.

Labor Is Scarce in Connecticut

Connecticut manufacturers of automatic labor-saving machinery report that their production requirements are most satisfactory and that there are no indications of any slowing up of business. Inquiries are very favorable and contracts are being made in consequence. The present time shows good automatic machinery buying.

"There is no urgent demand necessitating increase of our working force, but if there was I do not know where we would get skilled men," said one of the manufacturers, adding that it was commented upon by the employment bureau director of his organization, that there had not been an applicant in his office in two weeks. "Even the slacking up of some of the branches of the trade in New England and the curtailing of working hours has not sent any men around," he said.

Some of the Connecticut dealers in rebuilt machinery report a considerable business for the first three weeks of October. The volume of transactions by one of the organizations was reported as the equivalent of the total of any two months of the current year, and the business has been consistently good since the first of January. The total business for 1923 even now surpasses that of 1922.

Water Shipments

A noticeable increase in freight shipments by water was commented upon by a representative of a navigation company a day or two ago. Considerable of it was destined for transfer at New York for reshipment from there to other ports.

There is every indication that the present busy condition will continue for at least three months and some say perhaps six months.

New York Sales Better Than at Any Time Since June

October proved to be a better month than September in the volume of sales made by most machine tool dealers in the New York district. The first ten months of the year have shown rather a remarkable course in the industry in the Eastern part of the country. January and February did not open up to any particular brisk business. March showed decided signs of life. April and May proved to be the big months of the year and in some cases the biggest since the War. June developed a steady business with a drop felt in July and August. September came partially back with good business recorded but the reports were spotty, dealers being at a variance on the month as a total. October opened to brisk business and this trend continued throughout the month bringing business back to the steady level of June.

That orders follow inquiries is clearly shown. In the early part of September it was reported that inquiries were plentiful and during the first part of October sales to a like amount were reported.

The railroads are still buying and there are a few good sized lists out in the Metropolitan district. The American Locomotive Co. has recently been ordering single tools and the General Electric Co. has also been in the market during the past week for a few necessary tools. The automobile factories have sent out interesting inquiries and Southern textile mills have contributed a few orders.

Used tools are finding a fairly good market among the electric street car companies, but it has been difficult recently to secure tools.

Export business has improved during October which is considered exceptional at this time of the year.

Slight Increases in Cincinnati

The production of machine tools manufactured in Cincinnati shows a slight improvement during the past two weeks, although the volume of business being done is only fair. The slump in orders which hit the machine tool houses recently has eased somewhat, leaving conditions more favorable for future business. The main stimulus that is being felt is the buying done by the automobile factories. The production of automobiles is being maintained on such a large scale that the manufacturers have been rather heavy purchasers in the local machine tool market. It is expected that the volume of orders being placed by the automobile companies will show a decrease as the end of the year approaches, but the quantity of machine tools going to the automotive industry has been the chief factor in keeping up production.

Several of the largest machine tool manufacturers state that their business during October has been better than in September and they are much encouraged by the trend of their production. On the other hand, some state positively that business has been dull throughout both September and October. The outlook for the rest of the year for the Cincinnati machine tool industry in general is for a continuation of the present scale of manufacture which can best be described as fair.

Railroads Not Buying Much

The manufacturers of planers say that the orders now on their books and the number of inquiries being received indicate a continuation of the present spotty business. Railroads have not been in the market lately to any extent and it is extremely doubtful whether they will do much buying during the next few months. Some orders for planers are being received from automobile body manufacturers. Milling machines have shown more activity lately and have been in better demand than they were. Lathes are having a slow market in most cases, although several firms report that they have had some good orders for lathes during the past ten days.

The electrical tool manufacturers state that their business is holding up well in volume. Inquiries have been numerous and actual sales have been satisfactory. Conveying machinery concerns also report that their production is going along at a good rate and that orders are coming in in good quantities. Woodworking machinery manufacturers say that their business is good and they have some good orders on hand at present. The used machinery market continues to show improvement.

Business in the metal trades has eased slightly during recent weeks, but this lull is expected to be temporary. Mill and factory supply houses report business as fair, but orders are usually placed for immediate delivery. Tinware manufacturers, especially those engaged in the manufacture of special lines, report business good and have considerable future orders booked. There has been but little change in the pig iron market. A slight increase in inquiries has been noted.

Active Market in Philadelphia

A general tone of optimism prevails throughout the industrial centers of Philadelphia, with the approach of the end-of-the-year season. There was a little improvement noted in the machine tool manufacturing situation last week, compared to two weeks ago, when a slump from the large volume of midsummer and early Fall business appeared.

A larger number of inquiries have been received than in the previous two-week period, leading the manufacturers to the belief that buying will be resumed early in the New Year. The railroads have not been purchasers, and probably will not resume buying to any considerable extent for the present, say the manufacturers and jobbers, but general industrial developments appear to justify the hope for the beginning of a substantial volume of business early in 1924.

The best news of the week was the story that the Southern Pacific Railroad had placed orders for 43 locomotives. Of this number 25 will be built by the Baldwin Locomotive Works, and 18 will go to the American Locomotive Co. The Baldwin order is for 17 freight engines and 8 passenger-carrying equipment. This is a $1,500,000 job, one of the biggest domestic orders received by the Baldwins for several months.

Steel rail orders amounting to 35,000 tons, representing an expenditure of $1,505,000, have been placed by the Philadelphia & Reading Railway for 1924 delivery. The equipment is for extensions and improvements. The Bethlehem Steel Corp. received the bulk of the order, 25,000 of the 130-lb. rails, while the Carnegie plant of the United States Steel Corp. will roll 10,000 tons of the 100- and 130-lb. rails.

The general business situation is satisfactory. Orders in most mercantile and industrial lines are coming in slowly, but a reasonable trade is apparent. The general opinion prevails that there will be an increase for the remainder of the year. Hardware manufacturers and dealers report a fair business in all lines. Manufacturers of ice-making machinery report an improvement, with a considerable volume of exports. Recent shipments have been to Hawaii and to India, with inquiries from Mexico and Central America. The railroad repair shops are operating on a normal basis, and highway construction and county road work is keeping common labor employed.

All Factories Busy in Detroit

All production figures of Detroit's automotive plants are being broken. There is every indication in the business field that Detroit's phenomenal prosperity for this time of the year is not merely a flash in the pan, but is an index of a healthy condition which will keep the city's production up to the maximum for months to come.

Machine tool manufacturers feel that signs of increased activity insure a period of crisp business. Additions to plants are being rushed to completion and manufacturers are planning on production programs such as they have never had before. Noteworthy among the industrial activities of the past week was the arrival in Detroit of Carl E. Johansson, whose gage blocks are standard instruments of exact measurement throughout the world, who comes to assume an executive position with the Ford Motor Co.

Traffic on all the railroads throughout the state continues heavy with car loadings at a high figure. Shipments are being hastened by every manufacturer in the hope that a large stock of raw material may be on hand before bad weather makes receipt of shipments at anticipated times more or less doubtful.

Employment runs about the same, although the week ending Oct. 23 shows a slight increase over the previous period. Figures announced by the Employers' Association show that Detroit firms, members of the Association, are employing 214,278, as against 214,022 for the previous week. This is an increase of 256. According to officials of the Association this is likely to represent the average employment for some time to come.

The Industrial Review

First nine months of the year show business ahead of 1922—Electrical lines in good condition —Street railways better off—Coal mines buying machinery

FROM nearly every machine tool center in the United States the reports show that business during October was an improvement over that of the preceding month. In some spots the improvement was slight, while in others business was much better than the volume done in September. Predictions made last Spring that business would be greatly improved in the Fall and that an early return after the Summer lethargy have not been fulfilled. The return to business was slow and delayed, and the improvement has been gradual. However, a comparison with the same time in 1922 proves that both production and sales are far ahead this year and that a steadier trend is the result. The rush of orders last Spring was admittedly abnormal —even verging on a boom—while business that was done during October, though of a smaller volume had more the character of stability and nearer approached pre-war conditions.

None of the bad elements of 1920 are present today. War stocks have been fairly well absorbed. There has been no overstocking of machine tools. Production has not been allowed to "run wild" while orders lagged. The spirit of speculation as to the future has been curtailed. Optimism has been a cautious, well-founded optimism, not built upon false hopes and desires.

Automobile production showed a slight decrease in September over August, approximately five per cent. But on the other hand and saner basis of comparison, automobile production in September was fifty-nine per cent greater than in September, 1922. The three million mark predicted in January for the year was passed before nine months had elapsed and it looks now as if the total for the year would closely approach three and a half million automobiles.

Railroads are still buying in all parts of the country. The promise of the expenditure of more than a billion dollars announced early in the year by the American Railway Association is being fulfilled and recent announcements are that every penny allotted would be spent before the first of the new year.

Japanese buying has been started in the machine tool line for those tools that are necessary and especially for machinery. Other and larger purchases will follow before January. American industrialists are watching avidly the action of the Japanese Diet when it meets on Nov. 11.

Taken as a whole, the machine tool business may be summed up as good with every indication for steady improvement during the next three months; not up to the predictions or expectations of last Spring, but still ahead of last year.

The Electrical Field

In the electrical field it is reported that the General Electric Co. is running thirty per cent above last year's orders and that there is no end to this rate in sight. Motor makers are extremely busy for this time of the year and sales of all sorts of goods for the holidays are above last year's figures. Radio sets, electrical household supplies and wiring for tree trimming has found an excellent market and sells readily.

Heavy electrical machinery and power generators have both enjoyed good business since the first of last year. The only dark cloud at the present time is farm lighting equipment due to the comparative poverty of the farmers in some sections of the country.

Electric Railways

If further evidence were needed of the improved outlook for the electric railways it was certainly furnished at the convention of the American Electric Railway Association held at Atlantic City during the week commencing Oct. 8. The speakers all were optimistic in their remarks and the extent of the space given to the exhibits was greater than at any other convention of the association since its organization forty-two years ago. While little business is ever directly closed at such gatherings, the way was paved for the placing of many substantial orders. The exhibits of buses particularly was a most impressive one. More and more railway men are coming to a realization that the bus is the logical unit to supplement their service and for use where the electric service would not be justified by the density of the traffic offered. the growing use of the bus by the railroads of course means the extension of the field among the railways for the machine tool manufacturers.

Machine tool sales were greater in all parts of the country in October, electrical goods are finding a better field and holiday buying has started, reports from the electric railway convention show that industry to be improving, buses are becoming a recognized factor in transportation, machinery is being bought by the mines,—especially the coal mines,— and building records show this year still ahead of last.

Motor Buses

Motor buses are proving to be a big factor in every part of the country. Production is at a good rate and the industry is better off at the present than at any other time in its short history.

Mines Uncertain

The mining industry presents a rather uncertain aspect just now. Some expansion is reported, noticeably in Minnesota and Quebec, but more often the reports are coming in that mining is not up to expectations and the future is none too rosy. However, some of this can be blamed on the season and a note of encouragement is found in the fact that the year generally has been good.

Coal mining decreased during the past week and sales of bituminous have been extremely slow. But mines everywhere are buying new machinery and replacing old type machines with the newer and more labor saving models. Railroads report big storages of coal at all points.

Building Records

But whether business is good, bad or indifferent can best be judged by the rate at which industrial building is going on. When plants and factories are multiplying and expanding it is reasonable to suppose that the owners look with confidence to the future. Heavy industrial building not only gives employment to construction men. but also means many orders for machinery and equipment. If on the other hand industrial expansion is below normal, the reverse is of course obviously true.

Contracts awarded on industrial projects in the first nine months of 1924 amounted to $187,648,000 as compared with $133,178,000 during the same period in 1922. While there has been a steady decrease in industrial building since May the total for the year will probably exceed the total for last year. In October of this year, after decided drops, an increase is shown in the chart prepared by the *Engineering News-Record.*

French Like American Locomotives

American-made locomotives are proving as successful in operation in France as they have in America, according to a recent article by M. Lunier, inspector of equipment, Paris-Orleans Railway, in a French publication.

"The Paris-Orleans Railway in 1921 placed in service," he says, "fifty Pacific type locomotives with simple cylinders and equipped with superheaters. Because of the quick delivery required, the order was entrusted to the American Locomotive Sales Corporation."

After discussing the equipment of the locomotives as compared with those used on the French railroads, and technical tests that were made, he continued:

"These locomotives require very little maintenance and are greatly appreciated on this account by the engine drivers and master mechanics.

Give Excellent Service

"The tests confirm the results obtained by American railroads with two-cylinder Pacific locomotives. This type promises excellent service on French roads. These locomotives are simpler and have a smaller resistance to movement than the four-cylinder compound locomotives. Their maintenance is easier. As to their fuel consumption, it has been less, but it may be that they owe this superiority to their higher superheat. At an equal superheat, it would seem that the consumption of the two types of machines would be substantially equal."

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THE steadiness of the American markets in the face of the news received from Europe last week furnishes striking evidence of the inherent soundness of our domestic condition. Press reports and private advices agree in predicting that the break up of the German Republic will make it impossible for France to collect more than a tithe of the reparations she claims.

Cabling from London to the New York *Evening Post*, J. A. Spender says: "No one at this moment is thinking any more of reparations. Plainly there is nothing to be recovered from Germany in existing circumstances and if she breaks to pieces nothing will ever be recovered. The urgent question now is whether she can be kept from chaos and conflict which will have disastrous results for all Europe."

The market for foreign exchange has reflected the apprehension thus expressed, for the franc dropped to 5.72¼ cents on Tuesday, and sterling sold at $4.47¼ the same day, at which figure it was lower than it had been since November, 1922.

Here and abroad it is generally believed that France will be unable to pay her debts if she fails to collect anything from Germany and that the result will be the further depreciation of the franc and a brief period of inflation followed by the inevitable collapse. This would mean that Great Britain and the United States would have to write off what France owes them.

To this country the loss would not be serious, but to Great Britain it would be a great hardship. Therefore it is not surprising that private cables from well informed English bankers and merchants insist that the British Government will be compelled to yield to the demands of the labor party and resort to moderate inflation by issuing a large loan whose proceeds will be used to employ the unemployed in the construction of public works, such as roads and rocks. Lord Beaverbrook, who is said to be the most powerful man in England at present, is in favor of this policy and it is being actively urged by the newspapers under his control.

It may mean sowing the wind and reaping the whirlwind in the end. There are, however, many who believe that it is wise to resort to the anasthetic of inflation when the pain of poverty becomes unendurable and if England can put her idle hands at work they may be kept out of some forms of political mischief that would be worse than the inflation to which the conservatives are so much opposed.

But whatever the denouement may be it is plain that the financial outlook overseas is grave and prior to 1914 its reaction upon America would have been disturbing. That the only effect here has been to restrain speculative activity without depressing prices is particularly reassuring when the pessimism generated by the widely advertised dullness on the Stock Exchange is taken into consideration.

Prices there have moved but little and the changes have been without significance though the bond market has improved somewhat and new issues brought out under good auspices have been readily absorbed. As an example an offering of $15,000,000 bonds on a consolidation of Swedish match factories was almost instantly taken.

> "Meantime our home trade is entirely satisfactory. There are some who insist that after the holidays it will be smaller, but neither the markets nor the statistics sustain their predictions. The price changes recorded are neither important nor significant. . . . In Europe, the paper dollar is preferred to the gold dollar because all the foreign governments prohibit the export of gold."

Transactions like this involving the export of American capital in the form of goods are an anti-toxin that will make this country immune to the economic disorder that exists in Europe. The bankers who handle them are therefore performing a real public service as are the other banking concerns who have arranged the large credits with which the foreigners who have exported our cotton have been financed.

These credits, which have not been advertised, are in effect revolving credits which run into hundreds of millions. They partially explain our continued ability to sell our goods to an impecunious Europe and we will probably keep on shipping as long as such credits are available and are repaid as the merchandise financed goes into consumption. For this reason we need not fear the disorganization abroad if the people there can be kept at work and markets can be found for what they produce or fabricate. With political tranquility this will be possible.

The liberals among the English statesmen see this and are willing to accept inflation as the lesser of two evils. If it is resorted to there will probably be a revival of British trade for a time by which we will be indirectly benefited.

Meantime our home trade is entirely satisfactory. There are some who insist that after the holidays it will be smaller, but neither the markets nor the statistics sustain their predictions.

The price changes recorded are neither important nor significant. Wheat is a shade higher. Corn is a shade lower and cotton has reached and passed 30 cents upon the fear that the crop estimate to be issued Nov. 2 will indicate a sensational reduction in the productive expectancy.

On the mathematical relationship of the prospective crop and consumption very much higher prices for cotton may be logical, but the trees never grow to the skies and the psychological factor should not be ignored. It has and it may again interfere with the law of supply and demand.

The same generalization may apply to wool and woolen goods. Higher prices are statistically indicated but retail dealers say that buyers of all sorts of dry goods are commencing to consider cost very carefully.

As to most other commodities, there is nothing new to say. Business seems to be on an even keel. Sentiment would be improved by a settlement of the disorder in Europe, but in an economic sense this country has become so self-contained that the essentials of our domestic prosperity are no longer much affected by conditions abroad.

This view is confirmed by the weekly statement of the Federal Reserve System which shows a gain of $11,000,000 in the gold held and a reserve ratio of 76.8. In so far as our supplies of credit and cash are concerned our position is invulnerable and it is not surprising to hear that the dollar is rapidly becoming the preferred medium of exchange all over the world.

In Europe the paper dollar is preferred to the gold dollar, because all the foreign governments prohibit the export of gold. It is estimated that about $700,000,000 in American paper dollars is now in circulation outside the United States, and as the foreign currencies become worthless the demand for dollars is increased. As long as this condition persists we are not likely to lose gold and the monetary ease which prevails here seems likely to continue indefinitely.

Japanese Reconstruction Board Enlarged

The Metropolitan Reconstruction Board in Japan, which is to have charge of all reconstruction work throughout the devastated area has been enlarged and will consist of eleven members, according to a cablegram to the Department of Commerce from the commercial attaché at Tokyo.

Just How Poor Is Germany?

Many think that the rumored wealth of the industrialists has been exaggerated—The troubles of the machine tool builders and what's to be done

BY OUR BERLIN CORRESPONDENT

THE proudly commenced but ingloriously ended passive resistance in the Ruhr will forever be one of the most sinister chapters in Germany's troublous post-war experiences.

It was looked upon as an economic warfare which no doubt is quite a fitting figure of speach. The business situation resembles indeed a battleground strewn with the debris of many important strongholds. There is not the shadow of a doubt that more than four years of real war have not played such havoc with business as the barely nine months of passive resistance. Immediately at its end it does not appear as an exaggeration to speak of a more or less complete debacle.

In the light of comparison between the end of the great war and that of the economic warfare of the Ruhr which latter as a national struggle was of pygmean proportions compared with the former, many facts become clearly revealed, foremost among them the national impoverishment hidden behind an illusive hot house prosperity. The collapse of the passive resistance is attributed to the gigantic expenditure involved, which during its last week has run up to 233,000,000 gold marks not counting the indirect cost entailed by the depreciation of the currency with its disastrous effects upon the State revenue—in fact the whole national revenue. The values involved have, however, not been swept away like in the war, but in a large degree only changed hands. The true cost of the Ruhr war are constituted solely by the aggravated adversity of the foreign trade balance and loss of production. Large as they are, comparison with the cost of the war quite dwarfs them. Still they have brought business to the brink of ruin.

It is quite clear that the crisis following the Ruhr war is not its direct product but rather has matured in the unhealthy atmosphere of the years preceding it. The Ruhr war has solely precipitated its climax.

The Machine Tool Trade

The machine building industry, in fact industry as a whole enters with the end of the Ruhr war into a distinctly new phase. The era of inflation is over, killed by its excesses. The paper mark is in its last convulsions, a new currency, alleged to be of stable value is in the advent. The gold standard, although not firmly re-established yet, has made its entrance into all calculations. Values, which by gigantic inflation have assumed grotesque proportions are again reduced to their true dimensions. Many manufacturers when drawing up a gold balance, the first after almost a decade, had to realize how poor they have become. The huge profits which they made during past years appear to have vanished into thin air. Their possessions consist of their plant and their share in the 2 or 3 billion gold marks of working capital invested in foreign securities which the whole German industry is commonly credited with. Although this estimate is no doubt much too low, the single share is certainly a slender part of what it used to be. The quoted value of stock, which is supposed to represent the complete wealth of a company is in all cases of machine building works far below par.

German industrial property has in the average shrunk to the twentieth part of its pre-war value. A ratio of 1:8 as in the case of Ludwig Loewe & Co., one of Germany's leading machine tool works, is purely exceptional. There are only an elect few in the German machine building industry that can boast of such comparatively small depreciation of stock value. Their capital has never been increased and their assets constitute wealth accumulated in many years of conservative financial policy. Although industrial stock is, generally speaking doubtless under-valuated as regards capital value, the quotations represent as a rule the relation of present and pre-war liquid means. Although this relation has played a comparatively unimportant part during the era of inflation it weighs, of course, heavily at a return to the gold standard.

> "It would be an exaggeration to speak of a financial calamity, but a crippled state of finances certainly exists. This becomes apparent whenever the question of a return to pre-war trade terms is taken under discussion, a subject which will certainly become imperative as soon as there is a stable currency. Manufacturers have not up until now been required to face this question, having usually received part payment in advance and the rest upon delivery."

It would be an exaggeration to speak of a financial calamity, but a crippled state of finances certainly exists. This becomes apparent whenever the question of a return to pre-war trade terms is taken under discussion, a subject which will certainly become imperative as soon as there is a stable currency. Manufacturers have not up until now been required to face this question, having usually received part payment in advance and the rest at delivery. This was part of the bargain which their products were supposed to represent. It may safely be said that most manufacturers would find it now exceedingly hard not to say impossible to grant pre-war terms of payment. The buyer had to provide the working capital for the manufacture of his purchases.

Miss the Advances

The manufacturer received his money several months sooner than in pre-war times. The sums which used to be fed into the manufacturing process during those months are now missing in the majority of cases.

Not all are financially strong enough to work for stock and none to carry stock of a pre-war size. Such conditions were bound to come to an end one day. The Ruhr war has precipitated this development. To restore the financial equilibrium in industry's household, large credits are required which are clearly beyond the strength of the German banks. The manufacturers must resort to foreign loans, a fact corroborated by past experience. The trend of future developments is outlined quite clearly. Alienation of industry's capital, already noticeable everywhere will doubtless take still larger dimensions. Firms however, which are outside the pale of foreign interest, chiefly the younger or weaker members, also most private companies, are threatened with financial breakdown.

Can They Compete?

Apart from financial conditions the most important problem is: will the industry in the future be able to compete on foreign markets? The domestic market is much too small for the capacity of the industry. It could, at its best, hardly keep more than half of it employed. The other half, and the possibility to expand, can be found in the export business only.

The opinions heard in manufacturing circles in reply to this question are distinctly in the negative. This is not surprising, at this juncture seeing the upheaval of the fundamental conditions upon which their business had rested. It cannot, however, be answered definitely before the promised stable currency is firmly established and conditions had time to adjust themselves to it. There are certain elements in the cost problem, which manufacturers have it in their power to improve by more economical management and others which will rectify themselves automatically on the basis of a stable currency. Present prices of supply bear all the hall marks of excessive inflation. They are themselves inflated by safety factors incorporated in them as a consequence of their constantly shifting basic components. The manufacturer does not know his cost of labor until wages are due and not even then, as he regularly is faced by after-claims. Further he does not know how many paper marks he will realize from export proceeds and what intrinsic value the paper marks received from domestic sales really represent. This state of affairs, entraining an ever increasing and perfectly arbitrary safety co-efficient in all price calculations has to a large degree been responsible for the violent movement of prices, which quickly imparted itself to wages and has strongly precipitated the degeneracy of the paper mark.

It must be assumed that a stable currency will eliminate such co-efficients and reduce prices to their true size. The one factor which manufacturers have not in their power to remedy is the labor problem, comprising also the various encumbrances imposed upon them by socialistic labor legislation and

a hypertrophical administration machinery.

It is quite a dogma amongst manufacturers that in an era of stable currency the industry cannot exist unless pre-war conditions of labor are restored. They argue that the profits they have made during past years were mostly on paper only. That they were also chiefly of the so-called "invisible" kind resulting not so much from an honest surplus, but from the clever handling of overdrafts incurred at a certain mark rate and settled at a much lower one is now generally realized.

During the last months of the Ruhr-war and for some considerable time after its end, the German machine building industry, in fact business life as a whole, must be viewed as in a state of transition. Apart from economical problems momentous political questions are in suspense, foremost among them the future political status of the Rhineland and Ruhr. A customs cordon separating them from the German interior would seriously aggravate the future situation of the industry, narrowing the domestic market of either side and cutting deep into the usual ways of supply. The system of so-called "index" wages keyed to the cost of living is clearly untenable.

More Taxes

Hastily contrived taxation like the newly introduced—"work tax" imposed upon manufacturers at the rate of 20 per cent of all wages and salaries is overwhelming industry with added difficulties. Sudden contraction and ruinous rates of credits are putting the finishing touch on the situation. It can plainly be seen that the weaker members cannot sustain the strain and are at the point of breakdown. For the rest a waiting policy at closest retrenchment is adopted. Unemployment had in September not yet assumed exceptional dimensions. The number of unemployed of the machine building industry has from 3.6 per cent at the beginning of August risen to 7 per cent at the eighth of September, that of short time workers from 15.9 per cent to 25.3 per cent.

The works are kept going on old orders, new ones have become exceedingly scarce. The volume of business in hand is dwindling down through cancellations. A perfect avalanche of unemployment is, however, preparing itself under the surface as is indicated by the appalling number of factories which have given notice of shutting down under existing regulations which stipulate that this measure is carried out in stages covering about two months. It must be expected to commence its motion in October, an event which is looked forward to with a good deal of anxiety. In Saxony nearly one-half of all existing works are involved in it. The only gleam of light is seen in the lifting of the export control which is now restricted to certain classes of raw and semi-finished material. Machinery export is freed from all fetters. Not that this will help much to revive business. It might only be useful in speeding up shipments and especially in assisting the manufacturers in the occupied parts to clear their large stock, accumulated during the Ruhr blockade. The chief value of the measure is seen in its symptomatical nature, as a start in the right direction and a herald of free business.

Dr. Steinmetz Dies Suddenly

Dr. Charles Proteus Steinmetz, chief consulting engineer of the General Electric Co., died at Schenectady on Oct. 26, after a very brief illness. Dr. Steinmetz was taken sick during his recent visit to the West and although he recovered sufficiently to make the return trip to the East, the attack of illness which he suffered in the West proved fatal because of the patient's lowered resistance.

Dr. Steinmetz was an engineer-scientist whose gifted genius was widely



CHARLES P. STEINMETZ

reflected in electrical and chemical experimentation, research and design. His ability was recognized everywhere, and on old and new problems alike his opinions were eagerly sought. His most constructive work was done, perhaps, in connection with the development of alternating current motors, generators, converters, regulators, lighting and the like. His contributions to the advancement of electrical science and indirectly to humanity will probably never be fully appraised.

His Early Life

Dr. Steinmetz was born April 9, 1865, at Breslau, Germany. He was educated at the Breslau gymnasium and university, studying mathematics, astronomy, physics, chemistry and other branches including economics. In Switzerland he studied mechanical engineering at the Polytechnicum of Zurich. In 1889 he came to America and secured a position with the Eickemeyer Manufacturing Co. first as draftsman then as electrical engineer and designer, and finally on research work in charge of the Eickemeyer laboratory. With the absorption of the Eickemeyer interests by the General Electric Co., Dr. Steinmetz was attached to H. F. Parshall's calculating department in Lynn, Mass. When the company's headquarters were transferred to Schenectady, N. Y., in the spring of 1894, he organized and took charge of the calculation and design of the company's apparatus and of the research and development work. Since 1902 he has been professor of Electrical Engineering at Union University, at the same time retaining his connection with the General Electric Co. as consulting engineer, organizing and assuming charge of its consulting electrical department in 1911.

Dr. Steinmetz was a fellow of the American Association for the Advancement of Science, a member of the Mathematical Society and of the Physical Society. He was a past president and member of the American Institute of Electrical Engineers. He was the author of more than a score of books and of numerous papers on scientific and electrical subjects, many published in the Transactions of the American Institute of Electrical Engineers.

Barnes Optimistic on Export Future

Large scale production, attention to quality, and the inventive spirit of American manufacturers are bound to force the development of American export trade even against the lower competitive labor costs in foreign countries, said Julius H. Barnes, president of the Chamber of Commerce of the United States in an address before the National Foreign Trade Council of the American Manufacturers' Export Association at its annual luncheon at the Waldorf-Astoria Hotel on Oct. 25.

"You may be sure," said Mr. Barnes, "that the test of competitive labor costs in other countries will never be more severe than this last five-year period which you have successfully surmounted. The power of foreign industry to purchase labor service on a traditional currency name, no longer inherently possessed of its real measure of value, has almost run its course. When bread in Berlin sells, a single loaf at 2,500,000,000 marks, we know the long road of labor payment, unconsciously accepting the traditional mark with something of its historical purchasing power, is rapidly drawing to a close.

"There comes a time in these fantastic currencies of the world, when, robbed of this misleading tradition of value inherent in the name itself, these currencies under some title and in some relation must be stabilized in wage payment, in some fair relation to the things of ordinary worker requirement, to food and clothes, and shelter."

E. P. Thomas, president of the United States Steel Products Co., presided at the luncheon.

Baltimore Safety Board Will Start Meetings

The Industrial Safety Conference Committee of the Baltimore Safety Council, Baltimore, organized to seek co-operation in safety work in all the industrial plants of the city, has been organized with George W. Knapp, Jr., factory manager of the National Enameling & Stamping Co., Baltimore, as chairman. Within a few weeks the committee will start meetings for superintendents, foremen, safety engineers and others connected with the plants with the view of organizing safety councils in each plant. Prominent speakers on safety will address the meetings.

Personals

EDWARD G. SCHULTZ, treasurer of the R. K. LeBlond Machine Tool Co., Cincinnati, has been appointed receiver of the Cincinnati Aluminum Casting Co., Norwood, Ohio.

A. J. BARNES has charge of the New York office of the Shepard Electric Crane & Hoist Co., Montour Falls, N. Y. His headquarters are at 30 Church St.

H. C. POOLE, formerly sales manager in the New York office for the Colonial Steel Co., Pittsburgh, has been made general works manager.

C. J. FRANKLIN is in charge of the Western office of the Moltrup Steel Products Co., Beaver Falls, Pa. His headquarters are at 421 Stark St., Portland, Ore.

H. W. GLEDHILL, Eastern sales manager for the Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., will open offices in the City Centre Building, 121 N. Broad St., Philadelphia.

COL. JOHN ROSS DELAFIELD has been appointed to the rank of Brigadier-General by the Secretary of War. Gen. Delafield will have charge of the Ordnance Officers' Reserve Corps.

W. W. PHILLIPS, for the past twelve years sales representative for the Colonial Steel Co., Pittsburgh, in the Rochester district, has been made sales manager in charge of the New York office, with headquarters at 149 Varick St.

GEORGE HESSE has charge of the Pittsburgh office as district manager for the Blacker Engineering Co., New York. The Pittsburgh office is located at 421 Wood St.

G. K. ATKINSON, formerly connected with the Langhaar Ball Bearing Co., Aurora, Ind., is now connected with the New Britain Machine Co., New Britain, Conn., in the capacity of sales representative in the state of Ohio. His headquarters will be in Cleveland.

CHARLES P. TOLMAN has resigned as chief engineer and chairman of the manufacturing committee of the National Lead Co., New York, and has opened offices as consulting engineer. His headquarters will be at 111 Broadway.

F. E. HARRISON is the New York representative for the Eclipse Counterbore Co., Detroit, Mich. His headquarters are at 56 Pine St.

R. P. MCCORMICK, formerly with the Austin Machinery Corp., has been appointed Eastern sales manager of the Pawling & Harnischfeger Co., Milwaukee, with his offices at 50 Church St.

H. A. BAUGH, formerly a salesman with the Shepard Electric Crane & Hoist Co., has been appointed sales manager in the Pittsburgh district.

A. C. SMITH has arrived in Wallingford, Conn., from Houdon, France, where he has established a permanent residence. He will engage in manufacturing in Houdon and is in this country to purchase machinery for a plant he will set up to produce boring bits. Production of 1,500 bits daily is the opening schedule.

ALBERT W. GRAY, works manager for the past three and a half years at the Billings & Spencer Co., Hartford, Conn., has become works manager for the Bristol Brass Co., Bristol, Conn., succeeding JOHN F. WADE, who will take charge of the brass company's real estate.

N. P. FARRAR has resigned as district manager at Pittsburgh for the Shepard Electric Crane & Hoist Co. and has joined the sales staff at the Philadelphia office of the Pawling & Harnischfeger Co., Milwaukee.

PAUL T. WARNER, of the Baldwin Locomotive Works, addressed the Washington section of the American Society of Mechanical Engineers on Oct. 26. His subject was "The Locomotive as a Self-Propelled Power Plant."

FRANK CASPER WAGNER, for the last twenty-eight years a professor of engineering at Rose Polytechnic Institute, Terre Haute, Ind., and acting president since the resignation of DR. PHILIP B. WOODWORTH last May, has been elected president of the school by the board of managers.

L. M. KLINEDINST, assistant manager of sales, has been in addition, appointed advertising manager of the Timken Roller Bearing Co., Canton, Ohio. He succeeds R. E. MACKENZIE, who has resigned after four years' service.

Obituary

WILLIAM COPPEDGE HICKS, of Charlotte, N. C., district sales manager in the Southeastern territory for the Globe Automatic Sprinkler Co., of Philadelphia, died the latter part of October at Raleigh, N. C., following a stroke of apoplexy. He was 42 years of age, and had been in ill health for some time.

JOHN P. ARMSTRONG, president of R. S. Armstrong & Bro., Atlanta, Ga., one of the largest dealers in used machinery and used machine tools in the Southeast, and a pioneer in the industry in the Southern field, died the latter part of October at his home, 381 Williams St., at the age of 66 years, after a long period of illness. Mr. Armstrong had been a resident of Atlanta for a period of thirty-nine years, coming to the city from Albany, N. Y., in 1884, at which time he established, with his brother, the machinery, tool and iron firm of R. S. Armstrong & Bro., assuming the presidency of the concern and remaining as its executive head to the time of his death.

CHAS. C. JENKS, president of the Security Trust Co. and the Jenks & Muir Manufacturing Co., died in Richmond, Va., while on his way from the South to his home in Detroit. He was actively connected with the iron and steel trade in Detroit, having occupied a prominent position with the Peninsular Car Co. At one time he occupied the chief executive position in the United States Radiator Co., and at the time of his death was a director and member of the executive committee of Detroit-Edison Co., the Maxwell Motor Corp., the Detroit Lubricator Co., as well as many financial institutions of the city.

JAMES J. HAY, superintendent of the Vermont Farm Machine Co., Bellows Falls, Vt., died by electrocution in his bathroom Oct. 19, due to a defective lighting fixture. He had served the company as superintendent for 15 years.

WILLIS L. BROWN, SR., secretary and general manager of the Belvidere Screw & Machine Co., Belvidere, Ill., died recently.

Business Items

The Indian Motorcycle Co. is the name adopted in place of the Hendee Mfg. Co., by vote of the stockholders and directors in Springfield, Mass., Oct. 24. Frank J. Weschler was re-elected president, William E. Gilbert, vice-president and Parmly Hanford, treasurer.

The American Saw & Manufacturing Co., producer of hack and band saw blades, Springfield, Mass., has acquired the Dolman Manufacturing Co. of that city and will merge that concern's business of producing screwdrivers with its own establishment, which is being enlarged for the purpose.

The Mack Manufacturing Co. will move its automobile signal plant to Escanaba, Mich., in the Upper Peninsula, it is reported here.

The factory of the Charles Schaible Co., brass manufacturer and the brass foundry of the Berger Manufacturing Co., Cincinnati, were damaged by fire recently. The damage to the two plants was estimated at $6,000.

Property of the Stroh Casting Co., Detroit, for which the Secrurity Trust Co. is receiver, will be sold at auction at the company's plant on Nov. 2, under an order issued by Judge Ormond F. Hunt of the Circuit Court. The receiver has been in possession of the property since April of this year and for a time operated the business which was principally the manufacture of household aluminum ware.

The Coosa Pipe & Foundry Co., of Gadsden, Ala., announced the awarding of a contract for the construction of a new $75,000 plant to replace the company's present plant at Gadsden, The new factory will be considerably larger, increasing capacity about 20 per cent, and will include considerable new equipment and a steel cupola room.

A plant for the manufacture of motors and engines for marine use has been acquired at Brunswick, Ga., by the Everett Brothers Motor Co., a new corporation recently formed, and following improvements the new company will operate the plant manufacturing a new marine motor and other equipment recently perfected, it has been announced by Thomas R. Everett, of Athens, Ga., president of the company.

Conferences have begun between W. T. Durbin, of Anderson, Ind., as receiver for the Anderson Foundry & Machine Co., one of the Dollings subsidiaries, and Bert McBride, receiver for the R. L. Dollings Co. of Indiana, in regard to reorganization plans for that company.

The Cadillac Machinery Co., Detroit, has been appointed exclusive agent for the Grand Rapids Grinding Machine division of the Gallmeyer & Livingston Co., Grand Rapids, Mich., to cover the Detroit district and eastern Michigan.

The Cochise Machine Co., Los Angeles, Calif., has changed its name to the Cochise Rock Drill Manufacturing Co.

The United Tool & Die Co., of Hartford, Conn., has incorporated with an authorized capitalization of $50,000 of which $25,000 is paid in. James J. Carney of No. 17 Kelsey St., Hartford; Joseph E. Delaney, No. 30 Darcy St., West Hartford and Frank R. Velhage, No. 53 Levesque St., West Hartford are the incorporators.

The P.G. S. Co., Inc., of New Haven, Conn., has incorporated with a capital of $350,000 of which $250,000 is paid in. Arthur W. Chambers, Helen H. Hitchcock and Elizabeth M. Kraus, all of New Haven are the incorporators. Automobile parts and mechanical articles are listed as products.

Herbert F. Johnson, trustee of the Mitchell Motors Co., Inc., Racine, Wis., bankrupt, has instructed his representative, H. J. Weber, to immediately offer for sale the entire remaining shop equipment singly or in parcels. The equipment consists of an exceptionally wide variety of machine tools, hammers, presses, pots, ovens, woodworking machinery, etc., with more than 5,000 items listed. Later the real estate and buildings will be offered for sale. This method of liquidation was made necessary by the absence of a satisfactory bid for the plant and equipment as a whole.

The Evansville Tool Works, Inc., Evansville, Ind., with a capital of $200,000 preferred and $10,000 common no par value, has been incorporated to manufacture tools. The directors of the company are Samuel L. Orr, Irving S. Kemp, Caselberry Dunkerson, Frank Lohoff and Samuel Tweedal.

The American Metal Products Co., Thirty-third Ave. and Burnham St., Milwaukee, bronze castings, has decided to add a complete rolling mill and is now erecting an addition, 70x120 ft. When completed, this department will roll plates and bars from brass and copper as well as bronze. The company has purchased from the Briggs & Turivas Co., Joliet, Ill., a 5-stand, three-high 12-in. bar mill and a three-stand two-high plate mill, made by the Lewis Foundry & Machine Co., and a 400 hp. General Electric motor. Purchases of other machinery are now being made. The company is inquiring for a cropping shear, a squaring shear and a roll lathe taking work up to 72 in. in length and 22 in. diameter.

The Mine & Mill Supply Co., distributor in the Southern field of mine and milling supplies, etc., has moved its main headquarters to Lakeland, Fla., where it is planned to establish a plant and main offices, the company to construct a new building there on West Lemon St. Capital was recently increased from $100,000 to $200,000. Officers are now maintained at Mulberry, Fla., Tampa, Fla., and at Savannah, Ga., in addition to the headquarters office at Lakeland.

Francis Fenwick Is Claimed by Death

Francis Fenwick, the head of Fenwick Freres et Cie., well known Paris agents for a large number of American machine tool concerns, died at his home in Croissy-sur-Seine near Paris on Friday, Sept. 21, at the age of seventy-three. He was born in Paris on April 18, 1851, the eldest son of an English father and a French mother. The history of his life is largely the history of the business to which he devoted all his life.

The business was founded by his



FRANCIS FENWICK

father and mother in 1862, and from the first, and for a great many years, was devoted solely to commission undertakings for American and other foreign buyers. In 1885 Francis Fenwick became associated with his parents and brother, and later in 1888, on the death of his father, became the head of the firm, now called Fenwick Freres et Cie. During all these years, he made frequent trips to America where he was favorably known to numerous merchants in our leading cities who were accustomed to buy articles of European manufacture.

The entrance of the then firm into the business of representing American manufacturers of machine tools grew out of a close friendship with the late Lucian Sharpe, one of the founders of the Brown & Sharpe Mfg. Co. In 1888, on bidding farewell to Mr. Sharpe in Providence, he casually inquired if Mr. Sharpe had anything which he could sell in France. To this Mr. Sharpe replied that he might be able to dispose of some hair clippers, and provided him with samples.

During the following year, 1889, occurred the Paris Exposition, at which the company had an exhibit of considerable importance, over which presided F. G. Kreutzberger, lately retired as director of the well known Arsenal of Peuteaux, a man of splendid mechanical ability and experience. Following the Exposition, it was only natural that Mr. Kreutzberger's mechanical abilities should be seconded by the Fenwick interests, which had begun to represent the Providence concern; so between them they took the agency for selling machine tools in France and neighboring countries. Mr. Kreutzberger, however, soon retired as his age was not equal to the responsibilities, and Fenwick Freres et Cie. became the sole representative. Becoming incorporated as the Societe Anonyme des Etablisement Fenwick Freres et Cie., the house took the agency for various American concerns, and through ensuing years assumed the representation of many others. The expansion of this business later necessitated removal to more commodities quarters, which were built for the purpose at 8 Rue de Rocroy the present location.

In 1908 he was decorated by the Government as Chevalier of the Legion d'Honneur. Later he was made president of the Chambre Syndicale des Importateurs Francais; fostered by the Government, according to its custom, which body was to prove so useful in the War. He was also vice-president of the Comptoir d'Achats des Machines-Outils and a member of the Comité Interministeriel des Machines-Outils and d'Outillage Mechanique at the War Department. These various positions were only a small indication of the esteem in which he was held in France.

Interest Is Shown in Representation Plan

An information bulletin of the Pennsylvania R.R. states that the vote polled in the recent elections by shop employees of the Pennsylvania Railroad System for representatives on the various Shop Craft committees, indicates that more than 85 per cent of all the shop employees have signified by secret ballot their approval of the Pennsylvania plan of employee representation for the settlement of disputes that may arise between the men and the management.

A final report of the elections held this year in the four operating regions and Altoona Works shows that 85.9 per cent of all the shopmen of the entire system voted in these elections.

It will be recalled that the controversy between the United States Railroad Labor Board and the Pennsylvania R.R. grew out of the first elections of employee representatives of the shop crafts. The management believes that the results of this year's elections, which have now been completed, removes any reasonable doubt that might have existed as to the real desires of the Pennsylvania shopmen.

Forthcoming Meetings

American Society of Mechanical Engineers. Annual meeting, Dec. 3 to 6, in New York City. Calvin W. Rice, 29 W. 39th St., New York City, secretary.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8. Headquarters, Grand Central Palace, New York City.

Society of Automotive Engineers. Annual meeting, Jan. 22 to 25, at the General Motors Building, Detroit, Mich. Coker F. Clarkson, 29 W. 39th St., secretary.

Foreign Trade Council. Eleventh annual convention at Boston, June 4, 5 and 6. O. K. Davis, India House, Hanover Square, New York City, secretary.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Imported pig iron again appearing in the market. Price of coke low; furnace grade down 25@50c. per ton at Connellsville. October steel demand showed improvement over preceding month. Steel pipe, sheets, tin plate and nails most active items in present market. Plates and shapes still at $2.50 base; bars, $2.40 per 100 lb., with no quotations under that figure. Railroad and ship plates form bulk of steel plate demand; structural material quiet.

Advances—Tin shows sharp advance due to increased domestic demand; up 1¼c. per lb. in week. Antimony market stiffened appreciably; rose ½c. per lb. in New York.

Declines—Copper (electrolytic) at lowest price level since September, 1921; down ½c. per lb. in week. Increased discounts offered on bolts, nuts and rivets in Cleveland warehouses during week.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$26.05
Northern Basic	25.00
Southern Ohio No. 2	25.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	29.00
BIRMINGHAM	
No. 2 Foundry	23.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.25
Virginia No. 2	28.17
Basic	25.00
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	25.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	28.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	26.77
Basic	26.77
Bessemer	27.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21	3.70	4.95	4.45	5.05
Nos. 22 and 24	3.75	5.00	4.50	5.05
Nos. 25 and 26	3.80	5.05	4.55	5.10
No. 28	3.85	5.15	4.65	5.20
Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11	4.00	5.15	4.70	5.35
Nos. 12 and 14	4.10	5.25	4.80	5.45
Nos. 17 and 21	4.40	5.55	5.10	5.75
Nos. 22 and 24	4.55	5.70	5.25	5.90
No. 26	4.70	5.85	5.50	6.05
No. 28	5.00	6.15	5.80	6.35

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0,17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold drawn shafting or screw	4.65	3.90	4.55
Cold drawn flats, squares	5.15	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 5/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			13.12½
Tin, 5-ton lots, New York			43.50
Lead (up to carlots), St. Louis	6.55	New York	7.22½
Zinc (up to carlots), St. Louis	6.30	New York	6.75

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.50	27.00	25.50
Antimony (Chinese), ton spot	9.00	10.50	7.50
Copper sheets, base	21.25	21.50	23.00
Copper wire, base	15.50	18.75	16.25
Copper bars, base	19.75	22.00	19.50
Copper tubing, base	24.00	27.00	23.00
Brass sheets, base	17.50	21.75	18.75
Brass tubing, base	22.50	27.00	20.50
Brass rods, base	15.25	17.75	15.75
Brass wire, base	18.00	21.75	....
Zinc sheets (casks)	10.25	10.45	....
Solder (½ and ½), (case lots)	29.50	29.00	24.00
Babbitt metal (83% tin)	52.00	52.00	40@42
Babbitt metal (35% tin)	25.00	17.50	17@20
Nickel (ingot and shot)	29.00	....	....
Nickel (electrolytic)	32.00	....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00

Shop Materials and Supplies

METALS—Continued

Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.75	11.50	11.50
Copper, heavy, and wire	10.75	11.00	10.75
Copper, light, and bottoms	9.50	9.00	9.75
Lead, heavy	5.75	5.25	5.90
Lead, tea	4.75	4.00	5.00
Brass, heavy, yellow	7.00	.....	7.00
Brass, heavy, red	8.75	9.25	8.75
Brass, light	6.25	5.00	6.25
No. 1 yellow brass turnings	7.00	5.75	7.00
Zinc	3.75	2.75	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$25.10	$22.85	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.40	18.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	13.00	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13¼x13¼, per lb	11.00	36.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	.....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.98	1.05	1.14
Lard cutting oil (50 gal. bbl.) per gal	.55	.50	.67½
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.297	.35	.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30–10%	30–10%	30–10%
Heavy grade	20–5–2½	30%	20–5–2½%
Rubber and duck:			
First grade	50–10–5%	50–10%	40–10%
Second grade	60–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20
Fire clay, per 100 lb. bag	.....	.65	.60
Coke, prompt furnace, Connellsville	per net ton		3.50@4.00
Coke, prompt foundry, Connellsville	per net ton		5.00@5.50
White lead, dry or in oil	100 lb. kegs		New York, 14.00
Red lead, dry	100 lb. kegs		New York, 14.00
Red lead, in oil	100 lb. kegs		New York, 15.50

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0354	$0.0354	$0.0304
Cold finished shafting	per lb.	0.0465	0.0465	0.039
Brass rods	per lb.	0.1525	0.1575	0.17
Solder (½ and ½)	per lb.	0.295	0.295	0.265
Cotton waste	per lb.	.10@.13	.10@.13	.09@.11½
Washers, cast iron (½ in.)	per 100 lb.	6.50	6.50	6.00
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.02
Lard cutting oil	per gal.	0.55	0.55	0.55
Machine oil	per gal.	0.297	0.297	0.33
Belting, leather, medium	off list	30–10%	30–10%	40–5%
Machine bolts up to 1x30 in.	off list	40–10%	40–10%	40%

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40–10%	60%	45–5%
1⅛ and 1¼x3 in. up to 12 in	15%	50–5%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	25–10%	$3.50 net	.....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30–10%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65–5%
Lag screws, coach screws	40–10%	.....	60–5%
Square and hex. head cap screws	60%	70%	70–10%
Carriage bolts, up to 1 in.x30 in.	30–10%	50%	40–5%
Bolt ends, with hot pressed nuts	40–10%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 9/16 and smaller	60%	.....	.....
Semi-finished nuts, ⅝ and larger	55%	70%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	0.50	3.50	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	0.50	3.50	2.50
Nuts, cold punched, sq., per 100 lb. Off list	0.50	3.50	2.50
Nuts, cold punched, hex., per 100 lb. Off list	0.50	3.50	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	50–10%	60%	60%
Rivets, tinned	50–10%	60%	4½c. net
Button heads ⅞-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3.60	$3.75
Cone heads, ditto (net)	5.60	3.80	3.85
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

New and Enlarged Shops

Machine Tools Wanted

Ala., Tuscaloosa—Yellow Cab Co., Broad St.—drill press and lathe.

Conn., Hartford—Long Bros., State St.—lathe, planer, shears, upright drill, hack-saw, bolt threading machine and small tools for proposed garage.

D. C., Wash.—Dist. Comrs.—receiving bids until Nov. 5 for a 12 in. x 5 ft. geared head light duty engine lathe.

Fla., Sandford—H. F. Kent, Commercial and Rand Sts.—lathe, drill press and bench tools for garage.

Fla., Tampa—Hulsey & Holtsinger, Marion and Lafayette Sts.—drill press and lathe for automobile service station.

Ill., Chicago—Illinois Central R.R., 135 East 11th Pl., J. J. Bennett, Purch. Agt.—75 ton vertical motor driven hydraulic press.

Ill., Chicago—E. J. Paidar Co., 1218 North Wells St.—No. 3 punch press; 21 in. or over, turret lathe with power cross and longitudinal seeds; high speed saw with pump.

Ill., Rockford—Reliable Machine Co., 1324 10th Ave.—20 in. drill press.

Kan., Lawrence—G. W. Savage, 602 New Hampshire St. (machine shop)—36 in. x 10 ft. lathe, reamer and small hand tools.

Mass., Boston — Grovehall Realty Trust Co., c/o E. P. Finn, 1 Beacon St.—machinist's tools, including lathe, drills, etc., for proposed $250,000 garage.

Mass., Worcester—Crompton & Knowles Loom Wks., 93 Grand St., address Purchasing Dept.—machine tools for addition to factory.

Mich., Detroit—Kroger Grocery & Baking Co., 4760 Merritt Ave.—equipment for repair department of proposed $90,000 garage.

Mich., Kalamazoo—Valley Paper Co., 401 Press Bldg.—high speed motor driven paper machine, beaters, also complete machinery and tools for small machine shop.

Mo., Joplin—W. R. Watson, Genl. Delivery—drill press, lathe, belting, hangars, emery stand, shafting and bearings for garage.

Mo., Kansas City—Acme Electric Co., 2121 East 39th St.—7 ton punch press.

Mo., St. Louis—Tate Motor Co., Garrison Ave. and Washington Blvd.—drill press and lathe.

N. Y., Buffalo—Buffalo House Wrecking Salvage Co., 477 Walden Ave.—equipment, also one 1,000 gal gasoline tank and pump for service station on Main and Custer Sts.

N. Y., Buffalo—J. A. Cramer, 1010 Main St.—equipment for automobile service station at 173 North Pearl St.

N. Y., Buffalo—A. Dicianni, 415 Niagara St.—equipment for garage and repair shop.

N. Y., Buffalo—E. Goodman, 719 Genesee St.—equipment for automobile repair shop at 169 Niagara St.

N. Y., Buffalo—J. Strootman, 657 Genessee St—repair shop tools and equipment for garage.

N. Y., New York—New York Mchy. Co., 200 5th Ave.—pipe threading and cutting machine.

N. Y., Niagara Falls—N. Marcelle, 516 Walnut St.—garage and repair shop equipment and tools.

N. Y., Olean—Terry Chevrolet Corp., L. S. Terry, Purch. Agt.—tools, drill presses and equipment for garage.

N. Y., Rochester—L. G Gibaud, 352 Main St., E.—machine shop and automobile service tools, machinery and equipment.

N. Y., Rochester—G. Higgins, 38 South Fitzhugh St.—garage tools, machinery, drill presses and equipment for repair shop.

O., Cincinnati—Cincinnati Planer Co., South St., Oakley—30 to 48 in. open side planer and 48 to 72 in. boring mill.

O., Columbus—C. A. S. Products Co., Box 84—automatic screw machine.

O., Fremont—East Side Implement Co., E. Winters, Purch. Agt.—tools and equipment for automobile repair shop.

O., Youngstown—Trucson Steel Co., Albert Extension, J. Kahn, Pres.—machinery and equipment for plant extension.

Okla., Picher—F. P. Ussery—drill press, emery stand and wheel for blacksmith shop.

Pa., Bellwood—Natl. Steel Constr. Co., Inc., R. I. Motysek, Supt.—one bolt rethreading machine and one semi automatic electric welding machine, 150 volt, 22 ampere.

Pa., East Pittsburgh — Westinghouse Electric & Mfg. Co.—planers, drill presses and other machine tools, about 52.

Pa., New Castle—Pennsylvania Eng. Wks. (fabricating)—scarfing machine, plate planer, sectional flanging press, serpentine shear, straightening rolls, rotary shear and vertical punch.

Pa., Pittsburgh—J. Cutrara, 5511 Walnut St.—tools, presses and equipment for automobile repair shop.

Pa., Pittsburgh—Dorsey Garage & Repair Shop, 6115 Kirkwood St.—garage and repair shop equipment.

Pa., Pittsburgh—M. Jaconette, 6111 Kirkwood St.—automobile repair shop equipment, including bench tools and drill presses, to replace that which was destroyed by fire.

Pa., Pittsburgh—N. Joy, Music Alley and Hill St.—garage tools, presses and equipment for repair shop.

Pa., Pittsburgh—F. L. McShane, 2350 Baldwin Rd.—emery wheel, drill press, tools and equipment for automobile repair shop.

Pa., State College—Blue & White Garage, H. M. Myers, Purch. Agt.—bench tools, presses and equipment for repair department.

Pa., Westfield—V. Borden—presses, small lathe and tools for new automobile repair shop.

Pa., Wilkes-Barre—J. Edwards, 118 Waller St.—press, tools and equipment for garage.

Pa., Wilkes-Barre—J. Fox, Lee Park—drill press, small garage tools and general repair equipment for battery and automobile service station.

Pa., Wilkes-Barre — J. Iskra, 57 West Chestnut St.—automobile repair shop tools and equipment, including drill press.

Pa., Wilkes-Barre—J. F. H. Johnson, 202 North Washington St.—garage equipment, bench tools, etc.

Tex., Houston—Southern Pacific R.R., Southern Pacific Bldg., F. W. Taylor, 65 Market St., San Francisco, Calif., Purch. Agt.—equipment for proposed $100,000 shops at Valentine.

Va., Richmond — C. F. Nicholson, 303 North Graham St.—drill press, electric hand hammer and gas soldering machine for automobile repairs.

Va., Richmond—Richmond Auto Service Co., 814 West Broad St.—medium size lathe.

W. Va., Charleston — Sterling Gasoline Corp., Winchester and 27th Sts.—drill press and lathe.

W. Va., Montgomery—Montgomery Oldsmobile Co.—lathe and drill press.

Wis., Biron (Grand Rapids P. O.)—Consolidated Water Power Paper Co.—equipment for proposed $40,000 machine shop.

Wis., Hurley—Noeman Bros.—tool room equipment and air compressor, for proposed $50,000 garage.

Wis., La Crosse—L. and S. Fee, c/o L. Fee, 1018 Denton St.—automobile repair machinery, gasoline tanks and pumps for proposed garage on Vine St.

Wis., Okauchee—Wein Bros. Co., c/o R. Wein, Mgr.—automobile repair machinery, tanks and pumps for proposed garage.

Ont., Ingersoll—T. E. Bissell Co. (manufacturer of implements)—metal working machinery, lathes, drills and special equipment for machine shops, to replace that which was destroyed by fire.

Ont., Pembroke—Desrochiers Bros., 83 Lake St.—machine shop equipment.

Ont., Renfrew—Simpson & Elliot, Argyle St., J. C. Simpson, Purch. Agt.—complete equipment for automobile repair shop.

Que., Amqui—L. Audette—drill press and small tools for garage.

Que., Charny—J. E. Malouin—drill press and lathe for garage.

Que., Lachine—J. H. Thessreault, 327 Bway—complete equipment for automobile repair shop at 48 Drummond St., Montreal.

Que., L'Islet—L. Caron—garage tools, including small lathe.

Que., Montmagny — N. Pouliott, 101 St. Jean Baptiste St.—complete service station and repair equipment.

Que., Montreal—M. Block, 207 Wellington St.—complete equipment for garage, including tank, pump and compressor.

Que., Montreal—Goddard & Appleby, 664 Union Ave.—complete equipment for automobile repair shop.

Que., Montreal—B. B. Lusher, 35 Drummond St.—complete equipment for garage and repair shop.

Que., Montreal—G. Palmer, 2 B Park Ave.—complete automobile repair shop equipment, also gasoline tank, pump and air compressor.

Que., Outremont—P. Guidazio, Apt. 1, 640 D'Epee St.—complete equipment for 90 x 167 ft. garage.

Ont., St. Isidore de Prescott—J. Longtin—lathe, etc., for garage.

Que., Ste. Marie, Beauce—J. Bilodeau—automobile repair machinery.

Que., St. Romuald d'Etchemin — J. Halle, 235 Commerciale St.—bench tools, lathe, etc., for garage and blacksmith shop.

Que., Shawville—Connelly & Eades, J. W. Eades, Purch. Agt.—garage and repair shop equipment, including tools, emery wheel and stand.

Machinery Wanted

Ala., Mobile—K. N. Heath, 116 Hendon Ave.—woodworking machine.

D. C., Wash.—Bureau of Supply, Treasury Dept.—one combination forged drill, anvil and vise.

Ill., Chicago—Blue Valley Creamery Co., 700 South Clinton St.—machinery for proposed $40,000 plant at Bemidji, Minn.

Ill., Freeport—J. Knobel & Son, 4 Exchange St. (produce)—refrigeration machinery, several ton capacity, motor or belt drive.

Ind., Indianapolis—T. L. Green & Co., 202 Miley Ave.—one 5 to 7 ton traveling crane.

Ind., New Albany — New Albany Loose Leaf Tobacco Co., Locust and Clark Sts.—hydraulic presses for new tobacco warehouse.

Ind., South Bend—W. Reeser, 1345 North Welker St. (woodwork)—16 to 20 in. pony planer.

Kan., El Dorado—B. A. Runyan—job printing press and stereotype outfit.

Kan., Lawrence—Jarpy Machine Wks., 110 West 8th St., J. Jarpy, Purch. Agt.—10 in. bench miller (used).

Ky., Louisville—Office of United States Engineer, P. O. Box 72—one cutting torch, 20 to 24 in. long, with 90 deg. head for use with hydrogen; ten injectors, ¾, 1 and 1¼ in.; eight lubricators, double connection, brass forced feed; six hundred bars, round, soft steel, ⅝ to 1½ in.; eleven sheets, ¼ and ¾ x 48 x 108 in. structural plate; six 6 in. sheaves for ⅝ in. wire line.

Ky., Sutton—Sutton Coal Co.—coal handling machinery, etc.

La., New Orleans—Loubet Glassware & Cork Co., Ltd., 510 Bienville St.—complete equipment and special machinery for the manufacture of glassware, to replace that which was destroyed by fire.

Md., Baltimore — Sterling Drug Corp., Chandler Bldg.—machinery and equipment for new chemical plant.

Md. Elkton—Colonial Tool & Forge Co. (manufacturer of screwdrivers and tools). L. V. Blue, Pres.—machinery and equipment, including power hammers, shafting, hangers, etc., for new plant.

Mass., Barnstable—School Com.—equipment, including saws, tables, benches, lathe, planer, drills and miscellaneous small tools, for manual training department of new high school.

Mass., Boston—Amer. Box Co., 56 West Canton St., address manager—woodworking tools, including belt or disc sander, double spindle borer, power screw driver, medium size cutoff saw, etc. (used).

Mass., Boston—The city, Public Bldg. Dept. —manual training machinery and equipment for proposed $3,000,000 high school.

Mass., Brighton (Boston P. O.)—Hatfield Stair Bldg. Co., 124 Western Ave., address the manager—woodworking machinery, including lathe, saws, planer, drill, belting, pulleys, etc., to replace that which was recently destroyed by fire.

Mass., Milford—W. J. Collins Fdry. Co., 22 Franklin St., address manager—equipment for proposed addition to foundry.

Mass., Westfield—H. B. Smith Co.—equipment, including furnaces, melting pots, etc., for addition to foundry.

Mich., Detroit—W. Campbell Co., 5660 Merritt Ave. (manufacturer of fireless cookers)—one electric butt welder, small capacity.

Mich., Detroit—Detroit Concrete Receptacle Co., 4225 Michigan Ave.—equipment for handling concrete and sheet metal for proposed $250,000 factory for the manufacture of concrete ash receivers and garbage receptacles.

Mich., Mayville—Hardwood Products Co. —one 48 in. and one 54 in. veneer clipper.

Minn., Duluth—Cutler-Magner Co., foot of 8th Ave., W. (cement, lime and salt dealers)—machinery and equipment for $300,000 warehouse, to replace that which was destroyed by fire.

Miss., Hattiesburg—Tatum Lumber Co.—sawmill machinery.

Mo., Joplin—Race Track Mining Co., c/o B. E. Brown, W. Goodwin, Purch. Agt.—belting, hangers, shafting, pulleys and bearings.

Mo., Kansas City—Dean Rubber Co., 561 Grand Ave.—machinery for the manufacture of rubber water bottles.

Mo., Kansas City—H. H. Hervy, 209 Oak St. (machinery dealer)—five bar bending machines.

Mont., Hinsdale—J. E. Greene—one linotype and one intertype machine, belting, hangers, pulleys and newspaper press (used).

N. Y., Albion—Albion Furniture Mfg. Co., Inc., W. D. Wright, Purch. Agt.—woodworking machinery and equipment to enlarge plant.

N. Y., Au Sable Forks—Marr & Gordon —stone cutting machinery and equipment for marble cutting and quarry.

N. Y., Buffalo—K. Bauerle, 50 Camoridge St.—equipment for bakery at 93 Cherry St.

N. Y., Buffalo—Bemis Bros. Bag Co., 829 Chamber of Commerce—equipment for the manufacture of cotton burlap and paper bags for plant at 711 Northland Ave.

N. Y., Buffalo—Berling Magneto Co., Inc., 42 Laird Ave.—equipment for light assembly work on magnetos.

N. Y., Buffalo—Boehm Bros., 101 Norfolk St.—tools, saws, planers and equipment for new carpenter shop.

N. Y., Buffalo—Elba Cold Storage Co., Inc., C. Eismann, c/o Buffalo Vegetable Marketing Co., 29 East Market St., Genl. Mgr.—refrigeration equipment, hangers, pulleys, etc., for cold storage plant at Elba.

N. Y., Buffalo—R. W. Miller, Sycamore St. and Sweet Ave.—equipment for bakery.

N. Y., Buffalo—J. Willson, 256 Esser Ave. —upright Bradley hammer.

N. Y., Lyons Falls—Waters Mfg. Co., S. W. Sylvester, Purch. Agt.—machinery and equipment for plant for the manufacture of automobile parts and accessories.

N. Y., Marlboro—Record—cylinder or flat bed newspaper press.

N. Y., New York—Amer. Spectacle Co., 136 West 52nd St.—power cutting machine.

N. Y., New York—F. Hawley, 244 West 42nd St.—bandsaw.

N. Y., New York—L. Robertson, Inc., 540 West 22nd St. (machinist)—air compressor.

N. Y., North Tonawanda—Northern Lumber Co.—machinery and equipment for lumber mill.

N. Y., Rochester—Rochester Refrigerating Co., 1980 East Ave., R. Tomlinson, Pres.—refrigeration machinery and equipment for proposed addition, to contain 100,000 sq.ft. of floor space.

N. Y., Rochester—Stuart-Oliver Metal Finishing Co., 222 North Water St. (automobile body finisher), O. D. Stuart, Pres.—machinery and equipment for enameling and plating metal.

N. Y., Sherburne—Bd. Educ.—manual training equipment for proposed $175,000 high school.

N. Y., Utica—Powell Muffler & Timer Co., 316 Catherine St. (manufacturer of automobile mufflers)—machinery, hangers, pulleys, etc., for addition to plant.

N. C., Burlington—Community Refrigerating Co.—20 ton raw water ice plant, electrically driven, at Jacksonville, Fla.

N. C., Lakeview—J. B. McQueen, Vice-Pres.—equipment for proposed $300,000 cotton mill at Hemp.

N. C., Wilmington—Atlantic Coast Line R.R., A. C. L. Bldg., F. H. Fechtig, Purch. Agt.—woodworking machinery for the manufacture of passenger coaches.

N. C., Wilmington—W. Clark, P. O. Box 824—2 ton hoist and a steam driven gravel loader.

N. D., Arnegard — McKenzie County Farmer—model 15 linotype machine.

O., Canton — Wilson Rubber Co., 1216 Garfield Ave., F. J. Wilson, Vice Pres.—machinery for the manufacture of rubber gloves, molds and specialties.

O., Cleveland—Cleveland Wheelbarrow & Mfg. Co., 4001 West 25th St.—wiring press, No. 4 W. Bliss or equal, 24 in. stroke, 50 in. between gibs.

O., Columbus—Columbus Varnish Co., 262 Cozzens St., S. W. Hanna, Genl. Mgr.—complete equipment, including three mills, mixers, etc., for large addition to plant.

O., Columbus—E. J. and W. E. Jones, 406 West Spring St.—one molding machine and other woodworking equipment.

O., Lancaster—Natl. Glass & Lens Co., A. Steiner, Purch. Agt.—special machinery and equipment for the manufacture of patent lens.

O., Marion—J. M. Ruffner—20 ton Fairbanks wagon scales.

O., Mount Vernon—MacGee-Starr Granite Co.—machinery, equipment, conveyors, hoisting machinery, etc., for proposed building stone plant.

O., Piqua—Orr Felt & Blanket Co.—complete special machinery and equipment for the manufacture of blankets and felt coverings.

O., Toledo—Bingham Stamping Co., Post and Albion Sts. (manufacturer of stamping for automobiles, etc.)—special machinery, forging, furnaces and equipment for proposed addition to plant.

O., Toledo—Ranson & Randolph, Superior St.—special equipment and chemical machinery, etc., for proposed plant for the manufacture of dental supplies.

O., Uhricksville—Federal Collieries Co. (manufacturer of sewer pipe)—complete machinery and equipment for proposed $3,000,000 plant.

Ore., Eugene—Eugene Daily Guard, J. E. Shelton, Purch. Agt.—16 page stereotyping press.

Pa., Erie—Sims Mfg. Co., Whitley Ave. (manufacturer of castings, etc.)—foundry equipment.

Pa., Meshoppen—C. B. Tyler—complete machinery and equipment for proposed $40,000 flour mill.

Pa., New Brighton — Damascus Steel Casting Co.—foundry equipment.

Pa., Pittsburgh—Amer. Reduction Co., 2208 Forbes St. (garbage and refuse reduction)—one belt conveyor.

Pa., Pittsburgh—R. R. Lambert Co., Charles and Crispen Sts. (lumber yard, mill and brick yard)—hoisting machinery and equipment, to replace that which was destroyed by fire .

Pa., Pittsburgh—Natl. Nut & Bolt Co., 62nd St. along tracks of Allegheny Valley St. Ry.—bolt head trimmers, capacity ⅛ in. diameter and larger.

Pa., Pittston—World Playing Co., Oregon Heights — complete machinery and equipment for plant for the manufacture of playing cards.

Pa., Sheffield — Endstrom-Wetmore-Henderson Co.—complete machinery and equipment for proposed $50,000 plant for the manufacture of window shade rollers.

Tex., Dallas—J. C. Melton, 619 Martinique Ave.—job printing press and paper cutter.

Tex., Houston—Houston Ry. Car Co., P. O. Box 223, M. R. Darcey, Purch. Agt.—galvanizing machinery and equipment for the manufacture of refrigerating tanks.

Tex., Sulphur Springs—Hopkins County Echo—duplex 8 page press.

Va., Graham—Bluestone Furniture Co.—lathes for turning wood.

Va., Lynchburg — Craddock-Terry Co. (manufacturer of shoes)—special machinery and equipment for proposed $150,000 addition to plant.

Va., Lynchburg—N. B. Handy Co., 9th St.—bar benders.

W. Va., Fairmont—Fairmont Cleaners & Dyers Co., Boulevard Ave.—dyeing machinery and equipment for new plant.

W. Va., Fairmont—F. W. McIntyre, Morgantown Ave.—bench tools and equipment for garage.

W. Va., Fairmont—Willets Clay Pottery Co.—machinery and equipment for $200,000 plant, to replace that which was destroyed by fire.

W. Va., Harrisville—Standard—7 column quarto newspaper press.

W. Va., Keystone—French Sand Dryer Co., C. S. French, Mgr.—dressing machines, lathes, etc., for the manufacture of sand dryers.

W. Va., Petersburg—R. B. Bird—broom making machinery.

Wis., Cambridge—J. Porter—large air compressor.

Wis., Green Bay — G. Richardson, 133 North Pearl St.—shaper, mortiser, sticker and sander.

Wis., Madison—J. E. Boettcher Co., 518 Wingra St.—special machinery and equipment for the manufacture of measures, weighing devices, etc., for plant at Waunakee.

Wis., Madison—A. Fiore Co., 620 West Mifflin St.—gasoline storage tanks and pumps for proposed filling station on Commonwealth and Monroe Sts.

Wis., Marshfield — Berg Supply Co., T. Berg, Mgr.—machinery and small tools for plant for the manufacture of barn equipment at Brillon.

Wis., Milwaukee—Dittmar Printery, 1180 11th St.—paper cutting machine.

Wis., Milwaukee—J. A. Hentz, 700 11th St.—laundry machinery, including power washer, mangle, ironer, dryers, belting and shafting.

Wis., Milwaukee—Logemann Bros., 3130 Burleigh St. (manufacturer of baling presses)—traveling crane.

Wis., Milwaukee — United Consumers Corp., 4519 Lisbon Ave.—air compressor with service station.

Wis., Newhope (Amherst Junction P. O.) —J. M. Rustad—bandsaw, circle saw and jig saw for sawmill.

Wis., North Milwaukee — A. Krueger, Route 5, Box 142—combination woodworker to include five operations.

Wis., Oconomowoc—P. Binzel—vegetable canning machinery, including viners, sealers, conveyors, belting and shafting.

Wis., Rice Lake—Chronotype—2 revolution newspaper press to take 24 x 36 in. sheets.

Wis., Sun Prairie—Standard & Specialty Porcelain Co., L. A. Stohl, Mgr.—dry kiln equipment and clay drying machinery.

B. C., Sapperton—Swift Canadian Packing Co., Ltd. (meat, lard, etc.)—complete equipment for refinery.

Ont., Atikokan—E. T. Moore—special machinery for the manufacture of boring piston rod packings.

Ont., Cobden—W. Gibson—special machinery for the manufacture of a carrier control system.

Ont., Hamilton—Canadian Westinghouse Co., Ltd., Aberdeen St.—furnace, cranes and moulds for proposed $250,000 foundry.

Ont., Kitchener—Schneider Packing Co.—equipment for factory.

Ont., North Wakefield—A. Latourelle—gasoline pump and garage tools.

Ont., Ottawa—Compagnie de Poinconneuse Automatique de Fiches Limitee, c/o G. E. Robert, 301 King Edward Ave.—equipment for the manufacture of self feeding gang punching machines.

Ont., Pembroke—J. M. Cameron, 361 Pembroke Rd.—vulcanizing equipment.

Ont., Pembroke—C. Devlin & Son, 274 Pembroke Rd.—foundry equipment.

Ont., Port Hope—Bush English China Co., Ltd.—complete equipment for the manufacture of china.

Ont., Toronto—Dacks, Ltd., 73 West King St., S. E. Dack, Purch. Agt.—rebuilt Peerless perforator.

Ont., West Lake—West Lake Brick Co.—equipment for proposed $30,000 brick plant capacity 40,000 brick per day, at Wellington.

Ont., Windsor—Ontario Power Comn., A. Beck, Pres.—machinery and equipment for proposed plant for the manufacture of gas and byproducts.

Que., Ladysmith—R. C. Holt—blacksmith shop equipment.

Que., Levis—L. N. Huard, 129 Commerciale St.—complete equipment for pulp mill on the Megiscane River near Temiskaming.

Que., Montreal—All Clear Windshields, Ltd., W. C. Nicholson, 15 Vendome Ave., Purch. Agt.—complete equipment for the manufacture of automobile accessories.

Que., Montreal—Canada Steamship Co., Victoria Sq.—coal handling machiery for Fort William, Ont.

Que., Montreal—J. A. L. Leclair, 654 Fabre St.—gasoline tank, air compressor and pump.

Que., Montreal—C. Picard, 943 Gouin Blvd., W.—gasoline tank, pump and air compressor.

Que., Pointe au Pere—W. Raymond—portable drill, air compressor, etc., for automobile repairs.

Que., Quebec—E. Andrews, 281 Arago St.—bench tools and chain hoist for garage.

Que., Quebec—St. Regis Pulp & Paper Co., Ltd., 70 St. Paul St.—complete equipment for pulp mill at Cap Rouge.

Que., Shawville—J. Brounlee—forge, bench tools and other equipment for blacksmith shop.

Que., Shawville—J. Rennick—forge and other equipment for blacksmith shop.

Metal Working Shops

Calif., Bakersfield—The Kern County High School Dist. awarded the contract for the construction of shop buildings. Estimated cost $85,839. Noted Sept. 27.

Calif., San Francisco—The Victor Oxyacetylene Equipment Co., 884 Folsom St., is having plans prepared for the construction of a 2 story shop on Folsom St. near 4th St. Cost will exceed $15,000. R. W. Jenkins, 918 Harrison St., San Francisco, Archt.

Calif., San Jose—The Pacific Gas & Electric Co., 445 Sutter St., San Francisco, is having plans prepared for the construction of a warehouse and garage, here. Cost will exceed $90,000. Private plans. Noted Feb. 8.

Calif., Visalia—J. B. Newman, G. & I. Bldg., is having plans prepared for the construction of a 1 story, 100 x 215 ft. garage on East 9th St. Private plans.

Ill., Aurora—The Barber-Greene Co., West Park Ave., manufacturer of conveyors, plans to build a 1 story, 130 x 175 ft. and a 24 x 45 ft. addition to plant. Estimated cost $40,000.

Ill., Chicago—The Hartman Furniture & Carpet Co., Pershing and Wentworth Sts., awarded the contract for the construction of a 1 story, 124 x 167 ft. garage at 3927-43 Wentworth St. Estimated cost $75,000.

Ill., Chicago—E. A. Heckel, c/o J. Hocke, Archt., 7602 Chappel Ave., is having plans prepared for the construction of a 1 story, 150 x 191 ft. garage on Exchange St. between 72nd and 73rd St. Estimated cost $65,900.

Ill., Chicago—J. Ure, c/o Van Gunten & Van Gunten, Archts., 26 East Huron St., awarded the contract for the construction of a 1 story, 75 x 105 ft. automobile sales and service station at 7517 North Clark St. Estimated cost $40,000.

Ill., Maywood—Van Gunten & Van Gunten, Archts., 26 East Huron St., Chicago, are receiving bids for the construction of a 1 story, 125 x 125 ft. pattern and machine shop, here, for J. A. Kennedy, c/o Architects. Estimated cost $40,000.

Ill., Waukegan—P. Gerhardt, Archt., 64 West Randolph St., Chicago, is receiving bids for the construction of a 1 story, 80 x 230 ft. automobile sales and service station on Madison and Spring Sts. for C. E. Bairstow, 111 South Sheridan Rd., here. Estimated cost $40,000.

Ind., Evansville—The Graham Bros. Truck Co. plans to build 1 story, 90 x 250 ft. Unit 6 of truck factory. Estimated cost $60,000.

Ind., Richmond—The Terre Haute, Indianapolis & Eastern Traction Co., Traction Terminal, Indianapolis, plans to build a car barn and repair shop, here. Estimated cost $50,000.

Ky., Louisville—The Standard Sanitary Mfg. Co., 6th and A Sts., is having plans prepared for the construction of a 1 story addition to pattern shop on 6th and Shipp Sts. Estimated cost $40,000. D. X. Murphy & Bro., Louisville Trust Bldg., Louisville, Archts.

Mass., Boston—The Grovehall Realty Trust Co., c/o E. P. Finn, 1 Beacon St., will build a 1 story, 175 x 250 ft. garage at 1186 Commonwealth Ave. Estimated cost $250,000.

Mass., Milford—The W. J. Collins Fdry. Co., 22 Franklin St., plans to build a 1 story, 50 x 75 ft. addition to foundry. Estimated cost $25,000.

Mich., Detroit—The Kroger Grocery & Baking Co., 4760 Merritt Ave., is having plans prepared for the construction of a 1 story, 85 x 365 ft. garage on Junction Ave. Estimated cost $90,000. J. G. Kastler & Co., 523 Detroit Savings Bank Bldg., Archts. Noted Mar. 8.

N. Y., New York—J. Lagana, c/o J. J. Dunnigan, Engr. and Archt., 394 East 150th St., is having plans prepared for the construction of a 1 story, 55 x 130 ft. garage on Convent Ave. Estimated cost $50,000.

N. Y., New York—The Northern Union Gas Co., Webster Ave., is having plans prepared for the construction of a 4 story shop and office building on East Kingsbridge Rd. Jardine, Hill & Murdock, 347 Madison Ave., Engrs. and Archts.

O., Cleveland—F. B. Sanders, c/o Craig-Curtiss Co., Contrs., 4614 Prospect Ave., awarded the contract for the construction of a 2 story, 50 x 100 ft. garage at 3422 Prospect Ave. Estimated cost $40,000.

O., Toledo—The Bingham Stamping Co., Post and Albion Sts. (manufacturer of stamping for automobiles, etc.), is having plans prepared for the construction of an addition to plant. Hohly & Gram, Archts.

Pa., Phila.—L. Friedman, Inc., Agent, 251 South 15th St., will soon award the contract for the construction of a 1 story, 26 x 53 x 76 x 102 x 125 x 211 ft. garage on Carlisle St. near Montgomery Ave. Estimated cost $175,000. L. Rothschild, 215 South Broad St., Archt.

Pa., Sharon—The J. Moyer Motor Car Co., North Main St., awarded the contract for the construction of a garage. Estimated cost $20,000.

R. I., Providence—The Textile Finishing Mchy. Co., 171 Westminster St., awarded the contract for the construction of a 1 story, 76 x 121 ft. roll shop and a 2 story, 61 x 110 ft. storage building. Estimated cost $80,000. Noted Sept. 13.

Tex., Austin—The State of Texas Institute for Colored awarded the contract for the construction of a 2 story industrial building and warehouse. Estimated cost $51,882.

Tex., Valentine—The Southern Pacific R.R., Southern Pacific Bldg., Houston, is having plans prepared for the construction of railroad shops, here. Cost will exceed $100,000. G. W. Beschke, 65 Market St., San Francisco, Calif., Ch. Engr.

Va., Richmond—The W. T. Rawleigh Co., 101 Liberty Ave., Freeport, Ill., is receiving bids for the construction of a 2 story, 80 x 165 ft. warehouse and garage, here. W. J. Trevillian, Vice Pres. J. R. and E. J. Law, 1st Central Bldg., Madison Wis., Archts.

W. Va., Huntington—J. J. Weiler & Sons, Robson-Prichard Bldg., plan to build a 1 story, 30 x 210 ft. structural steel shop. Estimated cost $50,000.

Wis., Biron (Grand Rapids P. O.)—The Consolidated Water Power Paper Co. plans to build a machine shop. Estimated cost $40,000.

Wis., Delavan—A. H. Schumacher will soon award the contract for the construction of a 2 story, 40 x 66 ft. and 20 x 32 ft. garage. Estimated cost $50,000. H. C. Hengels, 445 Milwaukee St., Milwaukee, Archt. Noted Oct. 4.

Wis., Elkhorn—G. A. Van Velzer, Williams Bay, awarded the contract for the construction of a 1 story, 52 x 100 ft. garage, here. Estimated cost $40,000. Noted Oct. 18.

Wis., Hurley—N. A. Nelson, Archt., Ironwood, Mich., is receiving bids for the construction of a 1 story, 98 x 100 ft. garage for Noeman Bros., here. Estimated cost $50,000.

Wis., Kenosha—The Amer. Brass Co., 570 Elizabeth St., is receiving bids for the construction of a 1 story, 222 x 542 ft. wire mill. Private plans.

Wis., Kenosha—The city, C. M. Osborn, Mgr., is having plans prepared for the construction of a 1 story garage. Estimated cost $40,000. J. M. Albers, City Hall, Archt.

Wis., Madison—The D. Belsic Co., 213 East Washington Ave., awarded the contract for the construction of a 2 story, 66 x 120 ft. garage and repair shop. Estimated cost $40,000.

Wis., Madison—The Chicago & Northwestern Ry., c/o B. R. Kulp, Engr., 201 South Blair St., awarded the contract for the construction of a 2 story, 50 x 100 ft. machine and repair shop. Estimated cost $40,000. Noted Sept. 6.

Wis., Madison—The Madison Nash Co., 155 East Wilson St., will build a 2 story, 66 x 122 ft. garage and repair shop. Estimated cost $60,000. A. R. Dillon, Mgr.

Wis., Madison—F. Riley, Archt., Conklin Bldg., is receiving bids for the construction of a 2 story, 45 x 100 ft. garage, boiler house and laundry for the Madison Medical Assn., c/o R. S. Ingersoll, Lakeside St. Estimated cost $50,000. Noted Oct. 11.

Wis., Milwaukee—The Finkler Motor Car Co., 924 3rd St., awarded the contract for the construction of a 1 story, 62 x 100 ft. addition to garage. Estimated cost $40,000.

Wis., Plymouth—J. E. Curtiss is having plans prepared for the construction of a 2 story, 60 x 90 ft. garage and repair shop. Estimated cost $40,000. E. A. Juul, Security Bldg., Sheboygan, Archt. Noted Oct. 4.

B. C., Victoria—The Dominion Government, Ottawa, Ont., awarded the contract for buildings, including a machine shop, etc., at the Esquimalt Dock, here. Estimated cost $350,000.

Ont., Hamilton—The Canadian Westinghouse Co., Ltd., Aberdeen St., awarded the contract for the construction of a 1 story foundry. Estimated cost $250,000. Noted Sept. 13.

Read the

SEARCHLIGHT SECTION

the "Opportunity" Advertising of the Machinery Field

See pages 173 to 186

American Machinist

Volume 59 NEW YORK, NOVEMBER 8, 1923 Number 19



FIG. 1—THE CARBURIZING ROOM AND FURNACES

Heat Treating in a California Tractor Plant

SPECIAL CORRESPONDENCE

Illustrations of the equipment used, its capacity, and the work done — The steels used, the fuels and the way in which work is handled

THE importance of heat treating parts for tractors is keenly recognized by the C. L. Best Tractor Co., San Leandro, Calif., as can be seen by the illustrations from its heat treating department. The principal steels used in the work are alloy steels Nos. 2315, 2335 and 2345 and S.A.E. carbon steels Nos. 1020, 1035 and 1045.

The following list of equipment will give an idea of the extent of this department and also show that no expense has been spared to make it first class in every particular. The sizes given are the approximate outside dimensions, not including the steel frames, and the capacities are the extreme capacity per furnace, being determined by the size and form of the work, and the temperature required:

Six carburizing furnaces as shown in Fig. 1. These furnaces are, 8 ft. square and have a capacity of from 450 to 1,500 lb. per 24-hr. day for each furnace. Samples are run in each box, and are broken and inspected before the work in the box is released to the shop.

One double-track car annealing-furnace 6x21 ft. This furnace contains two sets of five cars, each set travelling in opposite directions. Each car is 18x46 in. The capacity is from 3 to 4 tons per 24-hr. day.

Four reheating furnaces of the semi-muffle type, Fig. 2. These furnaces are 6½ ft. square and have a capacity of from 500 to 2,000 lb. per 8-hr. day.

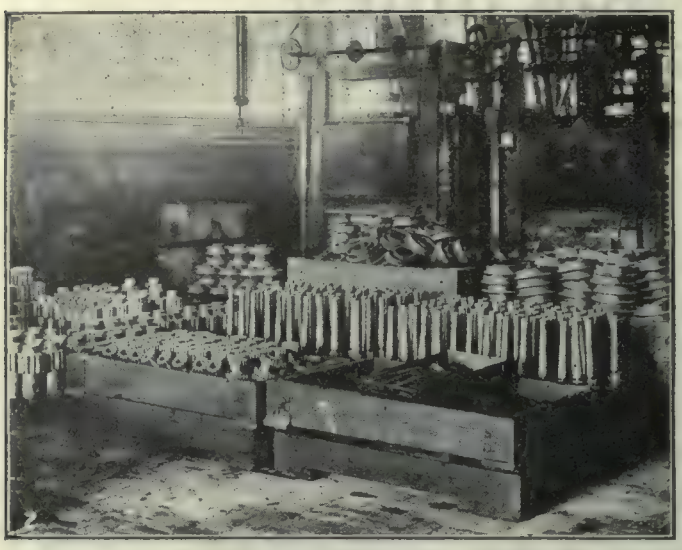
Three rotary-hearth furnaces 10 ft. in diameter, Fig. 3. Capacity is from 400 to 550 track links per day, or from 2,000 to 3,000 lb. This view also shows the trays used and the way in which they are stacked for trucking.

Special furnace for sprockets; capacity 12 to 18 sprockets per 8-hr. day.

One "hump" electric furnace 36 in. in diameter by 36 in. high.

Three drawing pots, 4 ft. in diameter. The total capacity of these pots is sufficient to handle all of the work that requires drawing, from all of the above furnaces.

Also there are four smaller furnaces for special work.



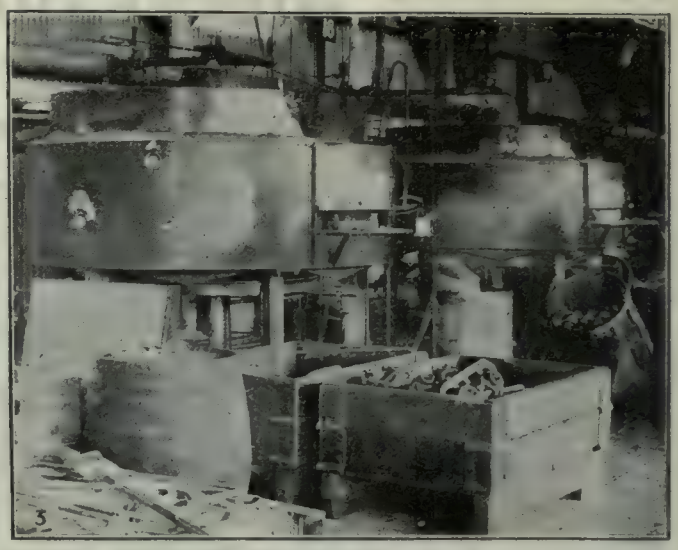
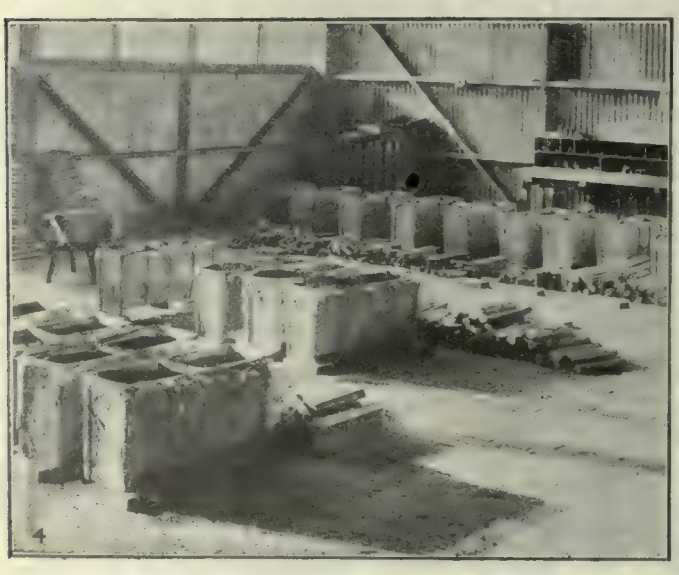


FIG. 2—REHEATING FURNACES. FIG. 3—ROTARY FURNACES FOR TRACK LINKS

The larger furnaces are all fired with preheated oil, but some of the smaller furnaces are heated by gas or electricity. The air supply is furnished by a pair of General Electric Co. centrifugal compressors. The choice of fuel or heating method has been decided by the accuracy of temperature control which the work required, whether the work is to be machined or not, the intensity and duration of the heat, and, of course, the cost per unit of the final output of sufficient quality. Control here refers to rapid and accurate changes of temperature. For small quantities, or batch processes, electric heat is often better. For long steady heat, oil is satisfactory. The rotary furnaces are held within 20 deg. F. limits. Preheated oil is fuel oil heated to a point below the flash point, before using, to secure better combustion.

Parts in the rough are either normalized or annealed, and in some cases both. Normalizing consists of heating considerably above the critical temperature of the particular steel being handled, and cooling freely in air. It is usually preparatory to further heat treatment. Some parts are normalized and then quenched and drawn, completing the entire heat treatment before being machined. The hardness of pieces to be machined depends on the analysis of the steel and subsequent operations. The maximum hardness of work which is to be machined after heat treatment is from 241 to 285 Brinell. The minimum hardness, which is, of course, on low carbon steel machined after heat treatment, is from 156 to 187 Brinell. In some operations the steel works better when it is from 187 to 217 Brinell than when it is softer.

With the exception of a very small amount of cyaniding, which is all done in one pot furnace, 8 in. in diameter and 10 in. deep, carburizing is done by packing in boxes with the covers luted in place, some of these boxes being shown in Fig. 4. The steels used for carburizing are S.A.E. 1020 and S.A.E. 2315. The maximum holding-heats range from 1,600 to 1,720 F., depending upon the steel, the form of the piece and the purpose for which it is to be used. The heating schedules are specified for a fixed rate of increase during the warming up to the maximum, and are held uniformly at the maximum for a definite time. The heat is controlled by a very complete pyrometer equipment, every furnace having a temperature measuring instrument of some kind. Some furnaces have their individual indicators, where they are not closely grouped. But the greater number of furnaces are connected to a Leeds & Northrup indicating potentiometer, and can also be connected to recording instruments for checking purposes. Each of the rotary hardening



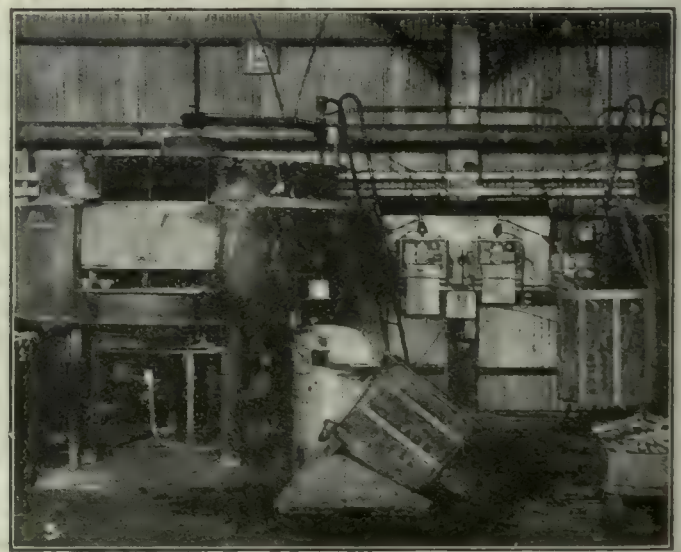


FIG. 4—THE CARBURIZING BOXES. FIG. 5—RECORDING INSTRUMENTS ON ROTARY FURNACES

furnaces shown in Fig. 5 is controlled by a recording instrument of the same make, which gives automatic regulation within less than 10 deg. F. Fig. 5 also shows the wire baskets used for quenching and the stand by which they can be held in an inclined position for easy loading.

The carburizing material is chemically energized charcoal made from peach pits. The heating time varies from 6 to 24 hr., depending on the parts being treated and the size of the boxes. The time allowed for cooling in the boxes is usually 8 hr. or more. All the work is cooled in the boxes and then single or double quenched afterwards, according to requirements. Many sections are heavy enough, so that a single quench gives the required quality in the case, with ample strength and desired hardness of core.

High-analysis steels, such as S.A.E. 1035, 1045, 2335, and 2345, are heated above their critical temperatures and quenched in oil or water. They are then drawn back in oil or molten salts in the draw pots. Or, if the temperatures are above a red heat and when scale is not objectionable, the drawing is done in open furnaces, otherwise in the electric furnace.

The "hump" electrical furnace of the Leeds & Northrup Co. is used exclusively for gears and tool work. The charge of gears is lowered into the furnace in one batch and kept covered until ready to quench, there being no circulation of air or furnace gases during this time, nor is any inspection necessary. The pyrometer temperature recorder writes a story of the changes going on in the steel and gives notice when the charge should be quenched. This is made possible by the fact that the temperature of the pyrometer couple is controlled by the steel being heated, and not directly by the furnace temperature. Incidentally, the chart gives a permanent record of the work and makes it easily possible to duplicate any required treatment without error and with minimum supervision.

Proper quenching is an important item in connection with the use of this type of furnace on account of the large mass being quenched at one time. The large mass makes it absolutely necessary to have a rapid circulation and uniform temperature of the quenching liquid, so these factors must be controlled as well as the temperature of the work.

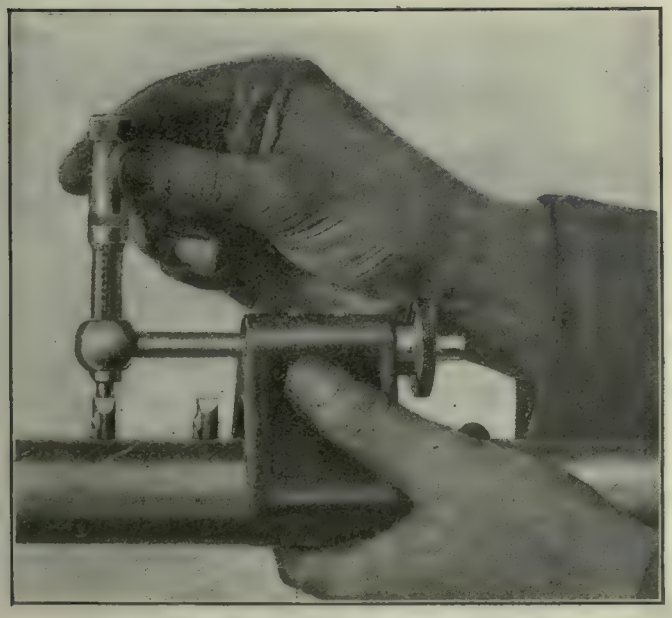
After heat treatment, the carburized work tests as high as 90 on the scleroscope and resists the file. Parts made of high alloys, such as gears, are given a maximum Brinell hardness of 555, or about 80 on the scleroscope. The minimum hardness for alloy bolts and for some shafts is 302 Brinell, or about 50 scleroscope, when these parts are to be treated after machine work has been done upon them.

The Brinell machine is used for testing hardness wherever the form and size or the class of the work permits its use. The scleroscope is used on the general run of carburized work, or where the other method is not feasible. The file is used on the small quantity of cyaniding work done and in a preliminary sorting of abnormal, carburized lots.

Gage for Setting Boring-Bar Cutters—Discussion

By F. W. Elstub
Alfred Herbert, Ltd., Coventry, England

There appeared on page 635, Vol. 58, of the *American Machinist*, an article under the above title by I. B. Rich, which describes a gage used by the Pierce-Arrow Motor Car Co., Buffalo, N. Y., for setting single-point boring-bar cutters. This gage is almost identical with one designed by Alfred Herbert, Ltd., Coventry, many years ago. It was found to have one disadvantage, however: When two cutters were set in the same bar within about 2½ in. of each other, the gage in some cases could not be used on one of the cutters.



GAGE FOR SETTING CUTTER IN BARS

An improved design is shown herewith. In this, the micrometer head is adjustable and can be used on a cutter about 2 in. away from the body. The sliding bar is keyed in the body and is clamped by the knurled collar at the back. This collar is split in three places and screws into the body until a taper seat tightens it on the sliding bar.

The micrometer head is a standard 1-in. ratchet-type. The method of using is as follows: Measure the boring bar and subtract the diameter from the required size of hole. Half the remainder gives the projection of the cutter from the bar. Set the gage with the micrometer touching the bar. Take the reading and then withdraw the micrometer to the required projection and set the cutter to just touch the micrometer. The body must be held firmly in contact with the boring bar.

For example, it is required to bore a hole 3 in. in diameter plus 0.005 minus nothing, with a 2⅛-in. bar.

Actual diameter of boring bar	2.124 in.
Actual hole required	3.005 in.
Half difference	0.4405 in.
Reading with micrometer touching bar	0.058 in.
Reading with micrometer touching cutter	0.4985 in.

It will be noted that in the above example the cutter has been set to give the maximum hole. The reason for this is that as soon as the cutter starts work it will begin to wear and such a setting gives the longest life to the cutter before resetting becomes necessary. It is the practice of many mechanics to set their tools in the middle of the tolerance allowed, but this is a mistake as a little thought will show.

Formulas for Helical Gears

By V. L. Sherman

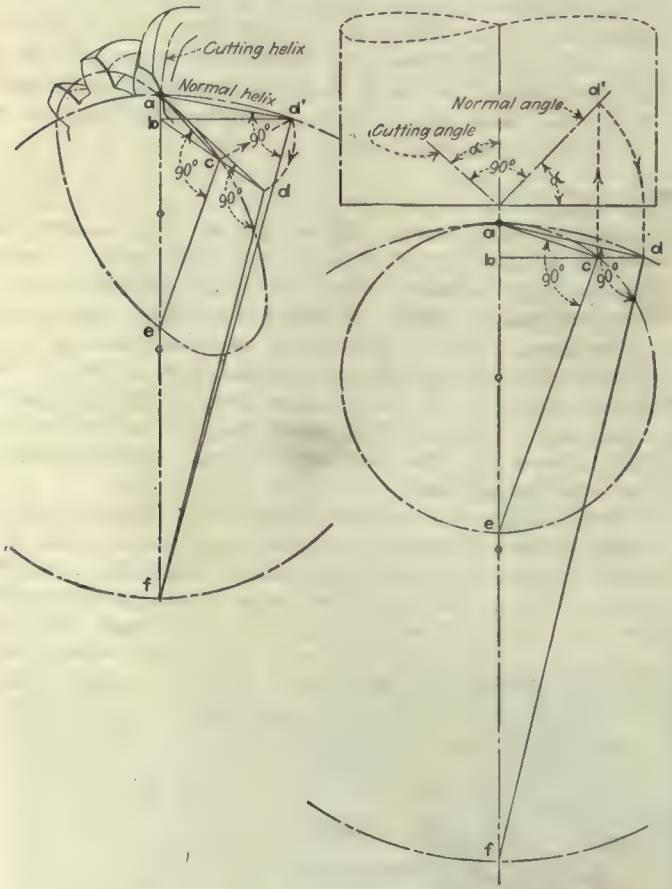
AT THE Lewis Institute in Chicago we are in the habit of using the formulas for helical gears published by the *American Machinist*, but in the classes in gear design we find that helical gearing is much better understood, and that a better grasp of the formulas is acquired, if the theoretical spur gear equivalent is shown to the students.

The following solution was developed some time ago in class and does not involve any higher mathematics than geometry. The problem is to prove

$$N' = \frac{N}{\cos^3 \alpha}$$

in which, N = number of teeth in the helical gear
N' = number of teeth in the theoretical spur gear equivalent, used in determining the number of the cutter
α = helix angle.

Inspection of the geometric construction in the figure will indicate that the action of the tooth at the



GEOMETRIC CONSTRUCTION FOR SPUR GEAR EQUIVALENT

instant of contact is taken at the point of intersection of two helices, one in the tooth of the gear and the other normal to it. A spur gear which would be equivalent to the helical gear would lie along the normal helix at the pitch point and have the same radius as the normal helix.

In the construction diagram *ae* is laid off proportional to the pitch diam. of the helical gear in question. A right triangle is drawn between the points *a*, *e* and an assumed point *c* on the pitch circle. Point *c* is then projected to the normal helix, along the pitch cylinder and parallel to the axis, giving the point *d'*.

A perpendicular erected on *ad'* at the point *d'* will intersect the extension of *ae* at *f* and form a right triangle *adf*. For convenience this triangle is shown rotated into the same plane as the triangle *ace*, in which position the point *d'* is designated *d*.

From the similar triangles *ace* and *adf*

$$\frac{ab}{bc} = \frac{bc}{be}, \text{ and } \frac{ab}{bd} = \frac{bd}{bf}$$

$$ab = \frac{(bc)^2}{be} = \frac{(bd)^2}{bf}$$

$$\frac{(bd)^2}{(bc)^2} \times be = bf$$

$$\frac{bd}{bc} = \sec \alpha = \frac{1}{\cos \alpha}$$

$$bf = \frac{be}{\cos^2 \alpha}$$

Since we are considering an infinitely small portion of the helix, let the side *ac* approach zero. As it becomes smaller *be* approaches *ae*, and *bf* approaches *af*. Hence,

$$af = \frac{ae}{\cos^2 \alpha}$$

We know that the normal circular pitch equals the circular pitch multiplied by cos α, and

$$\frac{N'}{N} = \frac{D'p}{Dp'}$$

in which D represents the pitch diam. and p the circular pitch.

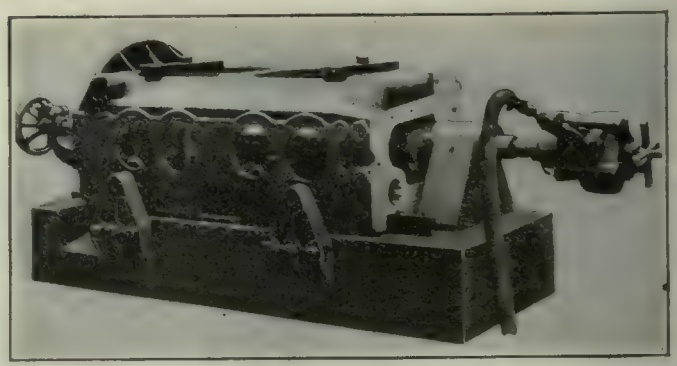
Then $$\frac{N'}{N} = \frac{1}{\cos \alpha} \frac{D'}{D} = \frac{1}{\cos \alpha} \frac{af}{ae} = \frac{1}{\cos^3 \alpha}$$

and $$N' = \frac{N}{\cos^3 \alpha}$$

Reaming Crankcases by Air Motor

By H. E. Crawford

The method employed by the C. L. Best Tractor Co., San Leandro, Cal., in the final reaming of crankcases, utilizes a Little David air drill as shown. The crank-



LINE REAMING WITH AN AIR MOTOR

cases are properly located on a substantial fixture which guides the line-reaming bar.

Cutters are provided for each bearing, so that the feed is limited by the length of the longest bearing. The feed is secured by the hand wheel at the left, which actuates the feed screw.

What About Automobile Shops?

BY A. L. DE LEEUW AND K. H. CONDIT
Consulting Editor, *American Machinist* Editor, *American Machinist*

Second article takes up drilling operations—Poor drill grinding an almost universal failing — Need for some test of drill grinding — Too little use of power feeds

IN OUR TRIP through the big automobile plants, the one thing that impressed us as a general fault in every plant was the inefficiency of drilling operations. In many shops the machine equipment was entirely adequate, in others it was not. But no matter what the condition of the equipment, it was seldom used to the maximum advantage because of poor drill grinding.

So much has been said about the necessity of proper grinding of twist drills that it seems almost like tiresome repetition to go through it again. The only reason we mention it is because of the general disregard of the first principles of proper drill grinding in almost every shop we visited. It is our guess that fully four-fifths of the drills we saw in operation were drilling with one lip only. When this condition exists, not only is the direction of the hole uncertain, but the hole will not be accurate as to size, being larger than the nominal diameter of the drill. In addition, the efficiency of the drill press is approximately cut in half when only one lip of a two-lip drill is cutting. The problem might be stated in this way: If one lip of a drill can stand a feed F, then the work itself can stand a feed 2F. If an attempt is made to force the drill with only one cutting lip to the output that should be obtained, the result of course is speedy breakdown of the drill.

The situation we have described indicates either one of two failings—the lack of proper equipment in good drill grinders, or else their improper use. So essential is this matter of proper drill grinding to satisfactory drilling machine production that we believe it desirable to work out some simple method of checking up the work of the drill grinders. Something like this might be worked out at small cost: Some sort of a device to hold the drill, so that it can be rotated by hand to take a chip from a piece of copper or other soft metal. Placed in this holder, the drill would be rotated by hand until one lip took a small chip from the copper. Upon further rotation without feed, the second lip should not take a chip. The drill would then be advanced slightly, so that the second lip would take a chip and the test repeated to see that the first lip did not take one. If neither lip takes a chip upon following the other one, it is evident that both lips are of the same length. The time of the test could be cut in half by providing two pieces of copper 180 deg. apart, so that one rotation of the drill would complete the test.

Both lips of the drill, of course, should have the same angle and adequate clearance, but these points ought to be taken care of automatically if a proper sharpener is used.

Where we had expected to find power feed in almost universal use where drill presses were in action, we found in some of the shops that lever feed presses predominated. One reason advanced for this situation was that a man working piece work with a lever feed machine gets out greater production than where power feed is supplied. It should be obvious that a drill will stand the same amount of feed under power drive as it will under hand drive. As a man does not apply uniform pressure and feed throughout the full travel of the drill, there is no reason why power feed should not give greater production, because the maximum feed applied by hand during a part of the travel can be applied uniformly by power throughout the whole travel.

With hand feed, entirely too much of the worker's energy is dissipated in the hard work of feeding the drill. The feeding should be left to mechanical means, so that the man can devote his whole effort to chucking the work and starting the machines. Depending on the relative time of chucking and drilling, a man could be given two, three, or perhaps four drill presses to operate, the fundamental principle being to keep both man and machines constantly occupied. The principle just enunciated is the one that underlies successful shop management in any line of work, and one that is very frequently violated, with bad results so far as economy of operation is concerned.

GENERAL disregard of the first principles of drill grinding points to the need of some means of testing a drill to determine whether it has been accurately ground.

Production is being seriously reduced by using poorly ground drills and by not driving power fed drills hard enough.

Fundamental principle of good management which requires that both man and machine be constantly occupied sometimes is violated with unfortunate results.

Requirements of deep hole boring indicate the need for a machine so designed that both work and tool rotate.

Track systems not always well designed. The same statement applies to loading fixtures and turntables.

Multiple spindle drills of high efficiency have been developed for the automobile industry, and we saw many of them in operation. Some of them were doing all they were designed to do, while others were not being used to full advantage. The relation of loading time to drilling time was too great, thus keeping expensive, high-production machines idle too much of the time. Much of this lost time could have been saved by a wider and better application of loading fixtures or turntables, as the circumstances dictated.

Arrangement of Drilling Spindles

In some of the shops we saw multiple spindle presses arranged for drilling and reaming or counterboring, but in others the various operations were separated, entailing additional and unnecessary handling and loading time. It should be stated here that we are not endeavoring to lay down a hard and fast rule to the effect that drilling, reaming and counterboring should always be done on the same machine with one set-up of the piece. In determining the economy of such an arrangement, several variable factors must be considered, among them the complexity of the piece and the holding fixture, the number of spindles, the time required for the longest operation, and so forth.

Failure to think things through to a conclusion was in evidence in some places. In one place, a drilling machine turntable was working at only half capacity because of the fact that it had but two instead of four stations and fixtures. In another place, the track system serving a group of multiple drills was so arranged that generally only one of the drills was working at a time. A circular track or some other convenient means of returning the fixture to the starting point would have overcome the difficulty here. The fault was not with the operators who were doing the best they could under the circumstances.

In one shop we encountered the complaint that the construction of the tools was not sufficiently rigid to withstand the heavy feed necessary for maximum output. Perhaps one reason for this complaint was the age and general condition of most of the drilling machines of various types in that particular shop. Some of them had evidently seen hard service.

We saw some excellent installations of machines for boring holes, more particularly for cylinder boring. The boring bars used were practically the same size as the circle swept by the boring tool, thus insuring straightness of the hole by making the finished work an extension of the jig eye and thereby improving the guidance of the tool. Some other boring installations were not nearly so satisfactory, the jig eyes being entirely too short to give the necessary support and guidance. This failing was also evident where reaming was the operation in question.

Apparently, it is not generally understood that the finish and accuracy of a reamed hole can be greatly improved if the jig eye is made from four to six times as long as the depth of the hole to be reamed. For short holes, this proportion can even be exceeded. Where long holes are to be reamed, improvement can be secured by pulling rather than pushing the reamer through. If there is any deviation in the axis of the drilled hole, the pushed reamer is quite likely to follow it, at times even increasing the inaccuracy. The pulled reamer, on the other hand, will have a tendency to straighten out the fault that may exist in the drilled hole.

For both drilling and boring of deep holes the best results are obtainable in machines with provision for rotation of both the work and the tool. Extreme cases, in fact, can only be handled satisfactorily in this way. Very few such machines are in evidence in the automobile plants.

The boring tools themselves were not always all that could be desired in design and condition. Some of them had entirely too many blades. There is no advantage in an excessive number of blades, and there is a disadvantage if the dulling of a single one spoils the hole and requires the sharpening of the entire tool.

What was said before about keeping drilling machines occupied as much of the time as possible applies with equal force to boring machines. In some of those observed, output was reduced because of insufficient number of stations or fixtures on the turntables.

To finish up the subject of holes, we might mention two instances of bad broaching practice that came to our attention. In one case, where a rather heavy sectional broach was in use, no provision had been made for quick removal of the key connecting two of the sections. As a result, two men lost considerable time, in addition to their tempers, endeavoring to remove the key from a rather battered slot.

The other instance had to do with a double broaching machine attended by one man, where the motion was so slow that he had to spend more than half of his time waiting for the head to return before inserting a new piece. In this case, the operation might have been performed in considerably less time and at less expense with a greater number of short push broaches. It was just one more instance of the failure to observe the principle already enunciated of keeping both operator and machine constantly busy.

Trouble with Countershaft Clutches—Discussion

By S. H. Simon
The Carlyle Johnson Co.

Regarding the question raised by H. Maplethorpe on the above subject in his article on page 413, Vol. 59, of the *American Machinist*, the answer is simple.

Have each case diagnosed, as regards all conditions of actual use, as a physician would diagnose a case. Then put the data in the hands of a reliable clutch manufacturer whose engineers have had sufficient experience to recommend the best for the place, after they know all the conditions.

No stock clutch of any make is successful on all kinds of drives. The Johnson friction clutch can be modified to meet almost any condition for light powered drives if the firm's engineers are given a chance, and this may be true of other makes of clutches.

Most machinery manufacturers pay too little attention to the design of their countershaft clutches, after putting the effort they do into the design of their machines, and the main reason that their clutches are not serviceable is that they have not had extended experience in manufacturing clutches.

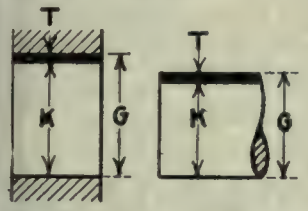
Nine-tenths of all clutch trouble is due to lack of or faulty lubrication and the other tenth to inattention to the adjustment of the clutch when it should be adjusted. Having manufactured clutches for nineteen years, from the job of office boy to general manager, I submit the above as the answer.

German Standards for Tolerances and Allowances in Machine Fits

By OSCAR R. WIKANDER

DIN | Tolerances and Allowances in **Machine Fits** Fundamental Terms and Definitions | DINORM **775** Sheet 1

In the manufacture of any object it is impossible to obtain exactly a certain desired size (Example: 59.95) and, therefore, two limits have to be prescribed, one maximum size G ("Grosstmass"), (Example: 59.97) and a minimum size K ("Kleinstmass"), (Example: 59.94). (See sketch).

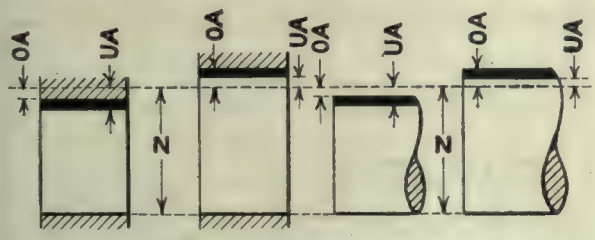


G = Maximum Size ("Grosstmass")
K = Minimum Size ("Kleinstmass")
$T = G - K$ = Tolerance

Maximum Size ("Grosstmass")
Minimum Size ("Kleinstmass")

Maximum size G and minimum size K are the two limiting dimensions between which the size of a certain part must be kept.

Tolerance—The tolerance T, is the difference between the maximim and minimum sizes, $T = G - K$, (Example: $T = 59.97 - 59.94 = 0.03$).



Basic Size—The two limiting dimensions are variations from a certain exact theoretical value, the basic size N ("Nennmass"), (say 60).

Upper Variation ("Oberes Abmass") The upper variation OA, is the difference between the maximum and the basic size, $G—N$ (Example: 59.97 — 60 = —0.03).

Lower Variation ("Unteres Abmass") The Lower Variation UA is the difference between the minimum and the Basic Size K—N (Example: 59.94 — 60 = —0.06).

The limiting dimensions are generally indicated by the upper and lower variations, the former written above, the latter behind the basic size (Example: $60\ ^{-0.03}_{-0.06}$). In case of standard fits, a symbol is substituted for the two variations. (Example: 60 ϕL). Corresponding external and internal members have the same basic size.

Actual Size ("Istmass")—The actual size of a part is the actually measured size of that part. The actual size of any machine part must lie within the tolerance limits of same.

Variation ("Abmass")—The variation of a machine part is the difference between its actual and basic sizes (Example: If measured 59.95, variation = 59.95 — 60 = —0.05).

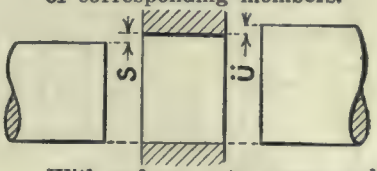
October 14, 1922. (Continued on Sheet 2)

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THE GERMAN Standards Committee has just about completed its fundamental work on tolerances and allowances in machine fits, and the important results of about five years' painstaking investigation will soon be published in book form, in the form of a so-called DINBUCH.

DIN | Tolerances and Allowances in **Machine Fits** Fundamental Terms and Definitions | DINORM **775** Sheet 2

The Fit ("Passung") is the general designation of the relation between external and internal dimensions of corresponding members.

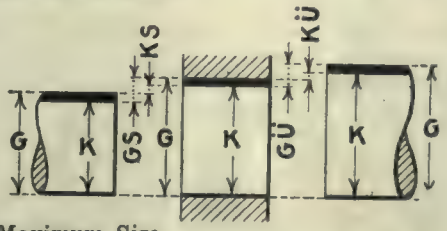


S = Looseness ("Spiel")
$\ddot{U}$ = Tightness (Übermass)

With reference to corresponding bores and shafts (or external and internal members in general), we distinguish between:

The Looseness ("Spiel") S, which is the difference between the diameters of the bore and the shaft, when the former is the larger one, and

The Tightness ("Übermass") $\ddot{U}$, which is the difference between the diameters of the bore and the shaft, when the latter is the larger one. Tightness is negative Looseness.



G = Maximum Size
K = Minimum Size
GS = Maximum Looseness ("Grösstspiel")
KS = Minimum Looseness ("Kleinstspiel")
$G\ddot{U}$ = Maximum Tightness ("Grösstübermass")
$K\ddot{U}$ = Minimum Tightness ("Kleinstübermass")

Maximum Looseness (or Allowance plus Tolerances) GS, is the difference between the maximum size of the bore (Example: 60.03) and the minimum size of the shaft (Example: 59.94). ($GS = 60.03 - 59.94 = 0.09$).

Minimum Looseness (or Allowance) KS, is the difference between the minimum size of the bore (Example: 60.00) and the maximum size of the shaft (Example: 59.97). ($KS = 60.00 - 59.97 = 0.03$).

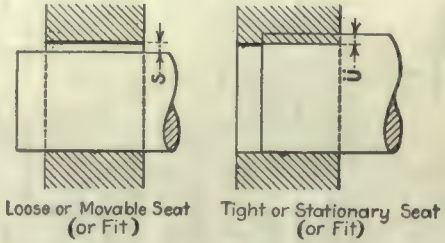
Maximum Tightness (or Negative Allowance) $G\ddot{U}$, is the difference between the maximum size of the shaft (Example: 45.06) and the mimimum size of the bore (Example: 45.00). ($G\ddot{U} = 45.06 - 45.00 = 0.06$). (Negative Minimum Looseness.)

Minimum Tightness (or Negative Allowance plus Tolerances) $K\ddot{U}$, is the difference between the minimum size of the shaft (Example: 45.040) and the maximum size of the bore (Example: 45.025). ($K\ddot{U} = 45.040 - 45.025 = 0.015$.) (Negative Maximum Tightness.)

(Continued on Sheet 3)

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DIN | Tolerances and Allowances in **Machine Fits** Fundamental Terms and Definitions | DINORM 775 Sheet 3

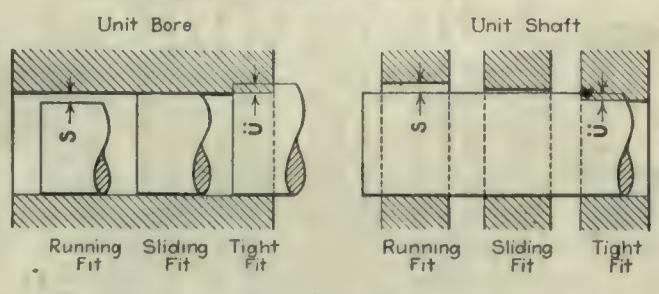


Loose or Movable Seat (or Fit).
("Bewegungssitz" or "Laufsitz").
Tight or Stationary Seat (or Fit).
("Ruhesitz" or "Festsitz").

Seat (or Fit). When an external member is mounted on a shaft a certain Seat (or Fit) is obtained.

A Loose or Movable Seat is obtained when there is sufficient alowance to permit the two members to move in service in relation to each other. A Tight or Stationary Seat is obtained when the allowance is smaller or negative.

System of Seats (or Fits)—A series of various seats or fits, determined according to certain principles, is called a System of Seats (or Fits).



The German Standards (or "Dinorms") contain two different systems of Seats (or Fits):

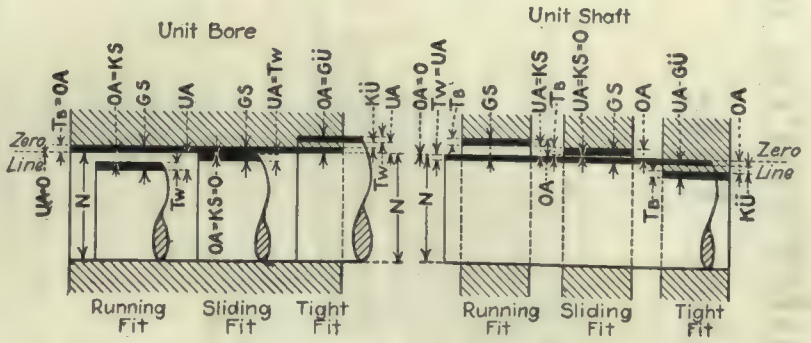
The Unit Bore System, see Dinorm 777.

The Unit Shaft System, see Dinorm 778.

In the Unit Bore System all the seats have the same size bore. The shafts are made to the necessary size so as to obtain the required seat or fit.

In the Unit Shaft System all the seats have the same size shaft. The bores are made to the necessary size so as to obtain the required seat or fit.

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In the **Unit Bore System** the basic size is the minimum size of the bore. The upper variation of the bore is thus equal to the bore tolerance (T_B), the lower variation is zero. For the shafts, the upper variation is equal to the minimum looseness (or maximum tightness). The lower variation is larger, their difference being equal to the shaft tolerance (T_W). (In case of tightness the lower variation is smaller than the upper one.)

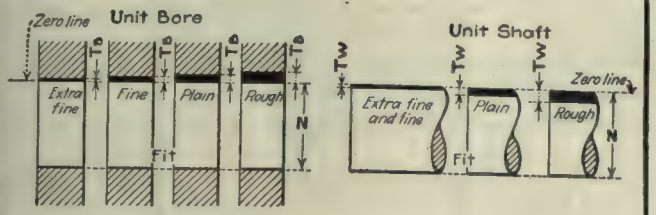
In the **Unit Shaft System** the basic size is the maximum size of the shaft. The upper variation is consequently zero and the lower one equal to the shaft tolerance (T_W). For the bores the lower variation is equal to the minimum looseness (or maximum tightness). The upper variation is larger, their difference being equal to the bore tolerance (T_B). (In case of tightness the upper variation is smaller than the lower one). The basic size is thus, in either system, the basis for the distribution of the tolerances and allowances.

The Zero Line limits, in the Unit Bore System, the minimum size of the bore and the latter is equal to the basic size. In the Unit Shaft System the Zero Line limits the maximum size of the shaft and the latter is equal to the basic size. The tolerances and allowances are counted positive or negative, depending upon their location in relation to the zero line. The "Gleitsitz" shaft in the unit bore system is the same as the unit shaft and the "Gleitsitz" bore in the unit shaft system is equal to the unit bore.

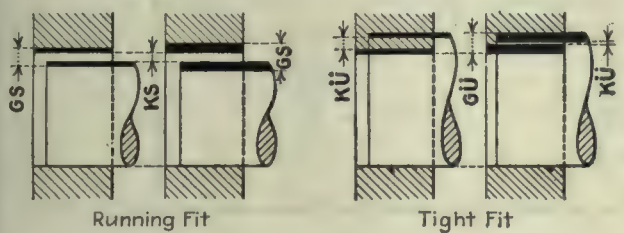
(Continued on Sheet 4)

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DIN | Tolerances and Allowances in **Machine Fits** Fundamental Terms and Definitions | DINORM **775** Sheet 4



Grade of Fit ("Gutegrad")—According to the requirements as to the grade or quality of work, the tolerances are made narrower or wider, and, in addition to the different classes of fits, we have different grades of fits for each class. Arranged according to increasing tolerances, we distinguish the following four grades of fits:
Extra fine, Fine, Plain and Rough.
(Edelpassung, Feinpassung, Schlichspassung, Grobpassung).
The location of the zero line is the same for the different grades of fits.



Seats of the same class have always the same minimum looseness (or allowance) *KS*, and, respectively, the same maximum tightness (or negative allowance) *GÜ*. The maximum looseness (or allowance plus tolerances) *GS*, and respectively, the minimum tightness (or negative allowance plus tolerances) are, however, different on account of the varying tolerances.
In changing from one grade of fits to another, the interchangeability of parts is retained for fits of the same class, provided the conditions of operation permit of the changes of the maximum looseness, *GS*, respectively the minimum tightness, *KÜ*.

Fit Tolerance ("Passungstolerance") *P*, is the sum of the tolerances of a bore and of the corresponding shaft. $P = T_B + T_W$ and consequently is equal to the difference between the maximum and minimum looseness, and, respectively, between the minimum and maximum tightness. $P = GS - KS = KÜ - GÜ$.
The character of a certain class of fit is only retained in its average looseness or tightness and is more or less lost in the extreme cases.
The closer tolerances of the finer grades reduce the Fit tolerance and consequently offer a greater guarantee for the conservation of the character of a certain desired fit.

Tolerance Unit—The looseness (or tightness) for a certain class of fits is a function of the diameter *D*. It is assumed to be proportional to $\sqrt[3]{D}$.
The Tolerance (or Fit) Unit *PE*, is computed from the formula:

$$1PE = 0.005 \sqrt{D} \sqrt[3]{D}$$

where *D* is the diameter in millimeters.

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DIN | Tolerances and Allowances in **Machine Fits** Symbols of Grades and Classes of Fits | DINORM **776**

Grade of Fits ("Gutegrad")			Unit Bore ("Einheitsbohrung")		Class of Fit ("Sitze")	Unit Shaft ("Einheitswelle")	
Name	Symbol	Color of Gage	Bore	Shaft		Bore	Shaft
Extra Fine Grade ("Edelpassung")	e	The Blue of the Cornflower	eB	F	Tight Seats ("Ruhesitze") Edelfestsitz	eF	W
				T	Edeltreibsitz	eT	
				H	Edelhaftsitz	eH	
				S	Edelschiebesitz	eS	
					Loose Seats ("Bewegungssitze")		
				G	Edel-Gleitsitz	eG	
Fine Grade ("Feinpassung")		Black	B	F	Tight Seats ("Pressitz")* Festsitz	F	W
				T	Treibsitz	T	
				H	Haftsitz	H	
				S	Schiebesitz	S	
					Loose Seats		
				G	Gleitsitz	G	
				EL	Enger Laufsitz	EL	
				L	Laufsitz	L	
				LL	Leichter Laufsitz	LL	
				WL	Weiter Laufsitz	WL	
Plain Grade ("Schlichtpassung")	s	Yellow	sB		Loose Seats:		
				sG	Schlicht-Gleitsitz	sG	sW
				SL	Schlicht-Laufsitz	sL	
				sWL	Weiter Schlicht-Laufsitz	sWL	
Rough Grade ("Grobpassung")	g	Light green	gB		Loose Seats:		
				g1	Grobsitz g1	g1	gW
				g3	Grobsitz g3	g3	
				g4	Grobsitz g4	g4	

The purposes of the symbols are:
Dinorm 249) to indicate the gages on the drawings to serve as distinguishing marks on the gages (see (see Dinorm 406, Sheet 5). The plug gages in the system Unit Bore correspond to those of "Gleitsitz" and "Grobsitz *g*1" in the system Unit Shaft as follows:
$eB = eG$; $B = G$; $sB = sG$, and $gB = g1$
The snap gages in the system Unit Shaft correspond to those of "Gleitsitz" and "Grobsitz *g*1" in the system Unit Bore as follows:
$W = G$; $sW = sG$, and $gW = g1$
*No symbols have as yet been agreed upon for "Pressitz," see Dinorms 54 and 55.

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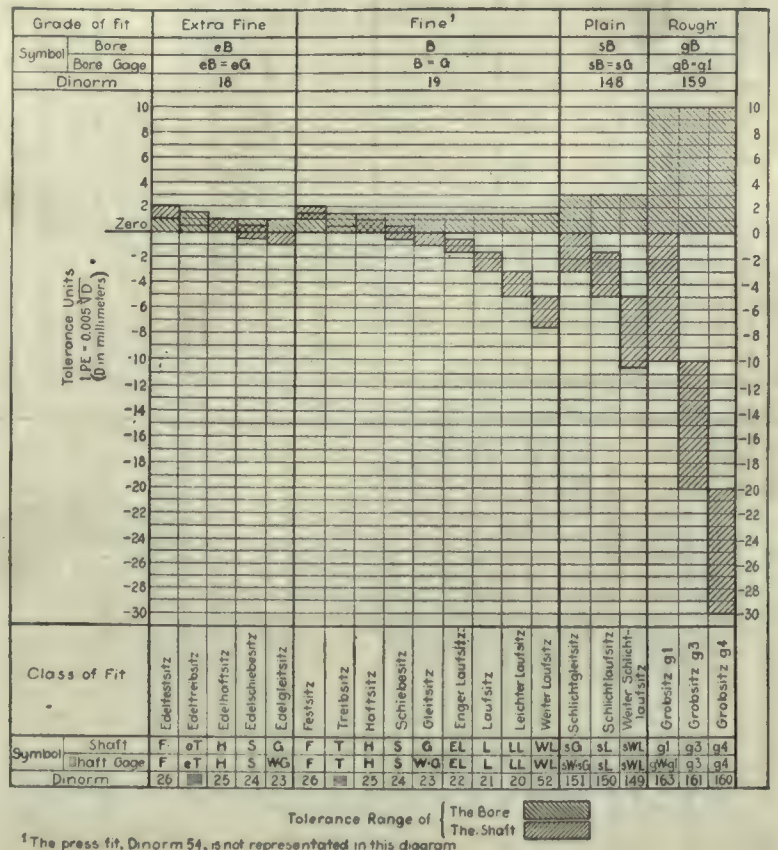
Due to the fact that this subject is of great interest to the mechanical engineers of this country, the writer has obtained the permission of the German Standards Committee to publish some advance information on the subject, as well as translations of the most important German Standard Sheets, or DINORMS, which refer to said subject.

The fundamental technical terms and their definitions are recorded and explained in DINORM 775, Sheets 1 to 4 inclusive.

The symbols of the various grades and classes of fits are given in DINORM 776.

DINORM 777, illustrates the variations for the various grades and classes of fits in the unit bore system, while DINORM 778 shows a corresponding diagram for the unit shaft system.

DIN | Tolerances and Allowances for **Machine Fits** Diagram of the Unit Bore System | DINORM 777

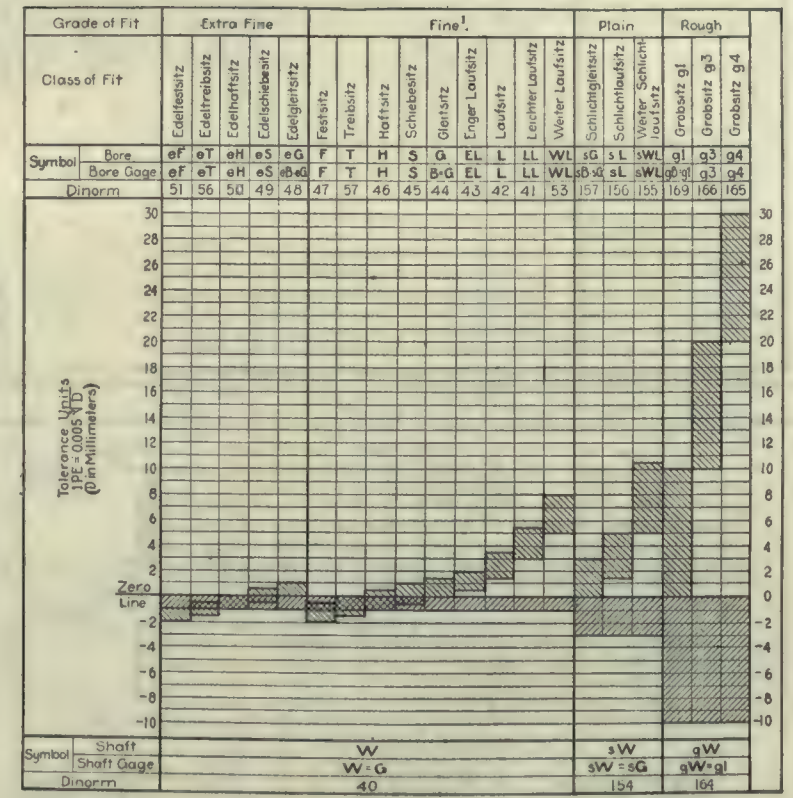


Tolerance Range of { The Bore / The Shaft }

[1] The press fit, Dinorm 54, is not representated in this diagram

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DIN | Tolerances and Allowances for **Machine Fits** Diagram of the Unit Shaft System | DINORM 778



Tolerance Range of { The Bore / The Shaft }

[1] The Press Fit, Dinorm 55, is not Representated in this Diagram

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In addition to the grades of fits, recorded in the above DINORMS, an extra rough grade has recently been adopted and the corresponding variations are given in DINORM 170.

The latest additions to the DINORMS on tolerances are those for press fits, which are covered by the following two standard sheets:

Pressitz, fine grade of fit, unit bore system, DINORM 54
Pressitz, " " " " " " " DINORM 55

The tolerances for the adjustment of working gages are laid down in *Dinorm 168.*

DINORM 406, Sheet 5, shows how tolerances and fits are indicated on standardized German drawings.

Separate DINORMS are published for each class of fits, in each grade of fits, in the unit bore as well as in the unit shaft system and the exact dimensions of new gages, the corresponding calculated looseness or tightness, as well as the type of gage to be used and the maximum permissible wear of same, are given for all diameters from 1 to 500 mm. The numbers of these separate DINORMS are given under each class of fits on DINORMS 777 and 778. We reproduce two specimens of same, DINORMS 22 and 46, in translation.

The proper variations for shrink fits depend on so many factors and the opinions of the experts differ to such an extent, that it has not as yet been found possible to arrive at any generally applicable standards.

The Germans have standardized on *two* complete systems of fits and tolerances, the unit bore and the unit shaft systems for the reason that in some cases one of these systems, in other cases another, brings such great economical advantages, that none of the several combined systems which have been proposed, has been found acceptable as a substitute for both.

It will further be noted that the basic size always forms the lower limit of the tolerance field in the unit bore, and the upper limit of said field in the unit shaft system. The advantages of this feature, in comparison to the practice on some of the older systems to arrange the tolerance field symmetrically on both sides of the basic size, are many. The most important one is, perhaps, that parts made according to different grades of fits are interchangeable, as long as they are made for the same class of fits.

In order to express the variations and tolerances in the same number of tolerance units (*PE*), for all shaft and bore diameters, the value of said unit must increase with the diameters. The value of 1*PE* can be computed from the formula, given in DINORM 775, Sheet 4, where *PE* as well as *D* are expressed in millimeters.

The entire range from 1 to 500 mm. has been divided in a number of sections and within each section the variations for the two extreme diameters have been calculated. Their arithmetic mean has then been accepted as the constant standard variation for the corresponding section.

ALL DINORMS, the above DINBUCH and all other publications of foreign standard committees, respectively, will be for sale at the offices of the American Engineering Standard Committee, 29 West 39th Street, New York City.

(To be continued in an early issue)

Test Shows No Abrasive in Bronze Bushings

In the May-June, 1921, issue of *Grits and Grinds* there appeared an article which gave the results of an attempt by the Norton Company's Research Laboratories to find abrasive particles imbedded in ground cast-iron cylinders. The conclusion drawn from this test was that at least as far as the sample submitted was concerned, there was no abrasive imbedded in the surface of the metal.

Recently, this question was reopened. This time instead of the subject being cast-iron cylinders, it was bronze bushings. Now, bronze offers but little resistance to penetration and still has the property of being fairly tough. If there is any possibility of a surface being impregnated with abrasive particles as a result of the grinding operation, it would seem that this metal would be more likely to be affected than almost any other.

In order to settle this question, another interesting experiment was carried out by the laboratories. Three bronze bushings were ground internally by Crystolon vitrified wheels, varying in degrees of hardness and fineness, all within the range of grains and grades commonly used for this work. The bushings were then split by means of a hacksaw. One-half of each bushing was examined chemically, the metal being dissolved for the purpose of learning if any residue remained and if this residue contained silicon carbide. The other half was examined under powerful binoculars for the presence of silicon carbide grain. Then the surface was scraped and the chips examined microscopically.

The results are interesting and conclusive. In no case by either method was it possible to detect the presence of abrasive. The same conclusion as was arrived at in a similar experiment with cast iron may be drawn, namely that no abrasive is imbedded in the metallic surface as a result of the grinding operation. *Grits and Grinds*, September, 1923.

Wanted—A Museum of Machine Tools—Discussion

By Harry E. Harris
Harris Engineering Co., Bridgeport, Conn.

On page 452 of the *American Machinist* there is an article by Mr. Thwing under the title "Wanted—A Museum of Machine Tools." It is proposed in this article to make a selection of exceptionally old machine tools and house them in some building as a museum.

I cannot conceive what value such a collection or museum would have, except to please a collector's whim or satisfy the idle curiosity of a few. Surely there would be nothing that would warrant the great expense that would have to be made in assembling such a museum and keeping it up.

It would seem to me that photographs and descriptions of such machine tools bound in book form would have whatever doubtful educational value such a museum might have, besides having the advantage of the possibility of wide distribution.

There are a large number of museums dotted all over the country at the present time whose only claim to value is their historical aspect; the interest in them is comparatively small, and without endowments they would not be kept up.

It would seem that a museum consisting of the very latest types of improved machine tools would be of considerably greater value and would have this advantage—it would receive the support of progressive engineers, manufacturers and technical schools.

A Troublesome Drive and Its Remedy

By John Williams

I DO NOT know whether or not the change indicated by the accompanying illustrations is properly to be included under the heading of "it pays to replace," but there can be no possible doubt of the benefit accruing from it; both in the matter of reduced cost of upkeep

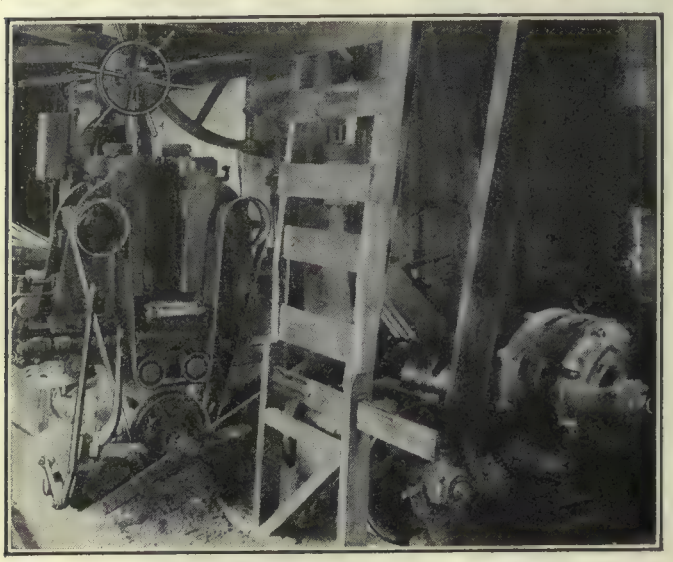


FIG. 1—BELT DRIVE TO A BAND RESAW

and in relief from continuous annoyance and exasperation. The saving of a great deal of hitherto wasted time and effort as well as a substantial reduction in power bills are also among the assets.

The machine involved is a heavy band resawing machine used in a lumber mill; the change being in the

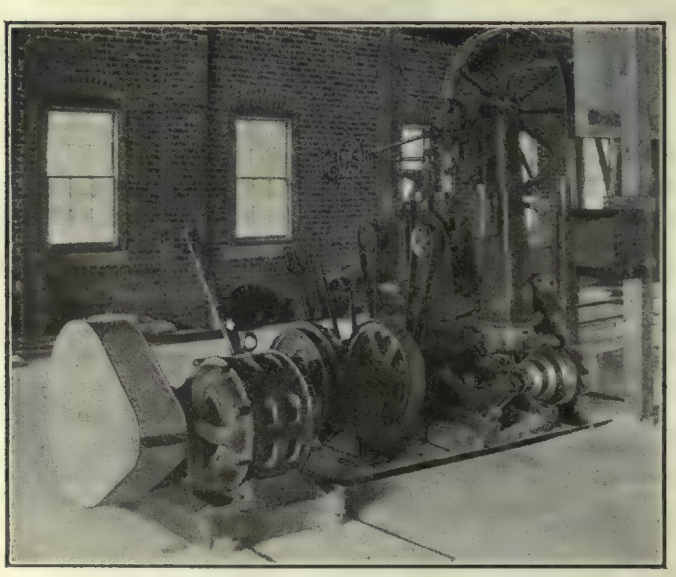


FIG. 2—BELTS REPLACED BY BRIDGEPORT REDUCTION GEARING

method of driving it and not in the machine itself, which remained the same in every particular after the new drive was installed.

The power was (and still is) derived from a 25-hp. Westinghouse induction motor which before the change was belted to an overhead countershaft from which a shifting belt drove to a pair of tight and loose pulleys on the first shaft of the machine. The motor belt was of canvas, 4 in. wide, and the shifting belt was of leather of the same width.

Now the climate of a lumber mill located in central New England is not exactly balmy during the month of January, and as much as fifteen minutes of time was often consumed in getting the saw up to speed on cold mornings. The shifting belt would slip and shriek, and the tight pulley would get so hot from the friction as to burn the leather. The canvas motor belt had been replaced as many as three times in one year and the leather belt was continually in need of attention. On one occasion a new kind of belt was put on by an enthusiastic belt salesman, who thought to eliminate all the trouble. This belt withstood the punishment for just three hours.

High Starting Loads Cause Trouble

In addition to all these troubles the starting load upon the motor was so high that fuses were frequently blown in the line, and the same thing happened from time to time as the saw struck a knot, or, perhaps, a spike.

Fig. 2 shows the same machine and motor, now driving to the first shaft of the machine through a regulation Bridgeport reduction gear train, a Dodge friction clutch and a special step-up train which is, in effect, the regular Bridgeport gear reversed.

The speed of the motor is 860 r.p.m. and the speed of the shaft the same. The logical thing to do, then, would seem to be to connect the motor shaft directly to the end of the saw shaft, but this was not considered practical because of the extremely high starting load that would be imposed upon the motor, and further because of the wide fluctuations in power demand resulting from the aforesaid knots and spikes. Neither was a high speed friction clutch in direct line desirable, and for much the same reasons.

As arranged in Fig. 2 the motor drives the Dodge clutch through a 4 to 1 reduction gear consisting of a cast iron spur gear and a micarta pinion. The clutch drives the saw shaft through a practically identical train placed in reverse position. The clutch, running at a comparatively low speed, is kept in adjustment to carry the full load with a small allowance for overload. In starting up the machine in the morning the motor is first put in motion with the clutch out, and the lever of the latter is then eased over until the load is picked up and the machine in full operation. Any subsequent overload causes the clutch to slip and thus safeguard the motor.

Lapping Cylinders and Pistons

By Chas. F. Henry

The lapping of cylinders and pistons is not common practice and is usually resorted only to by builders of high-priced cars or those who are fitting up motors for special purposes, such as racing. In one such case the cylinder is enlarged from 0.010 to 0.015 in. by lapping, using No. 60 carborundum for roughing and No. 180 for finishing. The two lapping operations require about 15 minutes.

Pistons also are fitted by lapping with ground glass and oil. They are lapped from 0.0025 to 0.003 in. smaller than the cylinder bore to give the proper allowance for expansion.

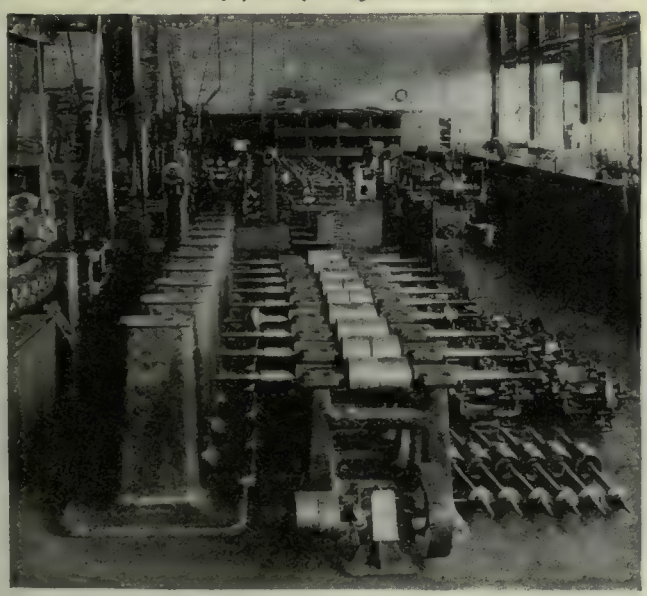


Light machine shop

Where Machine Tools Are Made

Diamond Machine Company

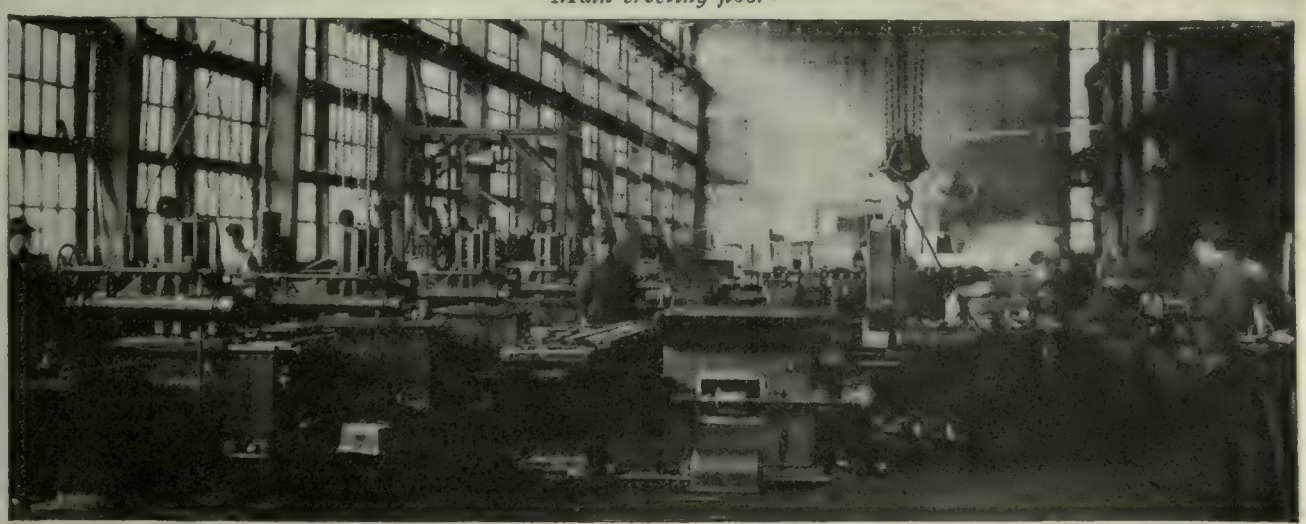
Assembly floor for lighter machines

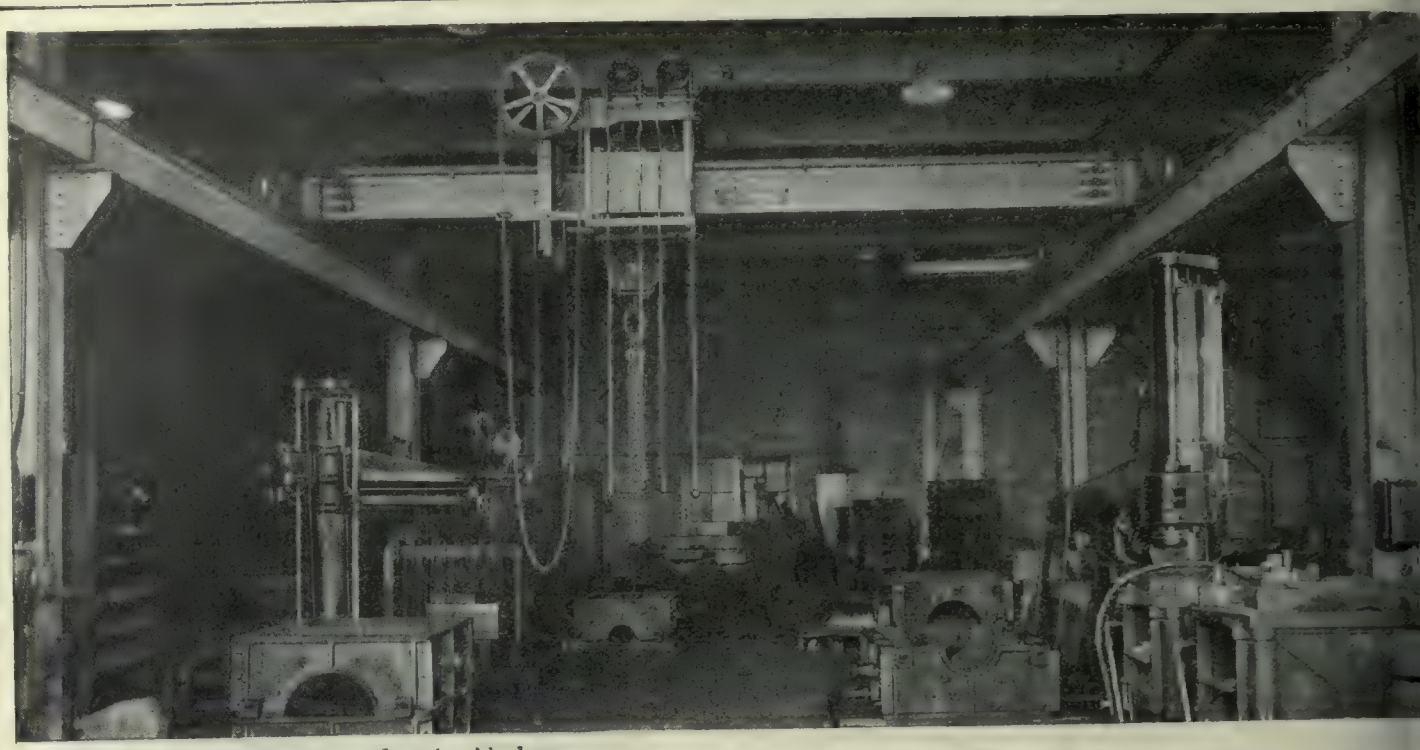


A corner of the foundry



Main erecting floor



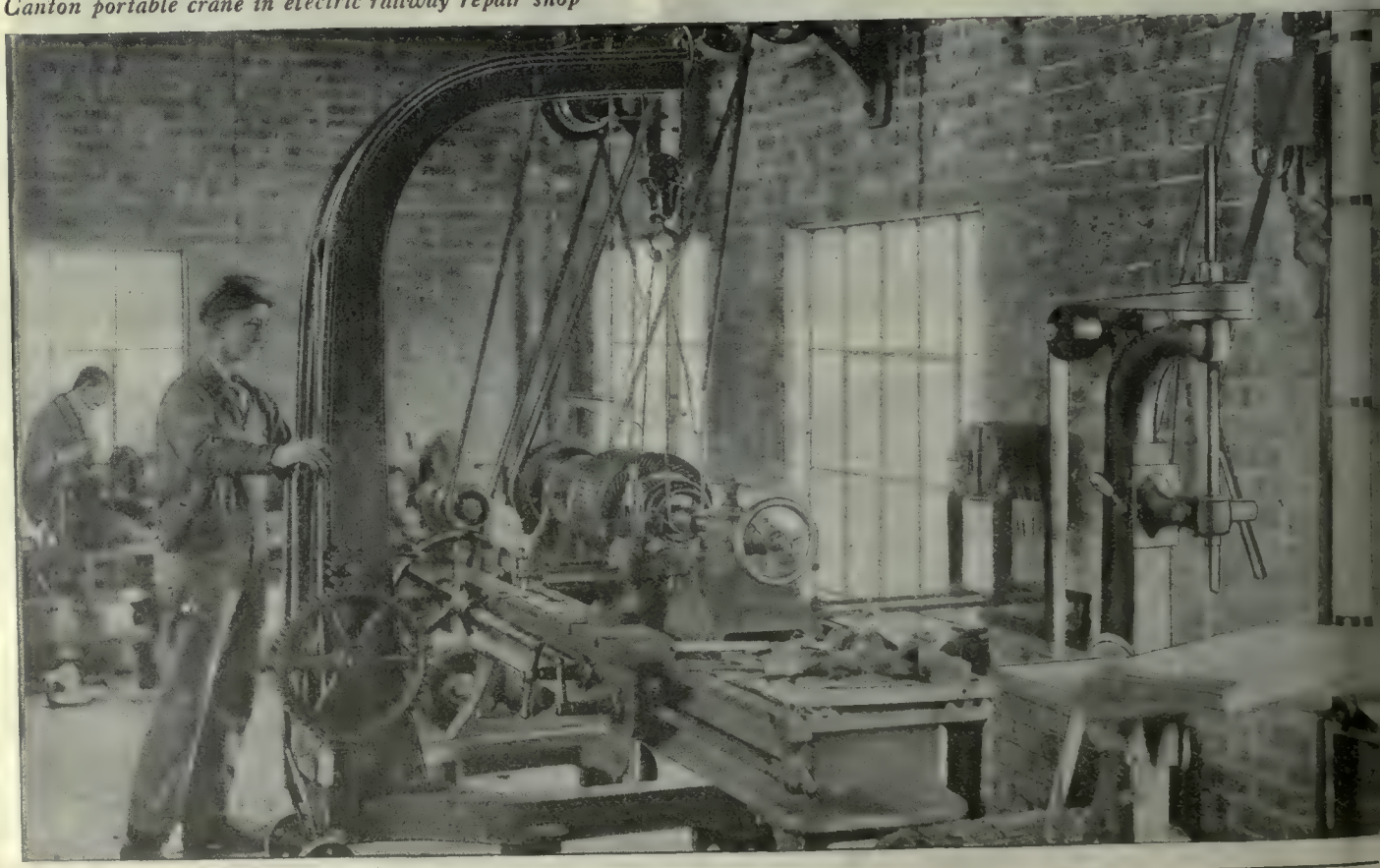


Whiting crane controlled from floor in side bay



IMMIGRATION—The Mechanical, Air or Electric

Canton portable crane in electric railway repair shop





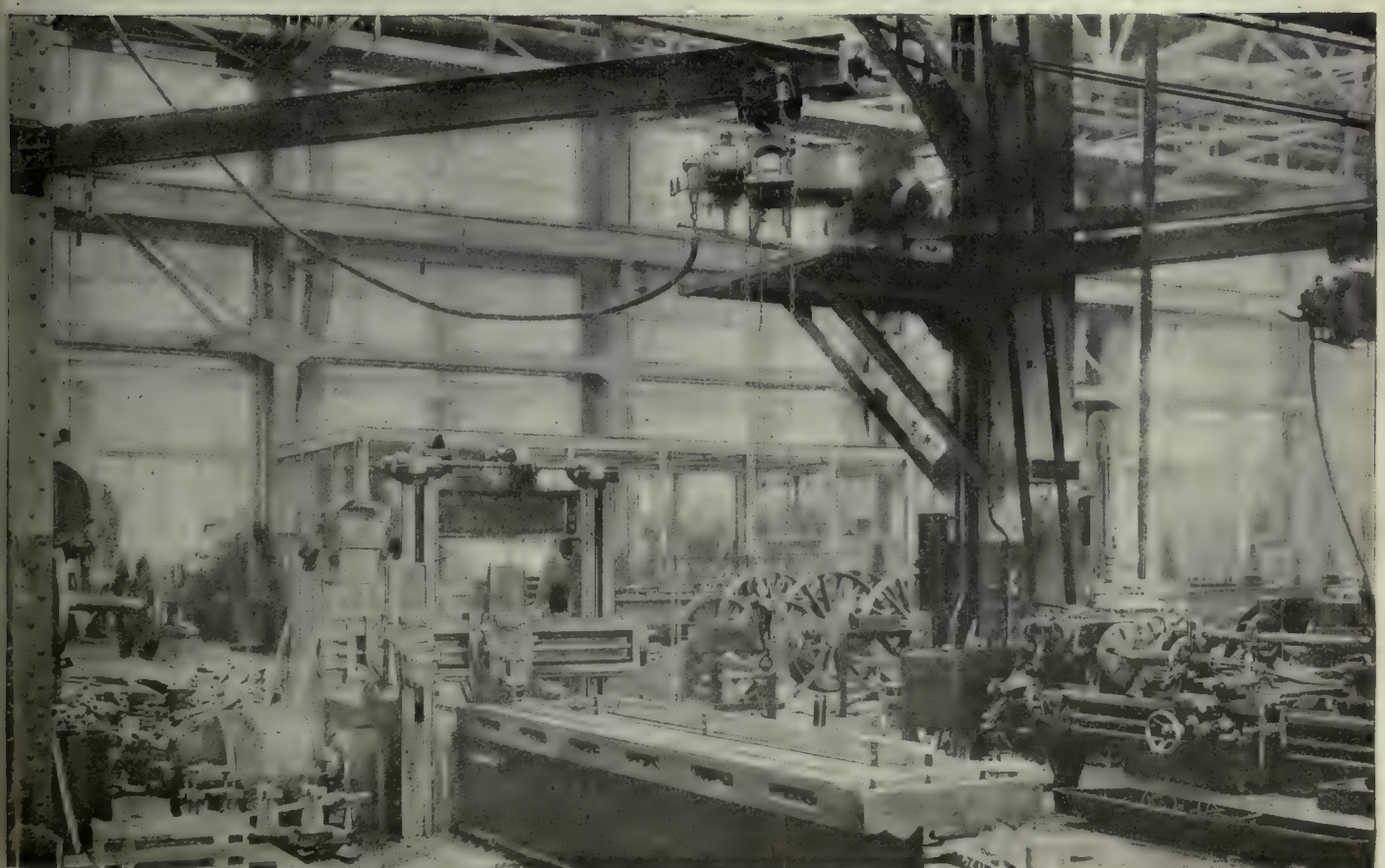
Northern low type electric crane in foundry

OR MACHINERY?

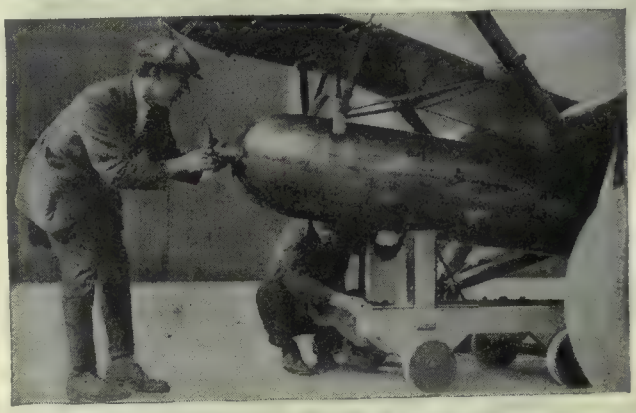
Hoist Offers Another Answer



Chicago Little Giant air hoist serving tools in railroad shop







Aerial Transport

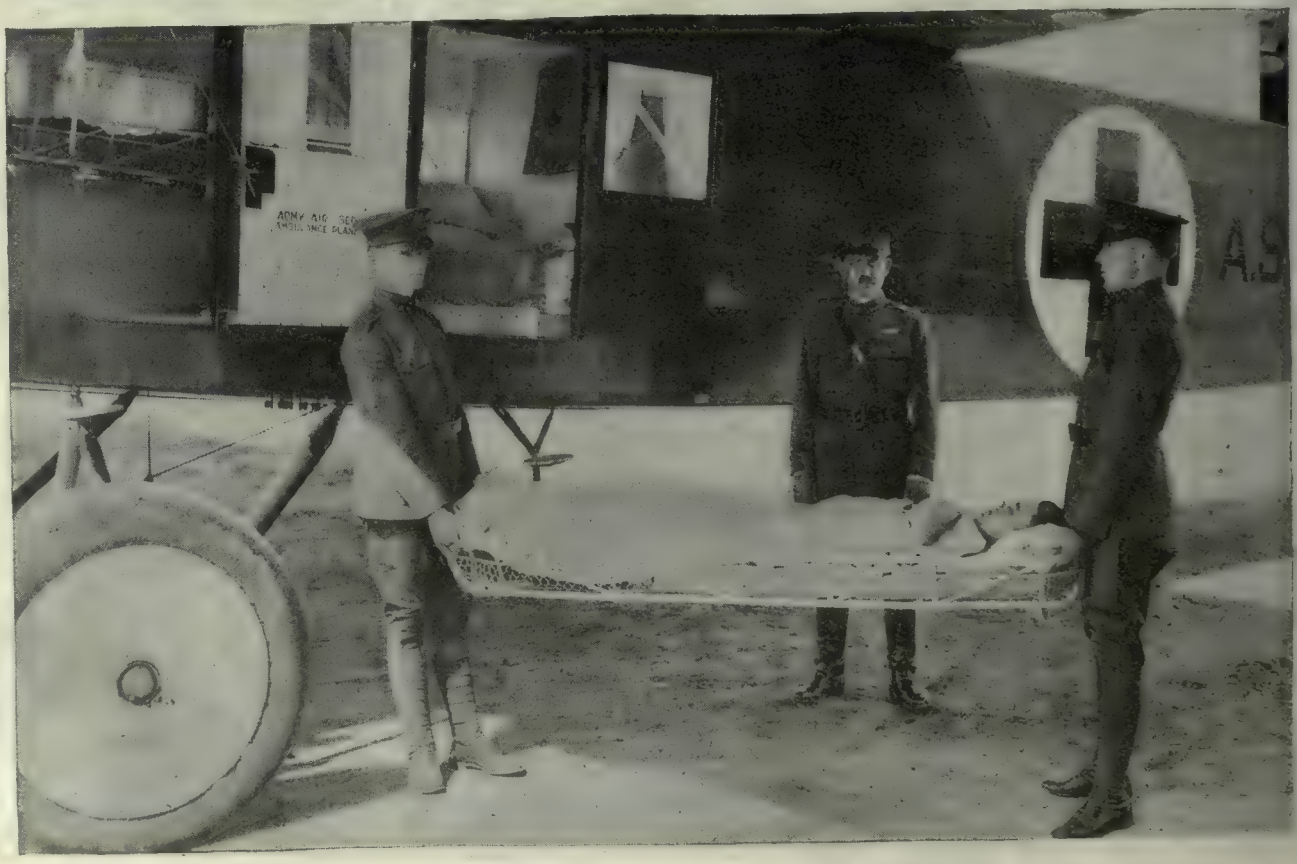
Destructive and Constructive

Above—New British Torpedo Plane.

Left—Mounting the Torpedo.

Below—Latest Ambulance Plane of U. S. Army Air Service has accommodations for pilot, doctor and four patients, two recumbent.

Photos by Kadel & Herbert, New York



Case Hardening and Other Heat Treatments As Applied to Gray Cast Iron

By H. B. KNOWLTON
Instructor in Metallography and Heat Treatment
Milwaukee Vocational School

Experiments conducted in heat-treating gray cast iron—Results indicate that gray cast iron can be made much tougher in the center and at the same time given a hard surface

SOMETIME ago the writer was informed that gray cast iron had been case hardened with commercial success. It was said that a certain firm had measurably increased the strength and wearing qualities of certain gray iron castings, by applying the treatments commonly used in case hardening steel. After this process, the castings were said to be fairly machineable in spite of their increased resistance to wear. The method was considered a success as long as it was applied to castings made by one foundry, but it failed on castings made in another foundry. Evidently the composition of the iron had a great deal to do with the success or failure of the method. The composition, however, of neither was known definitely. Both were simply classified as "gray iron."

The writer does not know how much has been done along this line, but so far has found nothing published on the subject. Consequently the research described in this paper was started. No claim is made that the paper is a complete exhaustive treatise on the subject. It merely attempts to give the status of the writer's research up to the present time. Criticisms, comment and suggestions are invited.

How Increase the Carbon Content?

Upon casual consideration, case hardening of gray cast iron did not seem feasible to the writer, and yet it was claimed that good results had been so produced. A gray cast iron obviously contains more carbon than can be retained in the combined condition. How then, could heating in a carburizing material increase the carbon content of the surface? The writer's only experience with cast iron heated in contact with a carburizing material, consisted in the use of cast iron pots and boxes used as containers in the carburizing process. It is a well known experience that such boxes "grow" on repeated and continued heating. This could be explained on the assumption that any combined carbon originally in the casting decomposed into free graphite and free ferrite. The writer knew of no reason for assuming that carbon was combining with the iron during this process. Why then, were increased wearing qualities produced by "case hardening?" Was the function of the carburizing material simply to prevent oxidation? Did the quenching treatment merely harden whatever pearlitic areas there were in the original casting, or did some of the carbon in the casting or the carburizing material actually combine with the iron? Was the process similar to the production of chilled castings? If not, could any advantage be claimed for "case hardened" castings over the more common chilled castings? Would they have any advantages over malleable castings? These are some of the questions that the author has started to investigate.

Material

The experiments, herein described, were conducted on samples cut from three sand cast test bars of the following chemical composition.

	Bar No. 1	Bar No. 2	Bar No. 3
Silicon	2.12	2.41	2.49
Sulphur	0.073	0.073	0.107
Manganese	0.72	0.59	0.63
Phosphorus	0.367	0.635	.....

These bars were about 1 in. square and were cut into samples ½ in. thick, with the exception of two samples, hereafter mentioned, which were ⅜ in. thick.

Each sample was given the number of the bar from which it was cut, and in addition was given an individual letter. Thus samples 1A and 1B are the first and second samples respectively from bar No. 1.

Four samples each from bars 1 and 2 were packed in pipes with an ordinary carburizing material such as commonly used in case hardening steel. Two samples from each of these bars were packed in sand in another pipe. The ends of this pipe were protected from outside oxygen by thin layers of charcoal. All of the pipes were sealed with fire clay, placed in a hot furnace and run for three hours at 1,700 deg. F. At the conclusion of this heat they were given different treatments described in the data tables. Four other samples from each of these bars were heat treated in the open furnace as described in detail in the tables.

After studying the results of these tests another series of tests was run. In this test, four samples from bar No. 3 were packed in a pipe with a carburizing material as before, and run for 8 hours at 1,700 deg. F. This pipe was placed horizontally in the furnace. Toward the end of the heat it was noted that the seal was leaking. This may explain some of the results mentioned later. Another sample from bar No. 3 was placed in the middle of a ball of fire clay, and heated in the open furnace for 3 hours at 1,700 deg. F. At the conclusion of this time it was allowed to cool slowly in the furnace.

After heat treating, the specimens were all cleaned

Abstract of a paper presented before the annual convention of the American Society for Steel Treating, Pittsburgh, Oct. 8-12, 1923.

and tested under the Shore scleroscope. The Brinell method was tried on one or two, but it was found that the samples were too brittle for this test. All of them which could be cut with a hand hacksaw were so sectioned. They are listed in the data tables as hard or soft on the basis of their ability to be cut with a hacksaw. The speciments were placed one at a time in a vice and struck with a 3-lb. hand hammer. This was given as a crude test of their toughness. All of the samples were polished and examined under the microscope both before and after etching with picric acid. One sample from each bar went through all of these tests in the sand cast, untreated condition. The results are given in the data tables, and in the text following.

Hardness — It will be noted that all specimens quenched from temperatures above 1,500 deg. F. were too hard to saw and showed a scleroscope reading above 55.

Toughness—The most startling thing about all the results was the extreme variation from great toughness to great brittleness on the different specimens. The

Table I

Heat Treatments and Results on Samples from Bar No. 1

Sample	Heat Treatment	Hardness Shore	Hardness Saw	Toughness
1A	Sand cast; no treatment	45	Soft	Brittle
1B	Carburized 3 hr., cooled slowly	40	Soft	Brittle
1C	Carburized 3 hr., cooled slowly; reheated to 1,500 deg. F.; quenched in water	65	Hard	Fairly tough
1D	Carburized 3 hr., quenched in oil directly	75	Hard	Brittle
1E	Carburized 3 hr., quenched in oil; reheated to 1,500 deg. F.; quenched in water	68	Hard	Brittle
1H	Heated 3 hr. at 1,700 deg. F. in sand; quenched in oil	62	Fairly hard	Brittle
1I	Heated 3 hr. at 1,700 deg. F. in sand; quenched in water	62	Fairly hard	Brittle
1J	Heated to 1,700 deg. F. in open furnace; quenched in water	72	Hard	.....
1K	Heated to 1,700 deg. F. in open furnace; quenched in oil	68	Hard	Brittle
1L	Heated to 1,420 deg. F. in open furnace; quenched in water	47	Soft	Brittle
1M	Heated to 1,500 deg. F. in open furnace; quenched in water	72	Hard	Brittle

samples which were tested in the sand-cast condition were all easily broken. Unfortunately there were no available means of making quantitative shock tests on specimens of this size. Simple testing by placing the specimen in a vise and hitting with a 3-lb. hand hammer, is so crude that it is difficult to describe the results. Suffice it to say that the only ones which could be called tough at all were the ones which were heated in the carburizing material, slowly cooled, reheated to 1,500 deg. F. and quenched in water. All of the specimens so treated showed some resistence to the hammer. The most startling variation was found between specimens 3C and 3G. Both of these were slabs $\frac{3}{8}$ in. thick, from the same bar. Specimen 3G was in the sand-cast condition, while 3C had been carburized, cooled, reheated and quenched. The former was broken by one hard blow of the 3-lb. hammer, while 3C could not be broken by numerous blows. A $\frac{3}{32}$-in. V-groove was then ground and filed in this sample, and it was again struck with the 3-lb. hammer, but again it failed to break. After several attempts it was broken with a 10-lb. sledge. The other samples which received the same heat treatment

Table II

Heat Treatments and Results on Samples from Bar No. 2

Sample	Heat Treatment	Hardness Shore	Hardness Saw	Toughness
2A	Sand cast; no treatment	45	Soft	Brittle
2B	Carburized 3 hr., cooled slowly	39	Soft	Brittle
2C	Carburized 3 hr., quenched in oil	77	Hard	Brittle
2E	Carburized 3 hr., quenched in oil reheated to 1,500 deg. F.; quenched in water	63	Hard	Brittle
2G	Carburized 3 hr., cooled slowly; reheated to 1,500 deg. F.; quenched in water	55	Hard	Tough
2H	Heated 3 hr. at 1,700 deg. F. in sand; quenched in oil	55	Hard	Brittle
2I	Heated to 1,700 deg. F. in open furnace; quenched in water	55	Hard	Brittle
2J	Heated to 1,700 deg. F. in open furnace; quenched in water	80	Hard	Brittle
2K	Heated to 1,700 deg. F. in open furnace; quenched in oil	70	Hard	Brittle
2L	Heated to 1,420 deg. F. in open furnace; quenched in water	47	Soft	Brittle
2M	Heated to 1,500 deg. F. in open furnace; quenched in water	68	Hard	Brittle

were only $\frac{1}{4}$ in. thick and consequently were easily broken. The specimens which were simply heated in the open furnace, particularly to the higher temperatures, shattered quite easily when hit with a hammer.

The fractures of the original castings were gray. Some of the specimens quenched from the higher temperatures showed very light fractures which were very coarse-grained. As already mentioned these were very brittle. The samples which were cooled slowly all showed gray fractures. Some of the specimens which were carburized, cooled, reheated and quenched showed a difference in the fracture between the center and the outer layers somewhat similar to the difference between the

Table III

Heat Treatment and Results on Samples from Bar No. 3

Sample	Heat Treatment	Hardness Shore	Hardness Saw	Toughness
3A	Carburized 8 hr., cooled slowly; reheated to 1,500deg. F.; quenched in water	70	Hard	Tough
3B	Carburized 8 hr., cooled slowly	35	Soft	.....
3C	Carburized 8 hr., cooled slowly; reheated to 1,500 def. F.; quenched in water	70	Hard	Very tough
3D	Carburized 8 hr., cooled slowly	..	.....	.....
3E	Sand cast; no treatment	45	Soft	Brittle
3G	Sand cast; no treatment.		.....	.....
3H	Heated for 3 hr. at 1,700 deg. F. in clay; cooled slowly	45	Soft	.....

Note—By the term "Carburized" used in these tables, and in connection with the photographs, it is meant that the specimen so labelled was heated in a caburizing material to 1,700 deg. F. without regard to whether the process is true carburization or not.

case and the core of a case hardened steel specimen. The difference was not so pronounced as in the case of steel. The fracture was not as light as some of the specimens quenched from the higher temperatures. Specimen 3C showed a very fine grayish fracture.

This paper is not complete and exhaustive enough to be the basis for any final conclusions. There are many things yet to be worked out. Future work may alter the opinions which would be drawn from this paper alone. The paper does demonstrate the possibility of greatly improving the quality of gray cast iron. The best samples in this series were hard and at the same time had a toughness almost comparable with that of a case hardened low carbon steel. They were considerably stiffer than malleable castings. It would seem that the production of such a combination of properties from cheap gray cast iron, might have considerable commercial value.

There may be differences of opinion as to exactly what took place, during the "carburizing" heat, as well as the reasons for them. In the first place it seemed quite evident that the combined carbon in the center decomposed into ferrite and graphite. In other words, the action was the familiar malleablizing annealing, except that the amount of combined carbon in the original casting was lower than customary. This meant that the decomposition or annealing did not require as much time. The carbon, however, which was in the plate form in the original casting was inclined to remain in that condition. This could not be considered an advantage. It was shown that sample 3C after heat treating contained graphite mostly in the globular form. Two other photographs of heat treated samples from bar No. 3 showed the same condition. The writer does not see the explanation.

Other Questions for Speculation

What happens in the outer zones of these pieces when heated in contact with a carburizing material, may also be open to speculation. At the end of the run it is noted that the outer layer is mostly pearlite. Of course there was considerable pearlite in the casting to begin with. It would be interesting to try the same process on a cast iron containing as little combined carbon as possible. It seems probable that the combined carbon in the outer zone is actually increased by the "carburizing" run. Why should this take place? Does the pressure or quantity of carbon monoxide gas in the carburizing box, produce a different condition of chemical equilibrium with which a higher amount of combined carbon in the outer zone, is in balance? Why should heating favor decomposition of the combined carbon in the center and the formation of the same compound near the surface?

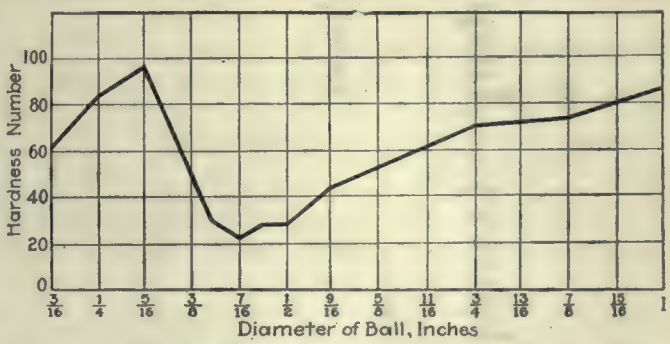
Another question which may well be raised, is; what composition of cast iron would be the most suitable. If the silicon is very high and the combined carbon very low, it might be possible that the excess of graphitic carbon might retain the plate form which would mean a weakness. Again if the silicon were very high would it not prevent the formation of pearlite in the outer zone? If the silicon were very low there would be a great deal of combined carbon in the casting to begin with. This might require considerable heating to break down and toughen. Also, if the silicon were low, would it favor the formation of excessive combined carbon in the outer zone and cause brittleness?

Testing Steel Balls for Hardness

By Major Johnstone-Taylor
Shrewsbury, England

IN ONE well-known British factory devoted to the manufacture of ball bearings, after the balls have been hardened preparatory to grinding, a crushing test is applied to a certain percentage of each batch, this test being done in a hydraulic press.

Each ball is crushed separately between a pair of hardened steel dies, the pressure being noted on the hydraulic gage. Bags are wrapped around the dies



VARIATION OF THE SCLEROSCOPE HARDNESS NUMBER WITH THE SIZE OF THE BALL

before pressure is put on, and provision is made to protect the inspectors by the use of a movable steel guard, as the balls burst with almost explosive force.

A peculiar feature of this crushing test is that, should a ball be subjected to a greater pressure than about half the ultimate crushing pressure and then be removed from the machine, it will in a short period of time, which may vary from a few minutes to several hours, suddenly and spontaneously fly to pieces.

The crushed fragments are interesting. At the points between which the pressure is applied sharp-pointed cones of crushed metal seem to be formed; and it is the driving of these cones into the body of the ball which appears to be the ultimate cause of the bursting.

The scleroscope test, it may be mentioned, is of practically no use in the testing of steel balls, the rebound of the hammer which gives the reading being too far dependent upon the size of the ball. The scleroscope number, moreover, is not by any means a simple function of the size of the ball even though the hardness is uniform. Small balls give a high number, which diminishes to a minimum for balls about $\frac{7}{16}$ in. in diameter, and then increases more slowly as the size of the ball increases.

The actual scleroscope readings of a series of balls gradually increasing from $\frac{3}{8}$ to 1 in. in diameter and all of equal hardness within commercial limits, are shown in the chart herewith. The shape of the curve is remarkable. The value for a $\frac{7}{16}$-in. ball is just about the same as would be obtained for a ball of equal size, but soft.

The reason for this peculiar result of the scleroscope test when applied to balls is not yet fully explained. It would, however, appear to be due to the reflecting back of the pressure wave produced by the blow, the reactive effect on the hammer depending upon the phase of the returning wave, which in turn depends upon the size of the ball. Hence the adoption of the crushing test, which has proved quite satisfactory.

World Trade in Metal Working Machinery—Imports

Bureau of Foreign and Domestic Commerce
Prepared by Industrial Machinery Division,

United States, 1922

Supplement to table published on page 772, Vol. 57

Countries	
Austria-Hungary	$ 1,464
Belgium	88
France	....
Germany	199,400
Greece	....
Italy	297
Netherlands	....
Norway	144
Sweden	12,417
Switzerland	7,977
England	19,241
Scotland	....
Denmark	....
Spain	....
Canada	7,077
Honduras	....
Panama	....
Mexico	....
Cuba	....
Argentina	....
British West Indies	....
China	....
British India	....
Japan	....
Australia	....
Union of South Africa	....
Total	$248,105

Italy, 1920

Supplement to table published on page 43, Vol. 58

Countries	Lire
Austria-Hungary	10,886,500*
Argentina	9,800
Belgium	365,700
Czecho-Slovakia	683,300
France	2,997,700
Germany	56,113,900
Great Britain	11,521,700
Greece	54,600
Netherlands	93,000
Hungary	101,500
Sweden	341,900
Switzerland	8,811,000
Egypt	.....
United States	19,024,700
Malta	.....
Spain	.....
Denmark	230,800
Turkey	.....
Other Countries	20,500
Total	111,258,600†

Par value of Lira is 19.30c.
Quintali = 100 Kilograms.
*Austria only.
†2 quintali and 2,000 lire re-imports of Italian machinery exported included in this total.

Australia, 1921-22

Supplement to table published on page 266, Vol. 58

Countries	£
United Kingdom	1,034,324
Canada	3,776
New Zealand	458
British India	.....
Other British Possessions	.....
Austria-Hungary	.....
Belgium	11,116
France	8,888
Germany	53,931
Italy	126
Netherlands	1,354
Sweden	21,330
Switzerland	5,969
Norway	660
Denmark	157
Russia	.....
United States of America	527,555
Hawaiian Islands	.....
Other Foreign Countries	5
Share of Importing States:	
New South Wales	507,220
Victoria	711,204
Queensland	34,732
South Australia	81,615
Western Australia	70,170
Tasmania	264,708
Northern Territory	.....
Total of Imports	1,669,649

Union of South Africa, 1922

Supplement to table published on page 152, Vol. 58

Countries	£
United Kingdom	4,182
Canada	6
France	18
Germany	887
Sweden	152
Switzerland	....
Holland	75
United States	2,060
Total	7,380

THESE tables are the last of a number of supplementary tables published in Vol. 59, pages 22, 42, 134, 170 and 212. They are supplementary to statistics on World Trade in Metal Working Machinery from 1909 to 1921, published in Vol. 57, pages 730, 731, 772, 804, 805, 840, 876, 877, 924, 958, 959, 1003, and Vol. 58, pages 43, 82, 112, 152, 188, 225 and 266. It is expected that additional figures on exports and imports will be published from time to time as they become available.

Progress in Gear Standardization

Résumé of the work of the sub-committees of the American Gear Manufacturers Association and report of action taken at the Fall meeting, October, 1923

OF THE sixteen committees on technical standardization, nine submitted reports previous to the fall meeting, and in every case those reports were distributed to the membership. The reports showed various degrees of advancement in the work of the committees, from progress to recommendations.

The Spur Gear and Nomenclature Committees presented recommendations, copies of which were distributed at the meeting and there discussed. Definite action will be taken at the Spring meeting.

The Worm Gear Committee made definite recommendations which were accepted as recommended practice. The object of the recommendations is to reduce in number the worm hobs which are carried in stock by the various member-companies. It is well known that there are hundreds, and perhaps thousands, of hobs in use. Almost all cases would be covered if these thousands were reduced to hundreds, and perhaps fewer. The committee's report not only makes recommendations for new designs, but also makes recommendations for use in connection with hobs already in existence.

The Bevel Gear Committee made recommendations in regard to bevel gear nomenclature and submitted a "Graphic Picturization" of the terms used and defined. The report was returned to the committee with suggestions for changes, and it is expected that the revised report will be offered at the Spring meeting.

The Inspection Committee made only a progress report. This committee now has in mind recommendations as to methods for testing, on the lantern and otherwise, the various types of cutters which are used in cutting gears. It has also considered the subject of raw material inspection, working in conjunction with the metallurgical committee.

The Sprocket Wheel Committee made a definite recommendation for "Standards for Transmission Chains and Sprockets." The recommendation is the same as that submitted by the joint committee of the Society of Automotive Engineers, the American Society of Mechanical Engineers and the American Gear Manufacturers Association, as made public in *Mechanical Engineering* for August, 1923. The recommendation was accepted as recommended practice.

The Metallurgical Committee, which in the past has been so very active, was unable, for the best of reasons, to make more than a progress report, but has under way recommendations which will be of great value to every manufacturer and user of gears. A definite progress report will be ready in the Spring.

The Composition Gearing Committee offered as a standard a revision of the original "Composition Gearing Standard" which was first adopted in October, 1919. The revision cuts out much of the reading matter which accompanied the original standard and which described how the tables were to be used. At this time the tables are self-explanatory. The revised standard was accepted as read. It has been approved by the sectional committee and later will be submitted to the sponsor societies for their approval and still later to the American engineering standards committee, providing the approval of the sponsors is obtained.

The Keyway Committee offered a definite recommendation, but owing to the distribution among the members at so late a date no definite action was taken. This committee has been working in conjunction with the A. S. M. E., and will continue to do so until such time as a standard agreeable to the manufacturer as well as the user is obtained.

The Tooth Form Committee made definite recommendations along some lines and only tentative ones along others. It is probable that these recommendations will furnish a basis of definite work during the winter.

The Nomenclature Committee made a progress report. It is interesting to note that the work of the different committees in connection with the nomenclature of gears has developed over 60 definitions which have met with the approval of the sectional committee and which will soon be given to the technical press for publication.

The Library Committee, which has been dormant for some three years, submitted a plan to publish, from time to time, tables in loose-leaf form, which can be filed away in some standard loose-leaf book, and which, eventually, will produce an authoritative manual.

The Herringbone Gear Committee, the *Committee on Electric Railway and Mine Gears,* the *Differential Committee* and *Transmission Committee* made only progress reports.

Since January the *Sectional Committee,* which is composed largely of members of the two sponsor societies, namely, the American Society of Mechanical Engineers and the American Gear Manufacturers Association, has held two meetings, one last January and one in September, where the nomenclature of gears was considered very largely at both metings and some 60 definitions approved. The sectional committee will consider at its next meeting tentative standards for stub tooth gearing as submitted by the French and Dutch engineering societies. It appears at this time that the question of a stub tooth standard is of interest to the users of gears all over the world, and we believe that a recommendation can be made in the very near future, which will be the basis of a future standard.

It is of interest to note that the sectional committee has recently been enlarged to include representatives from other societies, and that the work of this committee is receiving more attention from users of gears.

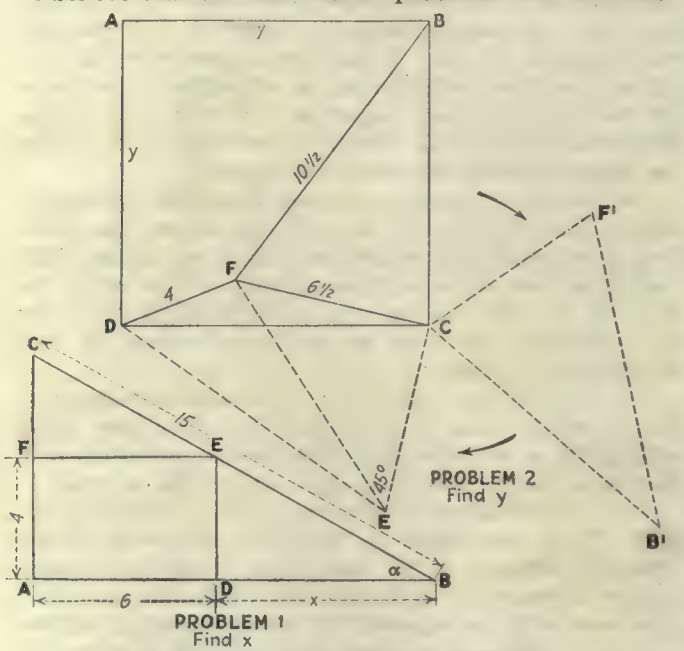
Prepared by B. F. Waterman, of the Brown & Sharpe Mfg. Co., Chairman of the General Standardization Committee and the A.G.M.A. Sectional Committee of the American Engineering Standards Committee.

Trigonometry Problems from the Drafting Room—Discussion

By A. L. De Leeuw

THE solutions given by Mr. Stevins on page 178 of the *American Machinist* to the problems presented by Mr. Thompson on page 652, Vol. 58, are all right from a purely mathematical standpoint, but may be a little over the heads of some people. I am inclined to think that there are some draftsmen, good ones too, who do not know any more about the solution of an equation of the fourth degree than they know about the fourth dimension, and who do not have even a bowing acquaintance with Messrs. Euler and Lagrange.

I believe that the solutions of problems such as these



TWO PROBLEMS IN TRIGONOMETRY

should be along simple lines, requiring only such knowledge as every draftsman should have and being well within reach of most shopmen who have studied their shop mathematics. In this particular case such simple solutions can be given. I propose to start with Problem 2, the sketch for which is here given.

If we imagine triangle *BCF* swung around point *C*, as indicated by the arrow, until line *BC* coincides with *CD*, we obtain figure *DFCE*.

$\angle FCE = 90$ deg. because $\angle DCE$ is the same as $\angle FCB$;

$FC = 6\frac{1}{2}$ and $CE = 6\frac{1}{2}$. Therefore

$EF = 6\frac{1}{2}\sqrt{2}$ and $\angle EFC = 45$ degrees.

We know all three sides of ΔDFE and therefore can calculate $\angle DFE$. There are two well known ways to do this. If we call S half the sum of the three sides of the triangle, we have

$$\sin DFE = \frac{2}{DF \times EF \times \sqrt{S\,(S-DF)\,(S-EF)\,(S-DE)}}$$

from which we can find $\angle DFE$.

We know *DF*, *CF* and the included angle *DFC*, which allows us to find *DC* by applying the formula:

$$DC^2 = DF^2 + CF^2 - 2DF \times CF \times \cos DFC.$$

The above method of finding $\angle DFE$ is particularly good when the dimensions of the sides are unwieldly, because the formula permits the direct application of logarithms. Where the figures are simple, as they are in this case, the angle *DFE* can be found by the use of the formula

$$\cos DFE = \frac{DF^2 + EF^2 - DE^2}{2DF \times EF}$$

This solution goes step by step, requires no solution of equations of high power and is within reach of anyone with an elementary knowledge of trigonometry.

As to Problem 1, it is still simpler, though it requires a little more patience and, perhaps, time.

$$EB = 4 \text{ cosec } \alpha$$
$$CE = 6 \text{ sec } \alpha$$

Adding,

$$EB + CE = 4 \text{ cosec } \alpha + 6 \text{ sec } \alpha$$
$$BC = 15 = 4 \text{ cosec } \alpha + 6 \text{ sec } \alpha$$

We see from the sketch that α is less than 45 deg. We will make a guess as to its approximate value. It is possibly somewhere between 30 and 40 deg. Taking our table of natural functions we find:

sec 30° = 1.1547	6 sec 30° = 6.9282
cosec 30° = 2.0000	4 cosec 30° = 8.0000
	14.9282 — (too small).
sec 40° = 1.3054	6 sec 40° = 7.8324
cosec 40° = 1.5557	4 cosec 40° = 6.2228
	14.0552 — (too small).

This work shows that our guess was incorrect. The angle must be less than 30 deg. It shows also that it is not far from that value. Trying 29 deg.,

sec 29° = 1.1433	6 sec 29° = 6.8598
cosec 29° = 2.0627	4 cosec 29° = 8.2508
	15.1106 — (too large).

The angle is therefore somewhere between 29 and 30 deg. and somewhat nearer to the latter. We shall try 29 deg. 45 min.

sec 29° 45′ = 1.1518	6 sec 29° 45′ = 6.0108
cosec 29° 45′ = 2.0152	4 cosec 29° 45′ = 8.0608
	14.9716 — (too small).

One, or at the worst two more trials will give the angle correct to within one minute. Further trials will give the angle, as correct as the scope of the table of natural functions permits. Having the angle, the other elements of the figure can be easily found.

This method can often be profitably applied in machine design; for instance, when calculating the helix angle of two helical gears with shafts at right angles to each other, and which must have a given pitch and center distance.

Safety Code for Aeronautics

Definite steps are being taken to increase the safety of aviation by the adoption of a safety code, as is in effect in other industries. The work is being done by the Bureau of Standards, the Society of Automotive Engineers and the American Engineering Standards Committee. The code will include the following parts, as representing different phases of aeronautic work: Scope and Nomenclature, Airplane Structure, Powerplants, Equipment and Maintenance of Airplanes, Signals, Airdromes and Airways, Traffic Rules, Qualifications for Pilots, Balloons, Airships and Parachutes.

This is a most important work and with the passage of a Federal bill for licensing both pilots and planes, will do much for the safety of aviation. Copies can be had from the Society of Automotive Engineers.

Factors Governing "Out-of-Roundness" Measurement

By A. H. FRAUENTHAL

Types of "out-of-roundness"—Measurement by the 3-point system and V-block method — V-block and other methods for checking elliptical forms — Instrument improvement suggestions

ACCURATE measurement of "out-of-roundness" is an important item of inspection that, it seems, has not received due consideration even in our larger plants which use the most modern of measuring instruments. It is an item that affects quantity, quality and cost of production. If, through a fallacy of inspection methods, parts are produced and accepted for production that exceed the specified limits, there is generally a falling-off of production due to the difficulty of assembling parts in this condition, and the quality certainly is lowered through the loss of bearing area. On the other hand, if parts that are actually within the specified limits are rejected and scrapped, the decrease in quantity of production and the increase in cost of production are obvious.

The two different general types of out-of-roundness are "regular" and "irregular."

The irregular class comprises those objects which assume an irregular shape and, consequently, will not be governed by any set rules for their inspection. Under this head are parts that become out-of-round due to distortion in heat-treatment, crowding of tools by hard spots, and the like.

The regular class is composed of those objects the high and the low-pots of which manifest some mathematical continuity. Since the objects do contain high-spots and low-spots, their sections are no longer circles and must not be treated as such. If the object contains two diametrically opposite high-spots and two diametrically opposed low-spots, its section is an ellipse; and, if it contains a greater number of high-spots and low-spots and we consider the low-spots as sides and the high-spots as vertices, the section becomes either a triangle, a square or some other polygon. The paper deals with this latter class of out-of-roundness.

Out-of-Roundness Characteristic of Certain Machines

Automobile parts, such as piston-pins, small shafts, valve-lifters, shackle-bolts, roller-bearing pins and many other similar parts, are generally ground on centerless grinders. It has been determined, on work that comes out-of-round from a centerless grinder, that the quantity of high-spots and low-spots is always a number that is a multiple of 3. This condition is, no doubt, due to the fact that the centerless grinder has three points of pressure on the part being ground; namely, the grinding wheel, the feed wheel and the work support. On the other hand the number of high-spots and low-spots on work that comes out-of-round from the ordinary grinder employing centers generally is a multiple of 2. This is doubtless due to the two points of pressure on the piece being ground; namely, the centers and the grinding wheel.

Other machines also produce out-of-round work, particularly gear-driven machinery on which the number of high-spots or low-spots is equal to a multiple or factor of the number of teeth is one of the gears or the train of gears. Due to the varied shapes which an out-of-round piece may take, it is necessary to use different types of checking apparatus to determine the true conditions of each differently shaped piece.

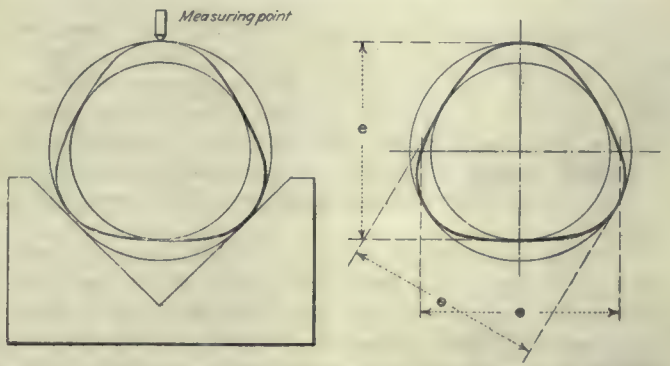


FIG. 1—OUT-OF-ROUND OBJECT OF TRIANGULAR SHAPE

A cylindrical object, the out-of-roundness of which is greatly exaggerated, is shown in Fig. 1. This is shown in the shape of a triangle and is the empirical form in which out-of-roundness manifests itself from the centerless grinder. It can be seen readily that if a checking method employing directly opposed measuring points were used on a piece of this shape, it might appear absolutely round; whereas, it actually could be considerably out-of-round. This is due to the fact that one of the measuring points would be located on a low-point, while the one directly opposite would be located on a high-point. Since the actual amount of out-of-roundness of any piece is the difference in the diameters of the inscribed and circumscribed circles, it is necessary to use a measuring apparatus that registers in three places in the case of triangular objects.

Various three-point measuring-tools are on the market and, since their application and results are all approximately the same, we may use for an example the V-block method as employed with any of the numerous

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amplifying gages, such as the one shown in Fig. 2. The amplifying gage is merely an apparatus that employs a lever system to increase the movement of a measuring point held in contact with the work, and an indicator to measure the increased movement. While there are various different gages on the market, the principle of all is the same and with most of them are furnished different types of work supports, such as centers, V-blocks or flat plates.

To the casual observer, this method may appear to

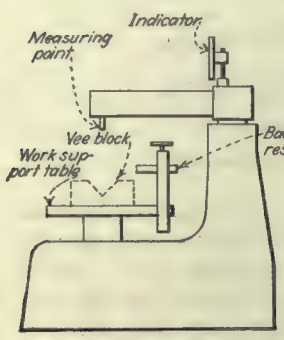


Fig. 2

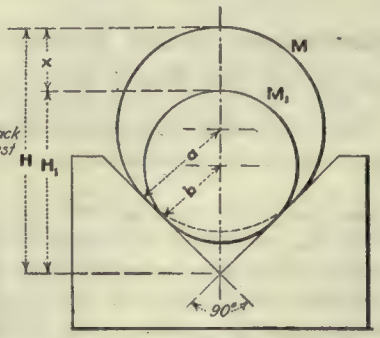


Fig. 3

FIG. 2—MEASURING INSTRUMENT WITH V-BLOCK AND AMPLIFYING GAGE. FIG. 3—INSCRIBED AND CIRCUMSCRIBED CIRCLES IN V-BLOCK

give accurate results; but such is actually not the case and, for each different included angle of the V, a different correction must be applied to the indicator reading. This correction is obtained by very simple mathematics and we will demonstrate the necessary correction on a V-block having a 90-deg. included-angle, since this is the angle universally accepted for commercial V-blocks.

It would be incorrect to use a 90-deg.-angle V-block for a piece containing three high-spots, since the high-spots would be indexed 120 deg. from each other, thus requiring a V-block having a 120-deg. included-angle. This is merely an empirical example of how the correc tion is obtained; it is, therefore, permissible, and the correction can be used when inspecting diametrical variations on parts within the tolerance for out-of-roundness.

Inasmuch as the V-block method will, at some time or other, while the piece is being revolved, present the inscribed circle to the three registering points and, at some other time, present the circumscribed circle to the three registering points, we can use any two circles of selected diameter and find out how much higher one will set in the V-block than the other. This figure, minus the actual difference in diameters, is the amount of the correction. The diagram in Fig. 3 shows two circles in a V-block as suggested.

If D represents the diameter of the large circle and D_1 the diameter of the small one, the following expressions are easily determined:

$$D = 2a;\ D_1 = 2b;$$
$$H = a + \sqrt{2a^2};\ H_1 = b + \sqrt{2b^2};$$
$$x = (a + \sqrt{2a^2}) - (b + \sqrt{2b^2});$$
$$2x = (D + \sqrt{2D^2}) - (D_1 + \sqrt{2D_1^2});$$
$$x = 1.2071\ (D - D_1).$$

The last equation shows that the difference in readings at M and M_1 will be 1.2071 times the actual difference in diameters. In other words, on account of this exaggeration, a correction of approximately 21 per cent must be applied.

The V-block method already described often is used erroneously on work for which the character of out-of-roundness has not been determined previously. The use of this method with elliptical objects is shown in Fig. 4. If we designate the major radius by a and the minor radius by b, using the symbol m for the slope of the V, it is evident that the straight line, $y = mx + k$, is tangent to the ellipse if $k = \pm \sqrt{a^2m^2 + b^2}$.

We know that the line is tangent and that $m = +1$, therefore,

$$k = \pm \sqrt{a^2 + b^2};$$
$$V = \cos 45\ \sqrt{a^2 + b^2} = 0.70711\sqrt{a^2 + b^2};$$
$$H = V + a;\ H_1 = V + b;$$
$$x = H - H_1 = (0.70111\sqrt{a^2 - b^2} + a) - (0.70711\sqrt{a^2 - b^2} + b) = a - b.$$

This value of x is the indicated amount of out-of-roundness, but the actual amount is, of course, $2a - 2b = 2\ (a - b)$. The indicated amount is therefore only half of the actual difference between the major and minor diameters, and this method introduces an error of 50 per cent.

Fig. 5 shows a cylinder with the out-of-roundness in the elliptical form and exaggerated greatly. Inasmuch as the amount of out-of-roundness of any object is the difference in the diameters of the inscribed and circumscribed circles, it would be a very easy matter to measure this difference on the part shown merely by applying some measuring instrument with opposed measuring points, such as the micrometer caliper, to the distances a and b.

However, the micrometer caliper is no longer used for quantity inspection of work of this type, and has been replaced by the amplifying gage. The reasons for this are familiar to all, or are very obvious at least, and do not require discussion here.

In a manner analogous to that of the micrometer,

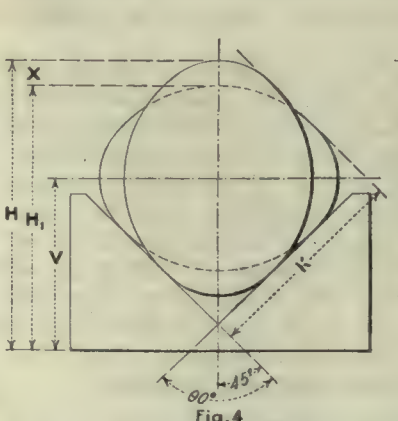


Fig. 4

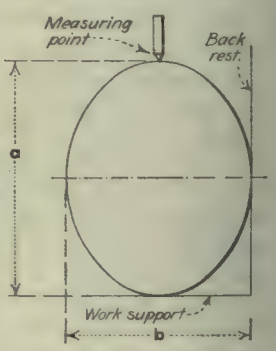


Fig. 5

FIG. 4—ELLIPTICAL OBJECT IN THE V-BLOCK. FIG. 5—ELLIPTICAL CYLINDER IN THE AMPLIFYING RANGE

the piece could be moved back and forth, horizontally, under the measuring point, until the highest and the lowest readings were obtained. This is a very accurate method, but is, unfortunately, slow. To overcome the difficulty of finding the highest and the lowest points and to eliminate the horizontal motion, which requires considerable time, the back-rest has been added as shown. When using this appliance, the original indicator-setting is made by a pluggage or master-piece which is moved back and forth under the measuring point until the highest reading is obtained.

The position of highest reading is, of course, at the diameter of the circle and, with this obtained, the back-rest is moved-up to the master-piece and fastened in place. In the actual inspection, the piece being tested is held firmly against the back-rest and revolved under the measuring point. This method is very rapid; however, it adds a third measuring-point to the combination and hence requires analysis to determine whether the indicator readings require correction.

To determine this, let us first assume that the amplifying gage is in perfect condition as received from the

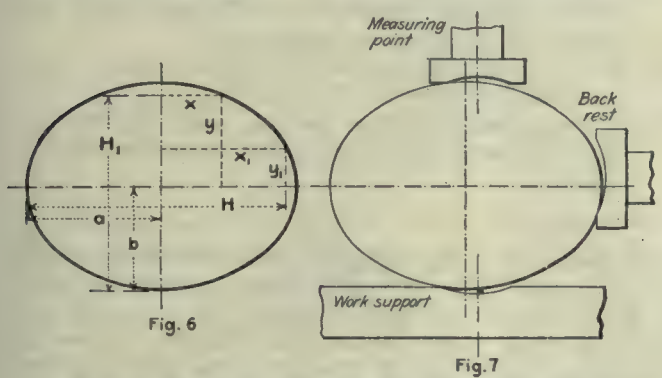


Fig. 6 Fig. 7

FIG. 6—DIAGRAM TO DETERMINE AMPLIFYING GAGE ERROR. FIG. 7—MEASUREMENT CONDITIONS WITH WORN MEASURING POINTS

manufacturer; that is, with the back-rest and the work-support perfectly flat and the measuring point rounded to give point contact and to permit the specimens to slide under the point readily. The elliptical piece is revolved as has been described and, when the lowest indicator-reading is obtained, the major diameter of the ellipse naturally will be horizontal, with one extremity against the back-rest, as shown in Fig. 6. This condition, of course, brings the measuring point off the center and the reading obtained is smaller than the actual minor-diameter. The amount that it is smaller depends on two quantities, the actual amount of out-of-roundness, which is unknown, and the degree of curvature of the measuring point.

When the highest indicator-reading is obtained, the conditions are just the same in effect, a smaller reading than the major diameter is obtained, and the amount that it is smaller depends on the same conditions. Although, with a perfect ellipse, the measuring point is the same amount off-center when taking the highest reading as it is when taking the lowest reading, the difference in readings, which is the indicated amount of out-of-roundness is not exactly the actual amount of out-of-roundness, even though we were able to procure point contact at the measuring point, which would eliminate the complication of the radius. It is, however, so nearly the correct amount that the method would be perfectly safe to use, even on so close a job as piston-pins, if it were possible to obtain the perfect conditions just described. However, it must be remembered that all readings, whether used in checking roundness or size variations, will be complicated by the radius on the measuring point. To overcome this condition, trials should be made periodically with known-diameter master-pieces to obtain corrections for radius and wear of the measuring-point radius.

The amount of error in the reading of both the highest and lowest points is found as follows, the readings being indicated by H and H_1 as before. If we designate the major radius by a and the minor radius by b, it is evident that the amount which the measuring point is off center is $\frac{a-b}{2}$. The equation of the ellipse is

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

$$x = \frac{a-b}{2}$$

$$y = \pm \frac{b}{2a}\sqrt{3a^2 + 2ab - b^2}$$

$$H_1 = b + y = b \pm \frac{b}{2a}\sqrt{3a^2 + 2ab - b^2}$$

The equation of the ellipse in the other position is $\frac{x_1^2}{a^2} + \frac{y_1^2}{b^2} = 1$ and, by substituting the value of $y_1 = \frac{a-b}{2}$, it is found that

$$x_1 = \pm \frac{a}{2b}\sqrt{3b^2 + 2ba - a^2}$$

$$H = a + x_1 = a \pm \frac{a}{2b}\sqrt{3b^2 + 2ba - a^2}$$

$$H - H_1 = a - b \pm \frac{a}{2b}\sqrt{3b^2 + 2ba - a^2} \pm \frac{b}{2a}\sqrt{3a^2 + 2ab - b^2}.$$

This equation shows the amount of error in the reading of both the highest and the lowest points and, although this particular error is very large, their difference in readings is very close to the actual amount the specimen is out-of-round. Unfortunately, the formula for the corrections comes out in an involved form that does not permit us to show the percentage of error readily. However, the correction necessary, due to the complications of the radius on the measuring point, is greater than the foregoing correction.

Now let us suppose that the instrument is not absolutely new but has seen enough service to show some slight wear on the three registering points; the support-plate, the back-rest and the measuring point. After 2,000 pieces are measured on one of these machines, the wear is evident even though the points subjected to wear show a scleroscope hardness as high as 90. This is a natural condition, as the pressure is very concentrated due to the bearing at all three points being a point of tangency.

Errors from Worn Points

The conditions shown in Fig. 7 now take place. With the major-diameter horizontal, the point of contact with the back-rest is either off the lowest point on the edge of, or entirely outside, the worn groove; this results in a lower reading than the true reading, due to the abnormal amount the measuring point is off-center. On the work-support, the piece is again either off the lowest point on the edge of, or entirely out of, the worn groove; this results also in a higher reading than the true reading, and the same condition is true at the measuring point. Hence, we see that one worn point contributes to a lower reading, while the two other worn points contribute to a higher reading. With the specimen in position with the major-diameter vertical, the results obtained are similar. The amount of error in the indicator-readings depends again on two quantities; the amount of out-of-round and the amount of wear. Inasmuch as the former quantity is unknown and the latter unknown or at least varying constantly, the results obtained cannot be corrected by any set

mathematical formula and the correction must be obtained by checking with known-diameter master-pieces in the manner described.

This discussion demonstrates that an out-of-round surface requires a checking instrument having opposed measuring-points if the number of high-spots is even and a checking instrument with 3-point contact with one point located on the center-line between the other two if the number of high-spots is uneven.

Another word of caution may be added concerning the use of the 3-point method. For close work, the angle between the three points of contact must be selected according to the number of high-spots. This is due to the fact that the high-spots are not points, nor the low-spots straight-lines, and it easily is possible to select an angle that would not register on either the highest or lowest points.

This paper is not to be taken as an indictment against these various methods of inspection or even an implication that these methods are not the best that have been yet brought forward. It is meant to point out that the various indicator-readings require correction to produce correct results. It was also intended to bring out the fact that there is still considerable room for improvement of these instruments to eliminate some of our present difficulties. In connection with this, I suggest three items that probably are worthy of consideration by the manufacturers:

(1) A flat measuring-point large enough to reach the major diameter when it is off-center with the measuring point due to ellipticity.
(2) A revolving characteristic of the measuring point to provide even wear.
(3) A corrected indicator for use with the 90-deg.-angle V-block, thus eliminating correction by the operator.

The Cost of Carrying Spare Parts

By John R. Godfrey

"WHAT do you know about the cost of carrying spare parts, Godfrey," said old man Johnson the other day.

It didn't take long to tell him.

"Well, you know what a howl there is about the cost of spares on some motors. I've hollered myself and would do it again, likely as not. But there are two sides to the question.

"Do you remember those special motors we built, say twenty years ago? Trouble was we built 'em too dern good. They've stood the gaff for years, with only an occasional break and when some customer wires in for a new part he expects to get it by return express, and for about ten cents a pound at that.

"If it were new stuff that we were making right along I agree that it ought not to cost a young fortune for a ⅜ bolt and nut. I believe it pays to sell such parts at a small profit so as to keep the cost of upkeep as low as possible.

Parts for Obsolete Motors

"But when it's a part for a motor that you built fifteen years ago and that hasn't been in production for over ten years, the fair price to charge is quite a different matter. We've got altogether too many parts of motors on hand that are out of date and are not called for more than once in a blue moon.

"Of course, we want to be able to help a customer keep his motor going but we can't afford to lose money doing it. There's a crankshaft which cost us thirty dollars by the time it got into the stockroom. It's been there ten years, taking up valuable space, having to be handled and inventoried every year, and eating its head off in interest and other charges. Yet we are supposed to sell that to a customer for the same price we quoted ten years ago.

"We've got thousands of dollars tied up in just such stuff as that and probably fifty per cent of it will be here at the end of the next ten years, whether I am or not. Now what's the answer, Godfrey? There's got to be a change in our notion of what things ought to cost in cases like that.

"I'm going to have Tom make up a list of the spare parts we've sold and see what parts wear out first and what parts are never replaced. Next I'm going to find out how long calls for parts come in after a model is discontinued. Of course, there'll be a strong call now and then from someone in Podunk Hollow or Goosebery Bend, long after most of the motors of the same vintage have gone the way of all scrap. But they are not going to count with me as much in the future as they have in the past. I want to do the square thing in supplying parts, but the Johnson Motor Co. has got to get a square deal, too.

"I figure that ten years is a liberal allowance for the life of even a Johnson motor, and we are not going to carry spares beyond the ten-year period. We'll just let the spares run out at the end of ten years, as nearly as we can figure it. Any parts ordered after ten years are to be made to order and charged accordingly. We won't see how much we can stick 'em up, but they're going to cost more than just production prices.

"Tom wants me to agree to a plan for increasing the price of spares after a five-year period, to cover cost of storage, of handling in yearly inventory, of interest and what not. It isn't a bad scheme and it's sure logical, but I'm not quite sure how it will hit a customer. The chances are he'd rather pay a little higher flat price from the beginning than feel that he was being penalized for taking such good care of his motor that it lasted over the five years. But I'm glad Tom has an idea once in a while whether we can use it or not. I'd rather have him think wrong once in a while than not to think at all."

This spare parts problem is a puzzle for many a concern and there may be a kind of solution in not trying to carry parts for machines over ten years old, for motors at least. This of itself might help to solve the used motor problem and to encourage people to buy new motors.

Some of the confusion arising in the designing and building of large machinery can be eliminated by following the practice of the Westinghouse Electric & Manufacturing Co. and dimensioning everything in inches. The use of "feet" was abandoned some years ago and since this change much of the confusion and many of the errors formerly existing have disappeared. There may be places where the sole use of inches will run into figures which are difficult to grasp and to handle, but in most cases it is a very sane and sensible move.

Tempering Tools By Steam at High Pressure

By ELLSWORTH SHELDON
New England Editor, *American Machinist*

A unique method of tempering—Relation between pressure and temperature of steam the basis—Perfect control of temperatures assured—Has been in operation for many years

A UNIQUE and interesting method of tempering small tools by means of steam at high pressures has been in service for many years in one of the prominent tool manufacturing shops of New England, but has now been discarded in favor of oil-tempering baths, not because of any defect or failure to secure uniformity of results but solely because it is believed that the more modern oil-bath will effect a saving in time. Indeed, for ease and certainty of temperature control the discarded method could not be improved upon.

As every one associated in any way with steam engineering knows, the temperature of saturated steam bears a definite and inviolate relation to its pressure. So certain is this relation that it is quite practicable to gage, accurately, the pressure upon a steam boiler by means of a thermometer, or to read, with equal accuracy, its temperature from a steam gage. In the apparatus here illustrated and described the steam gage is the only temperature registering instrument employed.

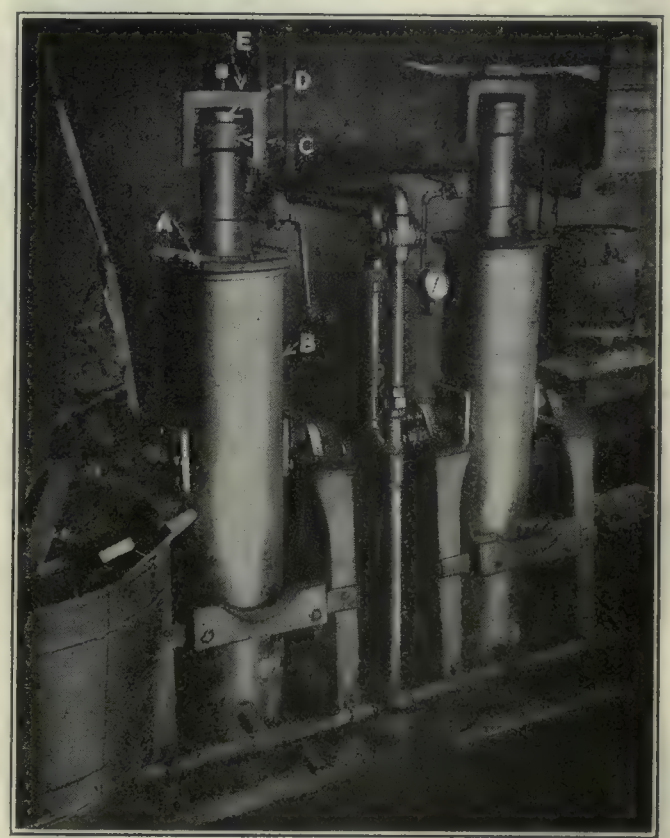
Tubes Used as Generators

Two separate units are shown in the illustration. Each consists of a piece of extra heavy wrought-iron tube about 4 in. in internal diameter by 6 ft. long. Only a small portion of the upper ends of these tubes are visible in the picture, as that portion of the tube below the cast iron flange *A* is concealed by the asbestos-lined sheet-metal jacket *B* that serves to confine the heat generated by a gas burner located within the jacket at the lower end.

The tube is closed, by welding, at the bottom to form a hemispherical end. It is open at the upper end, where it is surrounded by the wrought-iron collar *C*, also welded to the tube. The open end is accurately countersunk to form a conical seat for a steel plug, *D*, that is ground to a steamtight joint, and held to its seat by the clamping screw and forged yoke *E*, which gets its hold under the collar *C* by its inwardly projecting ends.

Except for the ¾-in. steam pipe tapped into the side of the tube and leading to the steam gage, there are no connections or openings into the tube after the plug has been seated. All other pipes to be seen in the picture are gas-pipes, leading to the burners. In the gage pipe there is a lever-operated value, the sole duty of which is to release the steam pressure when the desired temperature has been reached.

The whole apparatus is swung upon trunnions so that it may be tilted to an angle considerably below the horizontal plane for the purpose of dumping out the work after the tempering has been completed. The gas burner is built into the lower end of the jacket in such manner that the act of swinging the apparatus



APPARATUS FOR TEMPERING BY STEAM PRESSURE

to an upright position brings the burner into proper relation with the gas nozzle without making any pipe connections.

To introduce a charge of work the clamp and plug are removed and the tube tilted to a convenient angle. The number of pieces introduced does not matter; the tube may be full, or it may contain only two or three pieces without affecting the results obtained. After the work has been put in, the tube is swung upright and about a pint of water poured in. The plug is then secured in place and the burner fired.

The amount of water put into the tube depends some-

what upon the quantity of work it contains, and is judged by the operator's experience. Too much water would have no effect upon the resulting temper of the tools but would unduly increase the length of time required to raise the required pressure. Too little water would result in its being entirely converted to steam before the desired pressure was reached, and the steam would then take on a super-heat that the gage would not register. The consequence of such an error would inevitably be an overdraw, and the operator is therefore always careful to make his error, if any, in the direction of an over supply of water in the tube.

The time required for drawing the temper of a charge of work is from 10 to 20 min. (approximately). The pressures employed vary from 325 to 400 lb. per sq.in., according to the size and nature of the tools. The pressure rises slowly at first and the operator is not constrained to give his entire attention to the apparatus until the gage approaches the predetermined figure. When this is reached he shuts off the gas and opens the relief valve, thus releasing the pressure and reducing the temperature of the container to 212 deg. at once.

Efficiency in the Engineering Department

By Warren P. Willet

MUCH has been said and done in the interest of industrial efficiency, but unfortunately these activities have for the most part been confined to actual production and the so-called "non-operating" departments have received very little attention. Most seriously has the engineering branch of industry been neglected. This department, which plans and advises efficient and economical means of mechanical production, is often least efficient and economical in the use of its own time.



SCHEDULE BOARD FOR AN ENGINEERING DEPARTMENT

In the factory, by intelligent planning and scheduling, the man's work is ready for him as soon as he is ready for it. There is no lost motion and no waiting between jobs. Why not apply a little of this system in the engineering department? A few improved methods which have been established in one engineering department may be of interest and assist others in this important task.

Lost Time Causes

Upon analyzing one organization it was found that not all of the lost time was the result of dilatory habits and absences, deplorable as these things are, but a large part of it was due to the men not knowing what to do next, or in not knowing how to do the work in conformity with the standard practices of the company. Instead of proceeding from one job to another without interruption it was necessary for the men to go frequently to the chief engineer for instructions, and very often several men were at his desk waiting for work to be assigned them. This gave him very little time to go over his orders and assign work according to a man's ability. Finally his position became that of keeping the men busy rather than the more important function of supervising the engineering work.

This unsystematic practice became obsolete when a work schedule was established, and supplemented with a schedule board on which all work was posted in plain sight. The board was marked in vertical columns and horizontal lines forming rectangles, into each of which was set an open-front card retainer as shown in the accompanying illustration. A column was arranged for each man and headed by his name. Along a vertical column at the extreme left of the board was placed a series of numbers representing the days of the month.

A small card bearing a work order number can be placed in one of the designers' columns opposite the required date, its progress followed throughout the several stages, and finally after checking, be removed from the last retainer. Then, after entering upon the card the date of completion and other data as required, it may be filed away for future reference.

By this means the chief engineer knows at all times the status of his work. If a piece is falling behind schedule it is quickly detected by the location of the card with reference to the dates in the column, and if necessary, extra men can be used to catch up.

As for the writing of the cards, that is taken care of by a boy who simply copies from the written orders, the order number, the type of machine and the promised date of delivery. The chief engineer having indicated by whom the designing should be done, the cards are placed in a retainer under the indicated name and opposite the proper date.

Standardization of Reference Sheets

Like other departments of this kind we had a large collection of reference sheets containing the data of our manufacturing practices and, unfortunately, the usual disorderly arrangement of such sheets existed. As no uniformity was followed as to size of sheets, they were contained in some four or five folders. This made it difficult to know in which folder the required information was to be found and, as there was but one set, they were in great demand.

As a matter of standardization, all data was transferred to eight and one half by eleven inch sheets. This size is very convenient, as much of the data can be made up on the typewriter. Some of the more simple drawings in the sets were redrawn to this size but the more complex ones were reduced by means of the photostat. Several copies were made and each man was provided with a neat, compact set of standard data sheets in loose-leaf form which was complete in itself. This eliminated the necessity of several men trying to refer to the same book at once. The books are kept up to date by adding to or taking from, as the occasion requires, so that every man has before him at all times accurate and reliable information.

By this means searching for a data book which was generally in use was not only avoided but, as the men became familiar with the contents of their books, they found in them answers to many questions which, otherwise, would have taken up the time of the chief engineer.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

A Convenient Ball Chuck

By Frank C. Hudson

Among the products of the Pioneer Instrument Co., Brooklyn, N. Y., is what is known as a turn-indicator, an instrument which contains a small air-driven gyroscope that tells the airplane pilot the instant he begins to turn from his true course. The case of this instrument is an aluminum cylinder, as shown in Fig. 1, and in order to secure a wall of uniform thickness it is necessary to hold it by the inside cored surface during the turning operation.

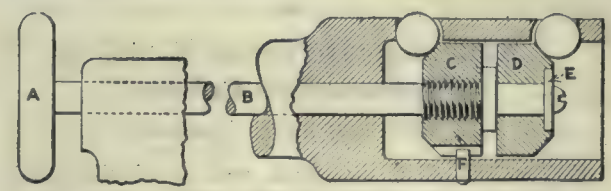


FIG. 3—HOW THE MANDREL IS MADE

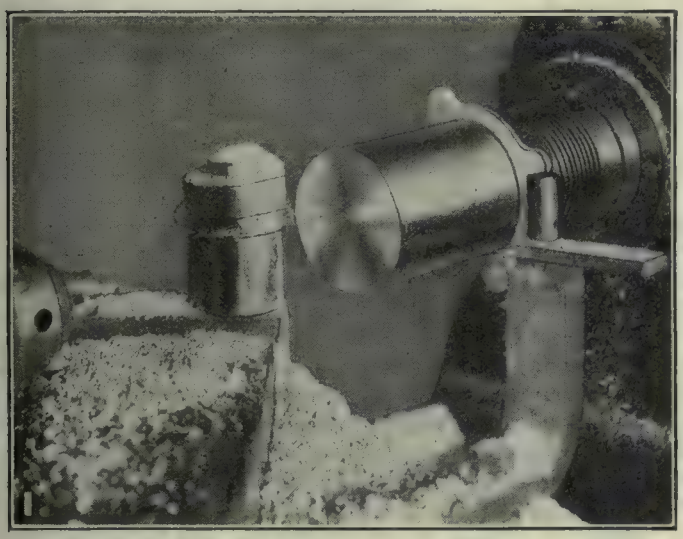


FIG. 1—TURNING CASE FOR GYRO TURN-INDICATOR.

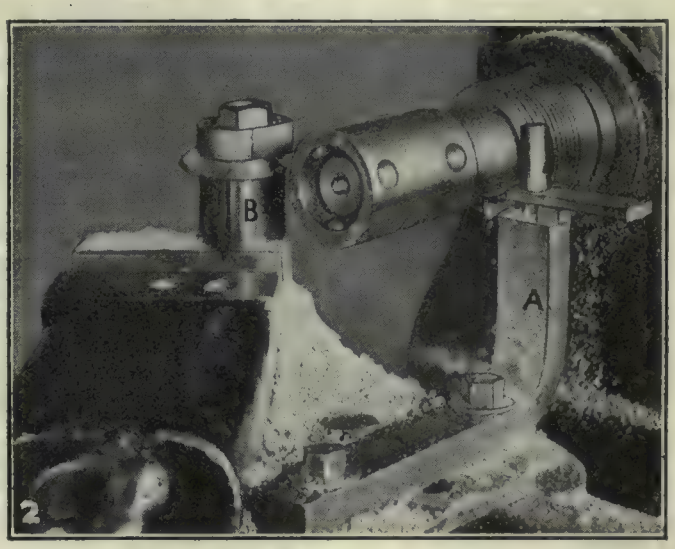


FIG. 2—THE BALL MANDREL WHICH HOLDS THE CASE

To chuck the cases quickly and accurately the superintendent, B. C. Goldsborough, designed the ball chuck shown herewith. There are six balls in all, in two sets of three balls each, so that the case is held on three points at both the front and back ends. Each set of three balls is controlled by a separate cone, as shown in Fig. 3.

The handle *A* is on a draw-in or chucking rod *B*, which controls both cones *C* and *D*. The rod is threaded into cone *C* while cone *D* has a plain hole but is held against end motion by the collar between the cones and a washer *E* at the end, held in place by a screw. The rod *B* is free to float endwise through the spindle and move the two cones with relation to each other, by means of the screw. The cone *C* is prevented from turning by means of the pin *F* which works in a slot. This makes a quick-acting chuck or mandrel that has proved very satisfactory in every way.

The tooling for the cases is interesting both for its simplicity and effectiveness. The improvised toolpost at *A*, Fig. 2, carries a simple tool which faces the back of the flange. The front toolpost *B*, carries two equally simple tools which turn the outside and face the end and the front side of the flange at the one setting. Suitable stops on the bed, gage both the diameter and the length and make this plain engine lathe do duty as a special machine set up for this job. When the cases go through in lots of from 50 to 200, the time saved by this device is very noticeable.

Modern Speeds for Turning Tires

By I. B. Rich

Machine shop men who are not familiar with the quality of the steel used in locomotive tires do not appreciate how hard they are to turn. If they did they would be more chary of their criticisms as to slow turning speeds. Cast iron or machinery steel can be turned at 40 ft. a min. or more in some cases, but let the lathe hand try to secure anything like this speed on tires for locomotives and see what happens.

We have a new wheel lathe of the latest design and we can sometimes get a speed as high as 15 ft. a min. This is the exception, however, as 12 to 14 ft. per min. is about all we can boast of. And this seems to be the economical speed when all things are considered.

When a wheel skids on the rails, it seems to harden up the contact spot and the surrounding metal. These spots are frequently so hard as to be almost unturnable. In one case we recently used up five roughing tools on one pair of 62-in. flat wheels.

Just to show what can be done under good conditions,

I may mention one railroad shop in which 32 pairs of 33-in. wheels were turned out in 8 hr. The cutting speed was 15 ft. per min. and our average output is 27 pairs in 8 hr. The makers of the lathe think we are running it too fast but it's still on the job. We keep a bunch of roughing tools already ground near the lathe at all times and we change tools the minute one shows distress of any kind. Otherwise we could not get such production.

Repairing Defective Welds in Locomotive Boilers

By Clifford H. French

No matter how the weld was originally made all deposited metal must be cut out of a defective weld and considerable more on each side, depending upon the length of the defect and its location.

The reason for cutting out the weld on each side of the defect is to equalize the contraction stress over a length greater than that of the defect repaired. If the defective weld were only 2 in. long it would probably be advisable to chip out 4 to 6 in. on each side, thus making a total length of new weld of 10 to 14 in.

It is advisable also to preheat the old weld several inches beyond the place to be gas welded before starting welding. Then, as the weld metal cools the contraction stress is distributed over the comparatively wide space.

If the attempt were made to simply cut out the defective weld and make a new gas weld, the probability is that the weld would crack in cooling. But if we have a large gas weld it will possess sufficient strength to draw the sheets while contracting in spite of the resistance of the sheet stiffness and the staybolts.

These suggestions regarding the repair of defective welds apply to both gas and electric welds which have developed defects. The defective seam must in all cases be rewelded for some distance each side of the defect, in order to make a sound dependable job.

Fixture for Drilling Differential Cases

By Chester H. Franklin

Probably the most important point in machining the cases for differential gears is to have the holes for the pinion bearings at right angles with those for the axle. The fixture used for this purpose by the Sheldon Axle & Spring Co., Wilkes-Barre, Pa., is rather unusual in design and is particularly interesting from the fact that it is easily handled and secures thoroughly satisfactory results.

The fixture is shown in Figs. 1 and 2, the former showing a case in drilling position, and the latter with the guide and latches withdrawn for the removal of the work.

The trunnions at each end of the case rest in suitable V-blocks and are clamped in position by the straps *A* and *B*, Fig. 1. The case is centered by the sliding block *C*, which has a central slot that surrounds the flange of the case and locates it endwise before it is clamped in the bearing.

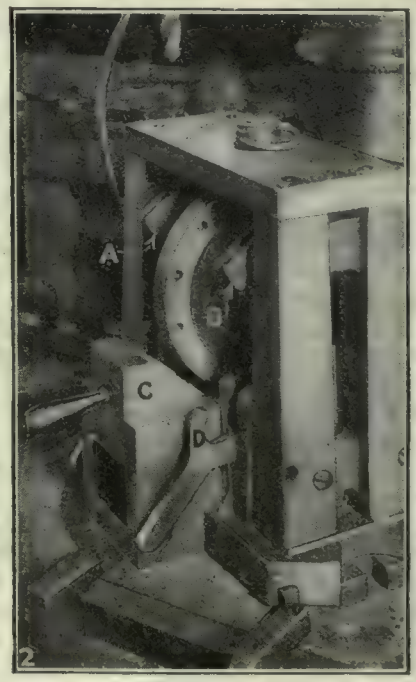
Clamps *A* and *B*, and wedge block *C*, are plainly shown in Fig. 2. This view also shows the form of hook latch at *D*, by which the clamps are held in position over the trunnions.

After the holes are drilled, the seat for the thrust washer is finished with a flat facing cutter and, in order to have this seat square with the pinion bearings, the pinion holes are used as a guide and stop in facing. The bar *A*, Fig. 3, is positioned in the facing tool at right angles to its axis and rests in two of the pinion bearings, as shown. The final facing cut is then taken, which insures the thrust bearing face being square with the pinion bearing.

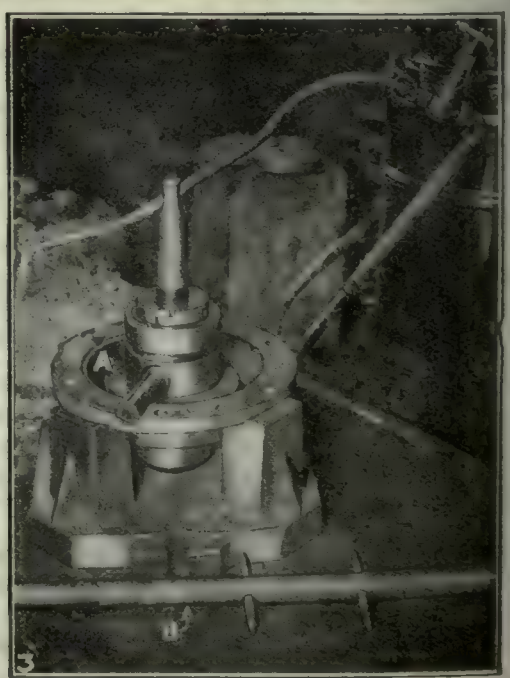
The very simple form of "go" and "no-go" gage used in this connection is shown at *B*. This gage is a hardened and ground bar of the proper size to fit the pinion bearings, and carries two sets of gage pins. These pins are in reality continuous pins going through the bar, but the ends of each pin are ground and lapped to the proper radius, so that the pins on one side act as a "go" and those on the other side as a "no-go" gage.



1



2



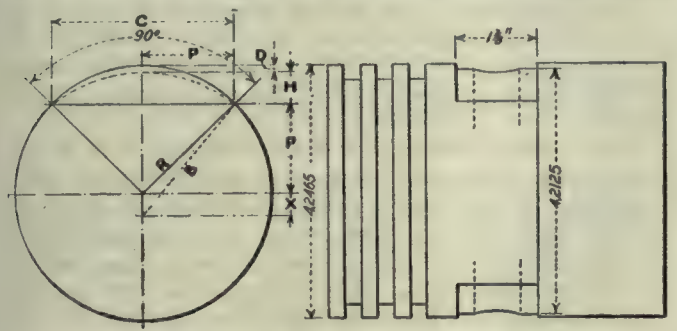
3

FIG. 1—DIFFERENTIAL CASE IN POSITION FOR DRILLING. FIG. 2—CASE READY TO BE REMOVED.
FIG. 3—FACING CUTTER AND PIN GAGE

Computing Offset for Relief Grinding

By Clarence D. Scrom

Our engineering department has specified a relief to be ground over each end of the piston wristpin hole and, to locate the relieved section within 90 deg. of the piston circumference, it was necessary to build an offset grinding fixture. The design of the fixture gave considerable



RELIEF GRINDING ON AUTOMOBILE PISTON

trouble until the proper offset was computed by means of the formulas herewith.

In the figure, which shows the proper relief ground in a piston,

X = Offset to be determined.
C = Chord.
P = One-half the chord.
D = Depth of recess.
B = Radius of offset.
R = Radius of piston.

In the computations for determining the amount of the offset, three formulas are used in the order given.

$$H = R - P - D.$$

$$B = \tfrac{1}{2}\left(\frac{C^2}{4H} + H\right)$$

$$X = B - R + D.$$

Using the dimensions given in the figure, the computations for the value of X are as follows:

$$D = \frac{4.2465 - 4.2125}{2} = 0.017 \text{ in.}$$

$$P = R \sin 45 \text{ deg.} = 2.1232 \times 0.7071 = 1.5014 \text{ in.}$$

$$H = 2.1232 - 1.5014 - 0.017 = 0.6048 \text{ in.}$$

$$C = 2P = 2 \times 1.5014 = 3.0028 \text{ in.}$$

$$B = \tfrac{1}{2}\left(\frac{3.0028^2}{4 \times 0.6048} + 0.6048\right) = 2.166 \text{ in.}$$

$$X = 2.166 - 2.1232 + 0.017 = 0.0598 \text{ in. offset.}$$

An Affixing Bolt for Bridge and Ship Workers

By J. P. Towlson
London, England

On metal construction work, such as bridges, pontoons, and especially in iron ship-building, there is frequent need for a simple and reliable device for the temporary, though secure, holding of various fixtures, such as the standard for a ratchet or electric drill.

Of course a bolt may be put through any convenient hole and the fixture held by a nut on the outside, but this procedure requires the services of two men and may often involve considerable delay, for, if the part to which the fixture is to be secured be the deck or side of a ship, one man may have to go quite a distance and be obliged to climb into awkward or inaccessible positions in order to reach the other side of the plate.

The sketch, Fig. 1, shows an expanding head bolt that may be pushed through any plain hole and firmly fixed by the simple expedient of pushing in a pin. A hole of suitable size is drilled lengthwise through the center of the bolt and the bolt is slit over part of its length into two, three or four sections, like a spring collet.

When entered into the hole in the deck-plate the parts close together sufficiently to allow the head to pass through. The expanding pin is then pushed into place from the outside and effectively prevents the sec-

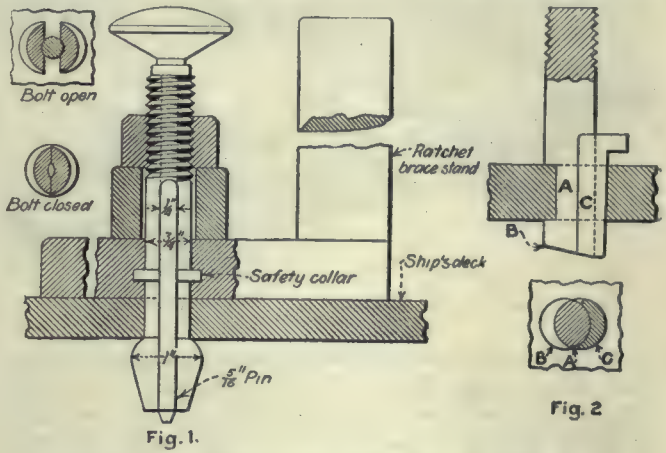


FIG. 1—AN EXPANDING HEAD BOLT. FIG. 2—A SIMPLER METHOD

tions from again closing as the pressure of the nut is applied.

Fig. 2 shows a somewhat simpler, though still effective, device for accomplishing the same purpose. A slot is cut crosswise of the body of the bolt near the end to correspond to the thickness of the deck-plate and when the bolt is entered in the hole a concaved faced key, driven into the hole beside it, forces the slot into engagement with the plate and prevents the bolt from being drawn out by the pressure of the nut.

Who Knows of This Drilling Compound?

By William Arnett

A tramp machinist once came to a shop where I was employed, and was put at work drilling holes in some pieces of spring steel, the material of which was so hard that it could not be punched. He was very successful on a job whereupon all of us had failed, and the secret of his success was in the compound that he used on the drill.

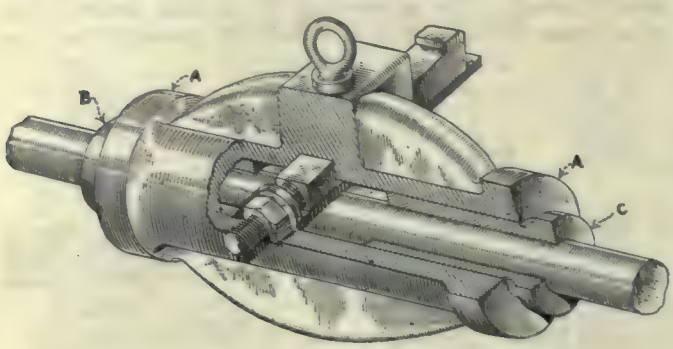
He was very reticent as to the nature of his compound and no one could find out of what it was composed until, one day, he came to work in a somewhat intoxicated condition and some of the boys prevailed upon him to give the secret away. The formula is as follows:

Dissolve a quarter's worth of camphor gum in a half-pint of alcohol and add one half-pint of lard oil. With this compound on a file you can file window-glass. With a drill ground to the proper angle, and using this compound, plate glass can be drilled without breaking. It is the best thing I know of for drilling anything of a hard nature. Try it out before condemning it.

Straightening Bent Shafting in a Lathe—Discussion

By J. T. Towlson
London, England

The letter under the above title by Frank C. Hudson, on page 920, Vol. 58, of the *American Machinist*, touches a subject upon which there is need for enlightenment, for the average workman is much too likely to resort to the reprehensible practice of using the centers of a lathe as the point of resistance—with the result



DEVICE FOR STRAIGHTENING SHAFTS

that the good accomplished by the operation is often more than counterbalanced by the damage done to the lathe. I have always barred this practice whenever possible, and have made use of it only upon old lathes that were about ready for the scrap heap anyway.

I had occasion to straighten a good many shafts during the war. They were of chrome-vanadium steel, 2 in. in diameter by 10 ft. long, and were required to clean up to 1⅛ in. Many of these bars were sprung as much as ⅜ in., some of them having short bends. Time was a most important factor, and it was necessary not only to straighten the bars but to do it quickly and accurately.

The device I used for the straightening is shown in the accompanying sketch, and embodies practically the same principles as those set forth in Mr. Hudson's article. The body of the device was smoothly bored to 3 in. in diameter and the ends at *A* turned true. Sleeves *B* and *C* were turned to fit closely in the bore of the body and were bored to a free fit upon the bars.

The device was suspended from the hook of a light crane over the lathe. A bar would be passed through it and the loose sleeves passed onto the bar, when one end of the latter would be caught in the jaws of a universal chuck and the other allowed to lie in an open steadyrest.

Finding the worst bend in the bar, the body of the device would be centered upon it, the loose sleeves pushed in, and pressure applied by means of the wedge, which was drawn in by a 1-in. Whitworth-thread nut. The inner ends of the sleeves could be separated to any desired distance up to 10 in. as the bend was long or short, and the bending pressure applied without imparting any strain to the lathe.

After each application of pressure the lathe would be started and the device, now cast loose from the crane hook, allowed to rotate with the bar. The truly turned ends of the body thus served to show the condition of the bar with regard to straightness; if they ran true, the bar was "good enough."

The lathe was by no means an essential factor, as the device could be held at any convenient place and height by the crane while the straightening pressure was brought to bear upon the bends. The lathe was merely a convenience to determine where the bar ran out and when it was straight.

A Drill Jig for Clevis Pins

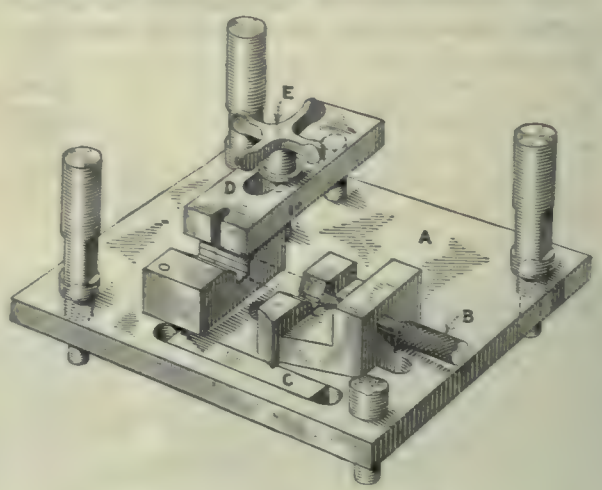
By A. Towler

An adjustable jig for drilling the cross hole in clevis pins of various diameters and lengths is shown in the accompanying sketch. It has the advantage of covering a wide range of sizes with a few and simple adjustments.

The base of the jig is a rectangular plate *A* of machine steel, ⅜ in. thick, 4½ in. wide and 6 in. long. It is machined all over and is provided with posts, or "feet" at the four corners, upon which the jig may stand, either side up, with all projecting parts clear of the drilling machine table. The ends of the feet are finished by grinding after they are assembled into the jig, to insure that the base shall stand parallel with the table in either position.

A pair of V-blocks serves to locate the work. One of the blocks is securely doweled to the base and the other, accurately in line with the first, is provided with a tongue upon the back that is fitted to slide in a shallow square-sectioned groove in the base, so that it may be moved to or from the fixed block without disturbing its alignment. It may be clamped in any position within its range by means of a single screw passing through an elongated slot in the plate.

The sliding block is made with a raised ledge at one



DRILL JIG FOR CLEVIS PINS

end, through which passes the knurled-head clamping screw *B*, to assist in locating and holding the work. A pointer, which is also a part of this block, extends over the graduated scale *C* on the base, and indicates directly the distance from the shoulder of the clevis pin that the cross hole is to be drilled.

A hole bored through the base plate and through the fixed block intersects the centerline of the V-groove and accommodates interchangeable bushings for the various sizes of drills. The drill bushing and the position of the sliding block are the only matters requiring attention when changing sizes of work.

The work to be drilled is held in the V-groove by a clamp *D*, which is tightened by means of the hand nut *E*. This clamp bears upon the work directly over

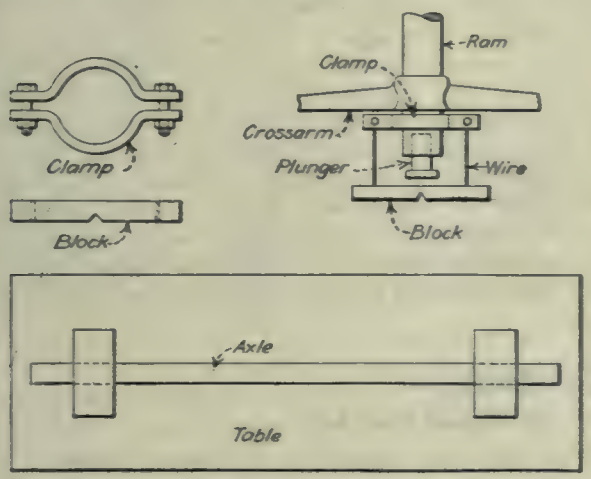
the drill bushing and thus sustains the drilling pressure.

With the sliding block adjusted to the proper position to accommodate the length of the work, as indicated by the pointer on the scale, and a bushing for the correct size of drill in place, a clevis pin is laid in the groove, the clamping screw *B* turned forward until the shoulder of the pin bears against the end of the sliding block, and the holding clamp is adjusted. The jig is then inverted and is ready for the drilling.

Saving Time on a Straightening Press

By Jas. A. Rodgers

We use a Lucas power press for straightening axles and similar work, and it was customary for the operator to use a bar of 1¼-in. sq. steel, about 1 ft. long, with a V-notch for holding it in place on the upper side of the axle. By the old method it was necessary to pick



ATTACHING STRAIGHTENING BLOCK TO THE RAM

this bar up and place it on the axle every time the ram was brought down.

In order to save both time and labor, we fastened the block to the ram by means of a clamp and suitable wires, so as to form a flexible connection.

This arrangement allows the block to adjust itself on the work, and saves the operator from lifting the bar and placing it is position at every stroke of the press. The accompanying illustration shows how this was done.

Repairing a Planer Bed

By Chester H. Franklin

Some time ago the Yoder Manufacturing Co. of Cleveland, Ohio, had a rather disastrous fire which, among other damage, cracked the bed of one of its largest planers in several places near the ends. Planers were not plentiful and time was limited so it was decided to repair the cracks with an oxy-acetylene torch. The illustration shows how one of these welds looked after completion.

The combination of the heat of the fire and of the torch, together with the sagging of the floors, left the planer decidedly out of line so that it became necessary to replane the V's before it could be used.

In order to do this the ram of a shaper was bolted to the planer table so that the tool head would project



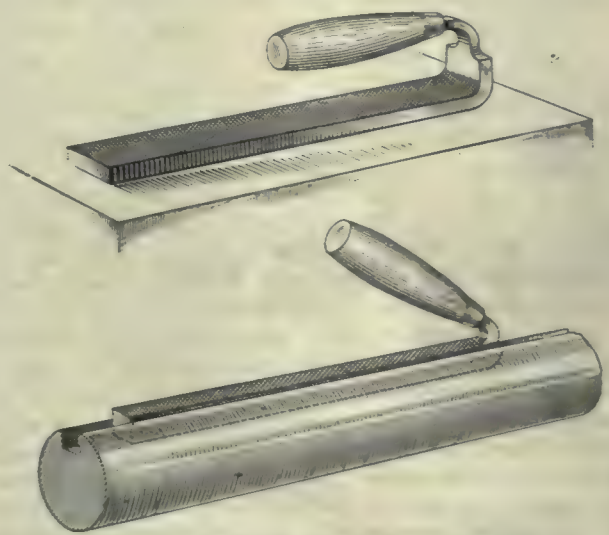
WELDING A CRACKED PLANER BED

a sufficient distance to plane off the high spots while the table was still running on that portion of the bed which was not distorted. In this way the V's were trued up and the planer again put into commission.

Inverted-Handle File for Special Work

By G. A. Luers

When filing broad flat surfaces or in slots or places below the surface of adjacent parts of a casting or forging, the usual handle of the file cannot be used. Special file holding devices and offset handles have been devised for the work under these conditions and are used to a large extent. An unusual but nevertheless serviceable and simple method of fitting a file for use under such conditions is shown in the attached sketch.



SIMPLE SURFACE FILE HANDLE

With this method the handle is in an elevated position, which makes possible the use of greater effort and the attainment of a considerable degree of accuracy.

The file is fitted for this use by annealing the metal adjacent to the tang and bending it, while heated, to the shape shown. The amount of bend and the position of the handle is made to suit conditions. In filing key slots or feathered keyways, a square file, bent accordingly, makes a very simple and convenient tool. The handle in the inverted or inclined position presents a convenient grip for the workman, while the work required to place the handle in this position is about as simple as could be desired.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors
November 8, 1923

The Automobile Industry and American Business

THE AVERAGE citizen of the United States has become so inured to the faculty of the automobile industry for breaking records of all kinds that he rather takes its big accomplishments for granted. Any information that leads to speculation on the size of the incomes of the Ford family is usually given first page space by the newspapers but facts of far more significance are passed over as relatively unimportant.

To the man who sells things to the automobile manufacturers the facts we have just mentioned have a deeper meaning. The statement that the industry is the biggest, or second biggest, consumer of hardwood lumber, of upholstery materials, of plate glass, gets right home to his pocketbook and interests him deeply.

In the first article, published last week, of our series, "What About Automobile Shops?" some figures on the mortality among the automobile manufacturers were included that looked rather gloomy if not carefully analyzed. We said at the beginning of the article that the failures probably had little effect on the productive capacity of the industry as a whole. Figures that have come into our hands since that article was published show just how small the effect was even in such a disastrous year as 1921. They indicate that probably not over four per cent of the total productive capacity as measured by dollar volume of sales was eliminated by the failure of manufacturers.

No wonder the industry occupies its present high position. That it is high, there can be no question. That it will remain so depends on the continued and well directed effort of the men responsible for production and distribution of its product.

Although distribution is somewhat out of our field we are convinced that great savings can be made in present-day distribution costs. When it comes to production, however, we believe that we can be of assistance. It is with this purpose in mind that the present series was undertaken. We expected to find progressive methods in use and we did find them. At the same time we also found some chances for improvements and they form the basis for the articles that are offered in the hope that they will be useful to the automobile production organizations.

Why Is A Stove Bolt?

AMONG the survivals of the dark ages in machine products the stove bolt stands out as a shining example. Originating in the days when bolts and screws were haphazard products, it had a square thread and a nut which only the mysteries of Providence prevented from dropping off. As an example of how loose a nut would stay on a bolt, it took the prize.

Then came the thread with sloping sides, on the order of what afterwards became known as the Acme thread, but the angle used varies through wide limits. The size of the head also varies as well, depending largely on whether the maker uses one or two blows in upsetting it. Eastern makers use the large head while those in the middle western districts stick to the small.

The uses of the stove bolt are, however, not confined to the making of stoves. The automobile industry among others uses far more than the stove makers. The National Screw Thread Commission has been carefully studying the problem for some time and it is coming to be the feeling among some of the members, that the stove bolt could be replaced by standard A. S. M. E. machine screws to the advantage of all concerned. They feel that the necessity for the stove bolt has disappeared and that the sooner it is discarded the better. Hence they are asking, "Why is a stove bolt?"

As eastern and western manufacturers of stove bolts are now agreed that the angle of thread should be 60 deg. as on other threaded work, the only differences now outstanding are on diameters and pitches, and these are insignificant. It is to be hoped, therefore, that when final specifications for thread and head dimensions of "National" or "American" machine screws are adopted by the Commission and the Sectional Committee they will be made to apply to all small metal fastening screws with nuts. whether used on stoves, automobiles, or elsewhere.

Coal Storage— A Major Problem

IT IS with the expectation of having available complete and unbiased data that we contemplate the study of the storage of coal by the Federated American Engineering Societies, whose final report will be ready about the first of the year. As was true in the investigation of waste in industry, made by the F.A.E.S., study of the coal storage problem is a gigantic task. More than 500 engineers are actively engaged in the work. Separate investigations to meet peculiar local conditions in various cities and districts are being made.

Mining operations are intermittent, causing heavy financial risk and a continuous aggravated labor problem to the operators, uncertain annual income and dissatisfaction to labor, high prices to the public, and inordinate burdens upon the railroads. The Engineering Coal Storage Committee, it was stated, "is of the opinion that a larger practice of the storage of coal would in a very significant measure reduce the degree of intermittent operations of the coal industry and therefore relieve the public of much of the evil that now prevails."

To set to work 500 engineers upon a problem of national importance is an accomplishment possible only to a society representing many engineering societies. It was with just such problems in mind that the organizers of the F.A.E.S. visioned the united societies, and the results from concentrated engineering effort are justifying the existence of the organization.

Standardizing Oil Well Casings

AMONG the projects of the National Screw Thread Commission is that of standardizing the threads of oil well casings. And though oil wells are confined to comparatively few sections of the country, it is difficult to find a more important piece of work, or one in which standardization is more urgently necessary. For whether we realize it or not, we are becoming more and more dependent on oil for all our activities. It is also very important from the point of view of national defense, for all branches of the service.

Some idea of the need for standardization may be had from the statement of one concern. This oil company has wells in three different fields and no two of them use well casing which will interchange. Each field seems to be a law unto itself, the kind and size of pipe and type of thread joint, apparently depending on the previous experience and personal inclination of the foreman in charge.

The cost of this lack of standardization can only be fully appreciated by those who have visited and studied the oil fields and become familiar with the cost of delays due to well casing fittings not going together as they should. Work of this kind is usually done under adverse conditions and when we are dealing with pipe lines which extend down into the earth from two to five thousand feet, the importance of having couplings fit can be readily appreciated.

A committee of the Mid Continent Oil and Gas Association is working on the problem of standardizing casing sizes and threaded joints and at the recommendation of the Thread Commission a beginning has already been made by the elimination of one of the tapers. Pipe tapers of $\frac{3}{16}$, $\frac{3}{8}$ and $\frac{3}{4}$ in. per ft. were formerly used but the $\frac{3}{16}$-in. taper has been abandoned. Furthermore there is to be a positive size at which the taper and number of threads per inch changes, instead of having different makers follow their own inclination as to the point at which the taper changes occur.

There can be no question as to the desirability of having oil well casing fittings interchange, in the same way as steam fittings. The demand for this standardization must come from the users of oil well casings. The sooner they realize the saving to be effected and co-operate with the National Screw Thread Commission in their endeavors, the sooner can standardization be brought about. The secretary of the Commission, H. W. Bearce, will be glad to give any further information desired and can be reached at the Bureau of Stand ards, Washington, D. C.

Prices of Machine Tools

MANY users of machine tools are still laboring under the delusion that prices are too high and that if they delay ordering they may again buy at about pre-war prices. A little consideration of all the costs that enter into the construction of machine tools, when compared with other products, will soon show the fallacy of hoping for pre-war prices. We have become accustomed to paying from twice to three times as much for many such necessities as shoes, clothes, coal and house rent as in 1914. We now consider seven or eight dollars as cheap for a pair of shoes that we formerly bought for four. And yet we kick because machine tools have not gone back to pre-war levels.

As a matter of fact the prices were never high enough except in a few instances. For it must be remembered that few machine tools can be built on a large scale production as with automobiles, washing machines and many other products. Being a basic industry on which all other manufacturing depends for its existence, tools must be constantly improved so as to turn out more and more work with less and less labor. New models are constantly demanded and standardization, except as to details, is out of the question.

The great trouble is that purchasers of machine tools became accustomed to getting altogether too much machine tool value for a dollar in pre-war days. Machine tools largely grew out of one-man shops, where the proprietor had formerly worked at the lathe and bench. He was content with day wages or a little better, not always realizing that overhead, interest and the cost of development had to be paid for by the customer.

For this reason the income of machine tool shops was not high enough to warrant paying good wages and the machine tool shops saw their best men go to the bicycle shops and then to the automobile industry, without being able to offer sufficient wages to keep them.

The machine tool industry needs the best mechanics in the country. It is to the interest of all other industries that it have them. But in order to get and to hold them, it must be able to pay as high or higher wages as other machine building shops. More than this, it must be able to attract young men who are now going into the building trades because of the money to be made in them.

If we are to have better machine tools, the shops building them must be able to get good men. To do this they must charge enough for their machines to be able to pay at least the prevailing rate of wages at all times. And buyers of machine tools should get over the delusion that prices must be lower before placing orders. For unless the machine tool industry can be maintained at its proper level, all manufacturing suffers.

The Fallacy of Imbedded Abrasive

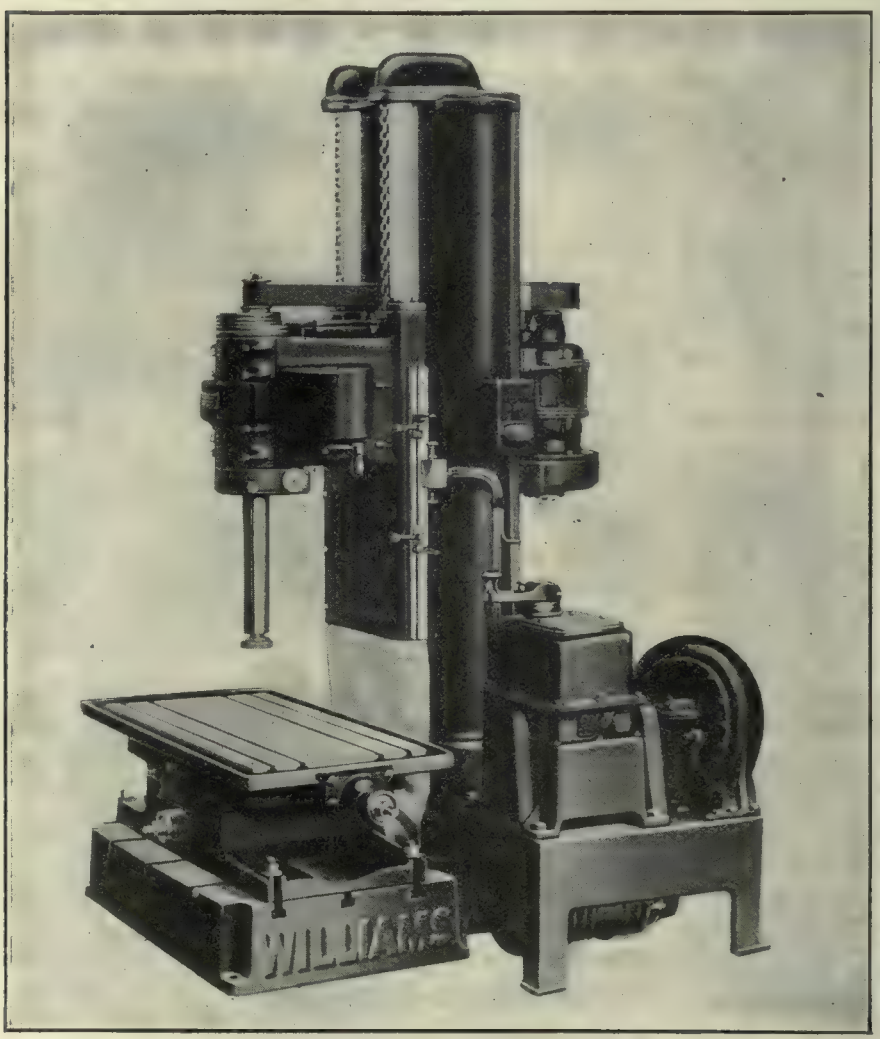
OCCASIONALLY, at ever greater intervals to be sure, someone offers as an objection to finishing cylinders by grinding, the argument that particles of abrasive become imbedded in the walls with later destructive results. The theory seems plausible and many people still give it credence.

There is a very simple way to check up on the action of the abrasive and that is to grind some cylinders and then examine them. A manufacturer of abrasive wheels and grinding machines has recently done just that, and the results brand the imbedding idea as a fallacy. A brief report of the tests is given on page 689 of this issue.

Shop Equipment News

Williams Vertical Cylinder Grinder

A vertical cylinder grinder which embodies several interesting arrangements for drive and control has recently been brought out by the Hi-Way Service Co., South Bend, Ind. The feed of the grinding head is accomplished by an Oilgear pump driven by a separate motor and mounted on a stand at the side of the column.



WILLIAMS VERTICAL CYLINDER GRINDER

The twin design column is cast in one piece with connecting sections at top and bottom, leaving an opening through which the motor arm projects from the grinding head. The ways on which the head travels are cast integral with the column, machined accurately and scraped.

The head is also a unit casting and contains all working parts. A 2-hp. vertical type motor running at 3,400 r.p.m. is mounted on an arm which projects through the column from the head. This motor is belted to the grinding spindle which rotates at a speed of 7,000 r.p.m. It is stated that this arrangement of the driving motor counterbalances the grinding head and tends to eliminate friction and wear in the ways.

The spindle is mounted in ball bearings and has an adjustable tapered bronze bearing at the lower end. A flexible idler is furnished to keep the 2½-in. belt at the proper tension, and speed changes are accomplished by changing pulleys on spindle and motor. The regular spindle is adapted to grind holes 2¾ in. in diam. and larger.

The arbor, in which the spindle is mounted, is made up of two eccentrics, by which the adjustment of the spindle center for planetary action is accomplished. The arbor is driven by an independent motor through a worm gear. The capacity of this horizontal type motor is ½ hp., and it has 2 speeds, 1,720 and 1,120 r.p.m. The starting, stopping, and speed changes are controlled by a drum type controller on the opposite side of the head. The dialing arrangement for adjusting the eccentric is located below the head and is simple in operation.

The Oilgear feed control pump, mentioned above, is driven by a 1-hp. motor, mounted under the pump stand, and the suction fan for removing chips and dust from the work is also driven by this motor. The fan is mounted on the stand with the pump. A ram, mounted in the center of the twin column directly under and in the center of the unit grinding head, is actuated by the Oilgear pump and feeds the head up and down.

By manipulating the control handle of the pump the head is caused to feed up and down, reversing automatically at the ends of the stroke. The length of stroke is adjustable by means of suitable trips, and the range of feed is up to ⅝ in. per revolution of the eccentric arbor. The vertical travel of the head is 28 in. and the distance from the arbor center to the apron is 11 inches.

A universal table for holding the work is mounted upon the machined surface of the bed, has an in-and-out travel of 7 in., and longitudinal travel of 36 in. The table surface is 36 x 18 in. For large work the table may be removed and the part to be ground may be attached to the bed.

Counterweights are provided for the head and are attached by chains which run over sheaves at the top of the column. The floor space required is 49 x 42 in., the height of the machine being 7 ft. The weight, including universal table and motors, is approximately 5,000 pounds.

News Section

Management Convention Brings Forth Many Progressive Ideas

The country's leading executives and employment managers to the number of more than 1,000 opened the three-day sessions of the American Management Association Oct. 29 at the Hotel Astor New York City, with the avowed intention of carrying on the association's drive to take the kinks out of Big Business. The increasing part which the selection of workers in all lines of industry is playing in business was brought to the front with the opening address of welcome by President W. W. Kincaid of the association. Elimination of expensive labor turnover, or in other words the best way of getting the employee satisfied to stay on the job, was one of the principal topics before the convention. Methods of improving the general conditions of workers in industry, the field of the plant publication in their daily lives, the best way to select workers, and kindred topics engrossed the delegates in simultaneous sessions carried on in three of the ballrooms and parlors of the Astor.

Beatty Discusses Workmen

A. J. Beatty, director of training of the American Rolling Mill Co., Middletown, Ohio, discussed the way his company aided its men in getting the vital facts about their work so they could appreciate it better, and Forrest W. Boswell, of the Buick Motor Co., told more than 50 house organ editors how the simpler facts of economics, intelligently applied at the factory, helped the men save money in the purchase of their homes and other expenditures.

Many of the larger industrial organizations of the country were represented at the sessions by groups of their executives, including the General Motors Corp., National Founders Association, the Conference Board of Physicians in Industry, the Society for the Promotion of Engineering Education, and the National Industrial Conference Board.

The second day was devoted in great part to the discussion of the problems of employers of labor. both factory and clerical, in obtaining the proper workers.

The report of the committee on trade apprenticeship, presented by L. L. Park, of the American Locomotive Co., chairman, took in the present-day tendency sway from laborious but profitable jobs toward the more cleanly but less remunerative "white-collar" positions.

"The number of apprentices in the trades has decreased in the past ten years," said Mr. Park, "and unless active steps are taken to train men for industry, the shortage will continue. Reports of the United States Census and the New York State Department of Education indicates that the number of apprenticeships in various trades has dropped materially in the past decade."

According to S. R. Rectanus, of the American Rolling Mill Co., interference from above does the workman no good and sometimes works for harm. It is well to bear in mind that the foreman is as fully an executive as the general manager, he stated.

At the banquet held Tuesday evening, John Hays Hammond was the guest of honor and the speaker of the occasion. His subject was "The Expansion of our Foreign Trade Through the Development of Backward Countries." He stressed the importance of going after business in countries like South America, Africa, Asia and Russia rather than spending our efforts in competition with Great Britain in Canada and the other British possessions.

Labor Turnover

More than nine million workers in manufacturing industries of the country change their jobs every year according to J. D. Hackett, Industrial Engineer, who rendered the report of the committee on labor turnover on Wednesday.

The association closed its convention Wednesday. One of the speakers was Elisha Lee, vice-president of the Pennsylvania R.R., who outlined a plan for closer relationship between employers and workers.

With the growing tendency in industry toward a more general recognition of the right of the worker to have a voice in determining the conditions of his employment, he said, there develops a new anxiety on the part of the executives of large operations as to the effect this more liberal regime may have upon supervision and discipline of the working forces and upon the attitude of the minor supervisory officers.

"Out of our experience," he said, "I think I can assure them that such change as has taken place or may be expected is an improvement over anything we have had in the past. New methods have been devised of handling industrial relations, much wiser than were ever before adopted, which are in consonance with the spirit of our changed viewpoints."

Fisher Body Corp. Buys Southern Plant

John Kelsey, president of the Kelsey Wheel Co., has confirmed rumors of the sale to the Fisher Body Corp., of a portion of the Kelsey interests in Memphis, Tennessee.

The wheel division will be retained by the Kelsey company. The property sold consists of 45 acres of land, a double band saw mill with a capacity of fifty million feet of hardwood lumber per year; dry kilns, storage for approximately seventy-five million feet of lumber and the automobile body woodworking plant, built during 1919; this plant contains over 150,000 square feet of floor space and was so constructed that its capacity can very readily be doubled.

Mr. Kelsey stated that it was the desire of his company to limit its Southern operations to the manufacture of wheels and parts and that the acquisition of the body plant by the Fisher Body Corp. was an assurance that considerable benefit would accrue to the city of Memphis through the transaction.

Fred J. Fisher, president of the Fisher Body Corp., stated that it was imperative that the concern acquire a woodworking plant close by the lumber supply. The plant acquired from the Kelsey Wheel Co. is conceded to be the largest and most modern woodworking plant in the South and provides ample room for expansion. As soon as the necessary changes can be made to adapt the plant to the requirements of the Fisher Body Corp., Mr. Fisher stated that it would, no doubt, be continually operated at capacity. This will mean continual employment for a large number of people.

U. S. Steel Declares Extra Dividend

The United States Steel Corp., the largest industrial organization in the country, expressed its confidence in the outlook for the iron and steel industry of the country and business in general by declaring an extra dividend of one-fourth of 1 per cent on its $508,302,500 outstanding common stock. At the same time the company issued its statement of earnings for the quarter ended Sept. 30, which was much better than Wall Street had expected. The company has paid no extra dividend on the common stock since 1919.

The declaration of the extra dividend was a complete surprise to the financial district, as also was the statement of earnings, $47,053,680, which Wall Street estimated ran from $39,000,000 to $43,000,000.

Machine Tool Output in 1921

Machine tool manufacture during 1921 was at a rate less than one-fourth of the capacity of the industry. Had conditions been such as to make possible the maximum output, machine tools to the value of $291,773,840 would have been manufactured in that year. Instead, the value of products at the 348 plants engaged in such manufacture was $67,729,362, or 23.2 per cent of the possible output. The figures have just been made public by the Bureau of the Census. They were compiled as a result of recommendations by the Committee on Census Schedules created at a conference of trade associations, which met in Washington in 1921 at the instance of the National Association of Manufacturers. Nathan B. Williams was chairman of the committee.

Milwaukee Reports Business "Spotty" But of Good Volume

Business among metal-working machinery manufacturers and dealers as well has become more "spotty" in the past few weeks, yet it is a matter of considerable encouragement that the volume nevertheless is well maintained. Makers of milling machines are working at the average capacity reached earlier in the year, and while these interests find the bulk of orders coming from a relatively few large buyers, they appear satisfied at being able to hold their own as well as they are doing. The principal orders have been coming from the automobile trade, and usually where a fairly steady buyer has dropped out of the market, another comes in for one or a few items to compensate for the vacancy.

The competition offered new machinery by used equipment is strong at present, although the pressure is by no means as severe as during the period when war tools were thrown upon the market in large quantities, almost without regard to price. The plethora of used tools is largely a local matter, for there has been much liquidation of large shops, which is still going on.

Shops in the market for tools consist mainly of those that desire to replace present equipment with machinery that will do more work at less cost and with fewer hands. This trend has brought about the condition where special designs are in much better request than the standard types. The cost of special machines naturally is considerably higher than than of standard designs, yet a manufacturer desiring the more efficient and advanced designs seems to be willing to pay the extra charge. The trouble is that there are not enough buyers of this class and too few customers for standard machines as well, to keep production schedules on a fairly even level.

A heavy demand for hydro-electric generating equipment is believed to be in the foreground as the result of the continuance of water power development in Wisconsin and adjoining states, which in 1924 is expected to reach its most advanced state in years. Several projects involving from $1,000,000 to $5,000,000 have been proposed or are under consideration. Manufacturers of hydro-electric machinery who have recently experienced some decline in advance orders in some departments of their large works express the opinion that the distribution of new water power plant orders in the next eight to twelve months will more than overcome the loss.

Fair orders are reported by manufacturers of sawmill and planing mill machinery. The best demand, however, is for high-production equipment for automobile body shops. The m sic industries are heavy buyers of high quality lumber for piano and phonograph cases, and veneer mills in this territory have recently purchased new equipment to meet the increased demand for panels.

Reports from the Niagara Machine & Tool Works, which specializes in the manufacture of tinsmith equipment, furnace men's supplies and the like, indicate that business in this line is good and will continue to be so for some time to come. The season started slowly, but is steadily picking up.

The Ferguson, Allen Co., Inc., which repairs locomotives, has been buying some new equipment and may buy a few more pieces, but most of the future buying is slated. This firm, however, is always on the lookout for anything that will save man-power.

The Buffalo Forge Co. reports a good steady business, particularly in the foreign department.

Building Airplanes

The Eberhardt Steel Products Co., Inc., is just finishing the last of a contract of fifty aeroplanes for the United States government. This plant continues to have plenty of work ahead in aeroplane specialties and accessories for the government and motor accessories and equipment for some of the big motor car factories.

One of the interesting trends in the machinery inquiries detected by some of the agencies is the demand for semi-special equipment; in other words, standard equipment with special attachments or features that will reduce the necessary amount of man-power.

Railroads Active in New York Market

Several excellent lists have been sent out during the week by the railroads of the East and the New York dealers of machine tools have been greatly encouraged not only by the inquiries, but also by the sales that have been consumated in this direction. The Baltimore and Ohio R.R. recently issued a list and some small buying has already resulted it is reported. Other railroads, such as the Delaware, Lackawanna and Western and the New York Central were in the field during the past week with orders.

Speculation upon the actual total for the year in the automobile production was the topic of interest to machine tool dealers in the Metropolitan district. It seemed to be the opinion that it would fall short of the four million mark, but by a small margin. Sales to Eastern automobile builders have been steady during the past week and fairly satisfactory.

The note of optimism in the speech made by Judge Gary at the meeting of the American Iron and Steel Institute and the subsequent underscoring of this remark by the action of the United States Steel Corp. in declaring an extra dividend found warm approval among both machine tool builders and dealers. Mr. Gary's prediction of six months' prosperity seems to be reflected in the opinion of economists in all parts of the country. Those who take the stock market as their barometer will be encouraged in Jesse Livermore's prediction and the upward trend of prices in all stocks.

Used machinery found a good market last week and it was also an easier matter to obtain the desired machine tools. Exporting was rather lethargic except in isolated instances.

Many Inquiries in Buffalo Market

Without exception Buffalo representatives in the machine tool business report a greater volume of inquiries than two weeks ago but the dull market remains.

The inquiries have had a tendency to cause the optimistic attitude of the early part of the season to return. It had begun to wane considerably about a month ago. All dealers gave practically the same report as to inquiries and volume of business, the first very good and the latter rather dull.

The inquiries are taken by those who understand conditions in the Buffalo territory as being a good omen. Where there is such a great number of inquiries some business must follow. It indicates quite plainly that some buyers are planning for the future and that they may fill their needs soon.

This is working out as some of the far sighted ones predicted. In a city the size of Buffalo with general industry in excellent condition it could be but a matter of time before there would be a demand for machinery, conservative as the buyers might be.

Cranes Find Market in Pittsburg

Single items in sales of machine tools and machinery govern the market at Pittsburgh at the present time. Activity has fallen off somewhat in the past two weeks, this decrease having been felt all the more after the rush of business caused by the heavy purchases conducted by the Pennsylvania railroad three weeks ago. However, several groups of sales have been recorded, among them a 42-in. planer by the Carnegie Steel Co. for another steel corporation subsidiary, the Edgar Thomson plant at Braddock, and a motor driven band saw. Users in western Pennsylvania have also placed orders for shapers, lathes, etc., one or two tools at a time. A sale of passing interest was of used equipment, consisting of a horizontal milling and drilling machine with a 5-in. bar.

Postponed Buying

A number of prospective purchasers of material have postponed their expansion program for a while, and this delays the buying of numerous tools, among them a 7-ft. radial drill. Some prospective customers were examining tools this week, and in a number of cases tentative orders were placed, to be definitely decided in a few days. It is expected that the Westinghouse Electric & Manufacturing Co. will commence to buy on its fourth quarter list very soon, but nothing definite has been learned as to the intentions of the American Sheet & Tin Plate Co. on its inquiry for new tools.

The crane market is loosening up somewhat and inquiries are more numerous than for several months past. Not less than a half a dozen inquiries came out during the past week, some for from

one to five cranes at a time, the largest inquiries coming from steel companies in this district. One award of a 5-ton crane was made, and several are on the verge of announcement, but details are lacking at this time. In general, the machine tool market lacks interesting features such as have appeared in the past few months, but dealers are encouraged by the number of inquiries coming out in the different grades.

Business Improves in Chicago

The machine tool market in the Chicago district has improved during the week. Several dealers report sales during October as being approximately ten per cent in excess of sales during September. Dealers report a number of small sales from the floor. A dozen sand slingers were sold to the Wilson Foundry Co., Pontiac, Mich. The Lehigh Valley R.R. is inquiring for seven machine tools, and the Norfolk-Southern R.R. is in the market for one motor-driven grinding machine, a 24-in. lathe, a 6-ft. radial drill, two steam hammers of 800-lb. and 1,100-lb. capacity, a tool room lathe and a side head boring mill.

The used machinery market continues fairly active.

Inquiries Plentiful

Inquiries for new machinery would indicate a better buying movement soon. Dealers are wondering whether the long deferred Burlington R.R. list will be closed this year. Several of the Western railroads are making inquiries for machine tools, but will probably not make any purchases until next year.

Metal manufacturing plants in the Chicago district are slowing up their operations. It is reported that several prospective purchasers of machine tools have deferred their proposed extension plans and have indefinitely postponed the buying of additional equipment.

Production of steel is declining in this district, and further curtailment will be the rule during the remainder of the year unless the carriers come into the market for heavy tonnages as is expected in many quarters. The semi-finished steel market is weak, but in some quarters a better demand is noted. Sheet bars especially are in small demand.

New England Trade Is Steady

In Hartford and vicinity there is no cessation of production and business in the industry is moving along at an even pace far ahead of that of a year ago.

In Bridgeport a chain company reports a rising demand for its products and the most gratifying indication is the tendency of jobbers to buy heavily for stock. Chain production for building material is heavier than usual to meet immediate demands and forecasts point to another great year in building activities. At this time manufacturers of agricultural chain have orders in hand to keep plants operating for four months without any more new orders. The requirements are excessive. A bigger production is to be sought shortly in silent chains for automotive equipment and this is aimed at through the further application of principle of the front wheel drive for commercial trucks. Production in this line so far in 1923 is far ahead of that of a year ago.

The trade for automatic machines of the labor saving nature is brisk, according to the reports from Hartford, New Britain, New Haven and Bridgeport. Although there is some stagnation in orders for old standard lines the better business in the group machinery types more than offsets the temporary quiet in the other line.

Steel manufacturers of this district report a good demand for steel and one of the big producers of cold rolled strip steel stated that indications are "better than favorable."

Nearly all manufacturers report 1923 business is now ahead of 1922's for twelve month, so with two months to go and a favorable tone indicated the prospects are propitious.

Canada Continues to Show Improvement In All Industries

The general industrial and commercial situation throughout Canada continues to show signs of steady and gradual improvement, the advancement being mostly along lines favorable to the machine tool industry. Metal working plants are increasing their output, which has been carefully curtailed to prevent over-production, and buying is on a broader scale. Dealers report that the iron and steel market is now somewhat more settled and better business is expected in the very near future. The Hamilton plant of the Steel Co. of Canada is working at close to capacity and continued activity is reported from the British Empire Steel Corp. at Sydney.

T. A. Hollinrake, president of the A. R. Williams Machinery Co. recently stated that competition was very keen but nevertheless, the last two or three weeks had seen an improvement in machinery sales.

Winter lumbering operations are likely to be much more extensive than last year. Japan has requested British Columbia lumbermen to bid on thirty million feet of lumber for Spring delivery. The September statement of the Canadian National Railways shows net earnings in that month to have been $1,845.970, an increase of $152,-557 over the same month last year. The country's total trade for the twelve months ending September shows an increase in imports of $170,000,000, and in exports of $204,000,000. During the twelve months Canada brought from the United States $614,000,000 worth of goods compared with purchases valued at $154,000,000 from Great Britain. The net increase in purchases from the United States during the twelve months was $122,000,000.

United States firms continue to acquire branch works in Canada. Motor car manufacturers have, as a group, probably established stronger branch factory connections in Canada than any other class of manufacturers. The tendency is toward the manufacture in Canada of a greater number of parts entering a motor car. A larger number of new factories are being established in Quebec province than during any period since the beginning of the great war. The majority are branch works of United States firms.

The annual report of the National Steel Car Co. shows that a deficit of $79,000 in 1922 was turned into a profit of $142,000 this year. During the year some $20,000 was spent in betterments to plant equipment. Orders on hand will keep the plant running until the end of November, when it is hoped further railways orders will be placed.

One of the most important recent developments in the industrial field has been the purchase by the Canadian Vickers, Ltd., of the stock, plant and business of the Phoenix Bridge & Iron Works, Ltd.

Elecrical Machinery Output in 1921

The manufacture of electrical machinery, apparatus and supplies during 1921 was at a rate only slightly more than one-half of the capacity of the industry. Had conditions been such as to make possible the maximum output, electrical machinery and apparatus to the value of $1,469,378,706 would have been manufactured in that year.

Future Bright for Detroit Trade

Brisk competition among the automotive plants in an endeavor to outrace one another in the contest for quantity production and an intangible feeling of optimism for the coming months indicates a continuation of the present industrial prosperity in Detroit and vicinity.

New quantity records are being established in some of the leading automobile factories of the city, and all weekly, monthly and seasonable marks are being rapidly superseded by manufacturers who are convinced that the best way to get their share of the market is to get on the ground first.

Leaders in the machine tool industry are not at all skeptical of the temporary lull during the past week in the placing of sizeable orders for new machinery and tools.

October, advance reports lead one to believe, was one of the most prosperous periods in Detroit's commercial and industrial life.

Building permits, new construction, addition to plants and warehouses and announcements of new undertakings give evidence of an underlying belief that Detroit will not meet a business slump.

As a token of the future, leaders point to the steady, slight rise in employment figures for the past several weeks. Figures announced by the Employers' Association show that for the week ending Oct. 30, 214,555 were employed. This is an increase of 277 over the figures of the previous week.

Railroad Lists Out in St. Louis

The railroads in the St. Louis district continue to buy as they have during the past several months, for pressing needs only, but some of them have put out inquiries relative to the prices of machine tools to be included in their budgets for 1924. These inquiries which began about three weeks ago have become heavier during the past two weeks.

The oil fields of the Southwest continue idle with the looked for re-opening deferred now until after the first of the new year.

However, the general business condition of this territory is very favorable. Railroads report an increase in car loadings for the first week of October in excess of the same period in September, the cotton and tobacco fields of the South are marketing their products at good prices and few price reductions in any line have been noticed. The demand for skilled mechanics has fallen off somewhat and in some grades a small surplus has resulted.

Collections show a slight improvement over September.

New projects of public utilities which are contemplated should provide the means for the sale of machine tools. One of these improvements is the construction of the new city waterworks at Howard's Bend on the Missouri River for which an ordinance appropriating $1,250,000 for construction of engine pits and intake towers was recently introduced into the Board of Alderman.

Members of the machine tool trade feel that there will be a more active demand for their products after the first of the New Year.

New York University Has Aviation School

After an exhaustive study of the field of aviation in the United States, New York University has inaugurated courses in aeronautical engineering and industrial aviation in its College of Engineering in New York City. The establishment of these courses is part of a plan to advance the study among the American youths of the designing and utilization of commercial airplanes and to develop among college students a body of highly skilled aeronautical engineers. Many men well known in the field of flying are patrons of the college and it has received the hearty approval of President Coolidge and members of the present cabinet.

Packard Has Good Year Report Shows

The Packard Motor Car Co. reports gross sales of $55,670,464 for the year ended Aug. 31, 1923, which with the exception of the boom year were the largest reported in the history of the company. Prices for motor cars in 1920 were higher than at present, so that the sales reported for the last fiscal year resulted from a record in the number of cars sold, which was 21,571. In the previous fiscal year the company reported gross sales of $37,988,498.

After payment of all operating expenses, interest and taxes, and the setting aside of a reserve of $2,000,000 for contingencies, the company reported net profits of $7,081,878 available for both classes of stock, against $2,115,828 in the previous year. After allowing for dividends on the preferred stock, the profits for the last fiscal year were equal to $2.54 a share on the 2,377,020 shares of common stock of $10 a share par value outstanding, against 90 cents a share earned on the 1,188,510 shares of common stock in the previous year.

Ready Sale for Ships That Are Scrapped

There is lively bidding for the naval vessels that are being scrapped in accordance with the treaty limiting armament. Among the ships that are to be cut up and sold as scrap are a number on which work was suspended prior to their completion.

The Navy Department has conducted a careful study to determine the best disposition which could be made of these ships. It has demonstrated to the satisfaction of a considerable number of contractors that it is easily possible to make profitable disposition of ship scrap. In fact a new industry has been created which is having the effect of enhancing the value of ships that are no longer serviceable. The fact that it has been demonstrated as being feasible to make profitable disposition of old ships is expected to influence the earlier retiring of ships from service.

The Shipping Board is much interested in the successful outcome of scrapping operations on naval vessels. Apparently it offers a much higher rate of return for some of its ships than could be obtained by the sale of vessels of questionable sea-worthiness for transportation purposes.

The extensive employment of steel-cutting processes also is resulting in various refinements of that art, it is declared.

Bids were received from seventeen firms last week for six of the vessels which the Navy is offering for sale.

Will Gather Data for A. S. M. E. Meeting

The Materials Handling Division of the A. S. M. E. held a meeting at the Engineering Societies Building, New York, on Nov. 2, in which plans for the further activities of the division were formulated. The economic features of the use of modern material handling equipment received attention, especially in connection with the formulas recently brought out by the division as a measure of the economies effected through the use of equipment under various conditions.

As a method for gathering data regarding the practical use of the formulas, it is planned to hold a session of the manufacturers of such equipment at the annual meeting of the A. S. M. E., at which these matters will be presented. Other methods for obtaining engineering data on the economies of material handling equipment from installations already made were also discussed.

Entire World Improved, Says Hoover

The commercial strength of the entire world, with the exception of Central Europe, has improved during the last year, Secretary Hoover declared recently at a meeting with the Foreign Commerce Department Committee of the United States Chamber of Commerce. Only two dark spots, said Mr. Hoover, loom up at all in an otherwise extremely encouraging situation. These are:

The American agricultural situation, in the disparity of prices of many agricultural products with those of other industries, more particularly in that the difficulties of the wheat farmers in certain portions of the West are considered acute.

The situation in Germany at the present time in its economic effects both on the German people and on the rest of the world. This situation contributes somewhat to the depression in American agriculture, more particularly in relationship to animal products.

General Stability

Secretary Hoover emphasized the strong industrial situation in the United States in the presence of the high rate of production, no serious unemployment, the absence of speculation and of large stocks of goods—all contributing to general stability. He pointed out that the commercial situation of the rest of the world except in Central Europe, had improved steadily during the year; that this increasing strength showed itself in increasing proportion of American exports to other quarters of Europe. At the present time 80 per cent of American exported manufactures go to other parts of the world; therefore the manufacturing industry does not feel the repercussions of Europe to the degree felt by the agricultural industry which is dependent upon Europe as the market for 75 per cent of the total of its products.

This committee, which serves as an advisory committee to the Department of Commerce, discussed a variety of foreign trade issues with Dr. Julius Klein, Director of the Bureau of Foreign and Domestic Commerce, and other officials of the Department. The committee also considered communications on the foreign trade situation from various organizations in the export and import trade throughout the United States, and also from the American chambers of commerce in the principal trade centers in various parts of the world.

Extension Evening School at Carnegie Tech

Another development in the educational service of Carnegie Institute of Technology in Pittsburgh will be evolved this year in Tarentum, Pa., where extension evening classes will be conducted for the first time in the Institute's history. The extension evening classes in Tarentum, although an innovation says an announcement, are the first of similar developments that will be worked out in other locations in the Pittsburgh district, wherever there is a definite demand for the extension work.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THIS is written on a trip through the South and Middle West. Thus far I have visited Charlotte, N. C., Macon and Columbus, Ga., and Opelika and Montgomery, Ala. In each place many men of affairs have been interviewed. With but few exceptions they are all optimistic, but until Wednesday, when the New York stock market turned upward their optimism was querulous and qualified by an admission that they could not understand the weakness of stocks.

The doubt created by the recent droopiness of quotations on the Stock Exchange is mentioned because it is a psychological influence so important that it cannot be ignored. In the South there is but little marginal speculation in stocks or bonds; the quotations are nevertheless widely published and carefully scanned, especially by the bankers and more important business men whose views shape public opinion. Until Wednesday they feared that the persistent weakness of the stock market portended some unseen trouble, but the action of the United States Steel Corp. in raising its quarterly dividend on the common stock to 1¼ per cent has dissipated the apprehension felt, and here as elsewhere the result has been distinctly tonic.

Therefore there is nothing in sight to impair what is probably the soundest prosperity the cotton states have ever enjoyed, for while the cotton crop is very short the sum received for it promises to be the largest on record. The Government report on Friday estimated the yield at 10,248,000 bales. The estimate did not subtract a bale from the actual yield, but it caused an immediate advance of more than a cent a pound.

When to the sum received for their cotton there is added what the farmers have obtained for the other things they have learned to produce the total will probably exceed all precedents in the history of Southern agriculture. There are, of course, certain districts in which the people are suffering because they planted nothing but cotton and failed to get a crop, but in most localities the deficiency in the yield of cotton has been more than offset by what has been obtained for the tobacco, fruit and livestock produced.

The great prosperity of the Southern cotton manufacturers and the money put into circulation by the construction of new plants as well as by the sale of older plants to Northern capitalists are also factors which make for a sustained prosperity unless there shall be an outburst of speculation that carries values into altitudes that are dangerous.

One thing by which the observant traveler in the South Atlantic states will be greatly impressed is the number of automobile tourists who are already on their way to Florida. For the most part they appear to be people of moderate means but with funds enough to spend a Winter of idleness in a semi-tropical climate. Many of them explain their early start by saying that they are anxious to get to Florida in time to enter their children in the public schools there. From this it is to be inferred that they do not expect to return until the late Spring. The movement, which includes many mechanics and other wage earners with their families, must number at least 100,000 persons.

"The great prosperity of the Southern cotton manufacturers and the money put into circulation by the construction of new plants as well as by the sale of older plants to Northern capitalists are also factors which make for a substantial prosperity unless there shall be an outburst of speculation that carries values into altitudes that are dangerous. One thing by which travelers in the South are impressed is the great number of automobile tourists who are already on their way to Florida."

By those who believe that a Winter of idleness for so many potential producers is economically undesirable this hegira will not be approved, but it cannot be denied that it furnishes impressive evidence of our national prosperity and the opportunity for enjoyment which high wages have brought to the working people of this country.

Many thoughtful persons are asking, however, whether reductions in wages are not among the probabilities for the future. The cut of 10 per cent announced by the copper companies and the statement of the leading "movie" producers that they will stop work until costs come down came close enough together to attract much attention. Neither of these industries is truly barometric. But demand for steel continues low and if the companies find it necessary to reduce prices they are likely to cut wages also. Nor would it be surprising if the same temptation presented itself to some of the textile mills, for wages, in terms of buying power, are the highest in our history, which cannot be said of profits.

In the possibility of wage reductions there is no cause for pessimism, for they would level inequalities rather than reduce the general buying power. By many economists reductions in certain costs and prices are regarded as essential if 1924 is to be as good a business year as 1923 has been.

Most of the major factors in the business situation are distinctly favorable. Prices of farm products were firm last week and the Department of Agriculture points out that their purchasing power, though still at a disparity compared with manufactured goods, is the highest in three years. There is no noticeable let up in the great volume of business being transacted, as indicated by railroad loadings, bank clearings and statistics of wholesale, retail and mail order trade. Our foreign trade has been growing recently. So much construction work remains to be done that business is sure to get a great impetus from it next Spring and much more building than usual will be undertaken this Winter, for the construction people are trying hard to keep busy during the entire year round.

The ease of money is the best assurance that this work will be carried on. After several months of firmness rates are going off slightly as money is being returned to the financial centers from the agricultural districts faster than industry needs it. This augurs well for the bond market and for business enterprise everywhere. As George E. Roberts of the National City Bank points out, "We have never had a serious depression in this country which began in an easy money market. It is not conceivable that a real crisis can develop without the pressure which results from an over extended credit situation."

Hopes entertained in some quarters that the conference of experts on reparations would produce great results have been dashed by Poincare's refusal to discuss the really vital aspects of the question and little can be expected of the meeting if it is held. Premier Baldwin's denial that Great Britain contemplates a policy of inflation is the most important news from abroad. The issue is not disposed of, however, and a general election is among the probabilities.

Otherwise the European situation is not improved, but our markets continue impervious to it.

Railroad Earnings Show Gain

An increase of $25,585,000 in gross operating revenues is shown in the earnings statements of the first thirty-five Class 1 railroads reporting for September, compared with the same month a year ago. Aggregate gross was $312,744,000 in September, 1923, and $287,159,000 in September, 1922. Net operating income was $51,295,000, against $27,426,000 last year and $55,986,000 for August, 1923.

Personals

DAVID FERGUSON has been appointed chief engineer of James Cunningham, Sons & Co., Rochester, N. Y., automobile manufacturers. He was formerly chief engineer with the Pierce Arrow Motor Car Co., Buffalo.

DEAN K. CHADBOURNE, manager of the department of the Far East of the Westinghouse International Co., will sail from San Francisco, Calif., the latter part of this month visiting Japan, China, the Philippine Islands, Java, Australia and New Zealand.

H. P. ORAM is the owner and manager of the New London Cylinder Grinding & Machine Co., which has opened on Mill St., New London, Conn. He was with the United Shoe Machinery Co. at Beverly, Mass., for seven years and six years were spent with the New London Ship & Engine Co., at New London. He was also with the Automotive Specialty Co., six years.

THOMAS P. BLAIR has sold the business and equipment of the Thomas P. Blair Sheet Metal Works, San Diego, Calif., to JOHN P. BERRY.

O. A. DOLES, of the Evinrude Motor Co., has been elected president of the Sales Managers' Association of Milwaukee. VAN B. HOOPER, of the Luther Grinder Mfg. Co., was chosen secretary.

ARTHUR SELL, of the Worden-Allen Co., has been elected a director of the Milwaukee Association of Purchasing Agents and delegate to the national association convention to be held in Boston.

J. C. MCQUADE is the new manager of the Buffalo office of the Blau-Knox Co., Pittsburgh.

DEAN R. WILSON has been elected president of the Anchor Drawn Steel Co., Pittsburgh, Pa. He was formerly vice-president and treasurer of the Carbon Steel Co., Pittsburgh.

ROY MUIR ELLIS has been appointed New England sales manager of the Calorizing Co., Pittsburgh. Mr. Ellis was formerly with the Brown & Sharpe Manufacturing Co., Providence and also with the Industrial Co., Boston.

EDWARD G. SMITH, newly appointed director of pig iron sales of the Belmont Iron Works, Ironton, Ohio, was for the past six years Central States representative of the Matthew-Addy Co.

PERCY E. WRIGHT, consulting mechanical engineer has been appointed assistant sales manager of the Reeves Brothers Co., Alliance, Ohio, erector of steel tanks and oil refinery equipment. He will be in charge of its Western business with headquarters in the L. C. Smith Building, Seattle, Wash.

W. W. LEWIS and P. H. SCHAFF were elected members of the board of directors of the Falcon Steel Co., Youngstown, Ohio, at the annual meeting of the stockholders recently.

W. A. LAYMAN, president of the Wagner Electric Corp., spoke before the members of the local section of the American Society of Mechanical Engineers recently.

H. C. ARMSTRONG of Sidney, New South Wales, spent several days in St. Louis recently buying machinery for a Celotex mill.

CHARLES DAY, a director of Mirrlees, Bickerton & Day, Stockport, England, manufacturers of semi-Diesel engines, has been conferring with Toronto firms regarding the marketing of his product in Canada.

H. H. COUZENS, general manager of the Toronto Transportation Commission, has returned home after a visit to England. Mr. Couzens was away six weeks.

FRANK H. SCHUBERT, district manager of the Wheeler Condenser & Engineering Co., St. Louis, Mo., and WILLIAM G. CHRISTY, secretary of the St. Louis section of the American Society of Mechanical Engineers and formerly with the St. Louis Boat & Engineering Co., have announced the organization of the Schubert-Christy Construction & Machinery Co. with offices in the Railway Exchange Building. The firm will represent manufacturers of power plant equipment.

E. P. COREY, formerly associated with the sales department of the National Tube Co., Pittsburgh, has been appointed assistant general manager of sales for the Youngstown Sheet & Tube Co., and will direct the sales of the company's tubular products. He took up his new duties on Nov. 1.

Business Items

The Wayne Forge & Machine Co., Ltd., has been incorporated with capital of $100,000 by W. S. Watson, H. G. Watson and others, to manufacture heating appliances in Toronto.

The Follen-Lorenz Tool Works of Kenosha, Wis., has been organized by James Follen, Frederick Lorenz and Henry Lorenz, and is equipping a new shop in a two-story building on Avery St. with some new machinery and a lot of used equipment purchased at the liquidation sale of the Mitchell Motors Co. of Racine, Wis., bankrupt. The new concern will manufacture tools, dies, jigs, fixtures, etc. Pending the opening of the new factory, the concern will operate in the works of the K. & F. Manufacturing Co. of Kenosha, which recently was placed in the hands of Horace G. Maddock as receiver. The Follen-Lorenz works have arranged to take over and fulfill all contracts held by the K. & F. company. James Follen was one of the original members of the K. & F. company.

The Steel Co. of Canada conducted a "Safety Week" campaign at its plant in Montreal.

The following changes have been made by the Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., in its branch offices: the Baltimore office will be in the Lexington Building with D. B. Patterson in charge; the Chicago office will be in the Peoples Gas Building with W. B. Briggs in charge, the San Francisco office will be located at 16 California St. under the supervision of W. H. Ringe, and the Birmingham office will be at 507 Woodward Building with F. R. Quigley in charge.

The Beaudry Co., Inc., Everett, Mass., is occupying its new plant on Parkway and Vine St.

Incorporation has been effected by the Damascus Crucible Steel Casting Co. of New Brighton, Pa., for the past fifteen years operated as a partnership. The company is building a new plant at Hammond, Ind., which is expected to be in operation about Dec. 1. This will be in addition to the present plant at New Brighton. Grinding machines that will be used by the Damascus company have been built at Cincinnati.

Obituary

WILLIAM F. WENDT, aged 65 years, founder and former president of the Buffalo Forge Co., Buffalo, died recently in that city. An obituary will appear in a forthcoming issue of the *American Machinist*.

MICHAEL B. RYAN, aged 60 years, died recently in Milford, Conn. Mr. Ryan was the inventor of the automatic electric chain welding machine manufactured by the Automatic Machine Co., Bridgeport, Conn. He was widely traveled, having spent many years in foreign countries.

WILLIAM P. CLARK, president of the Clark Tool Works, Inc., Belmont, N. Y., died recently in that place.

WILLIAM J. LLOYD, general superintendent of the General Electric Co., West Lynn, Mass., died suddenly in Lynn, Mass.

RUTHERFORD B. BURGHER, aged 65 years, prominent for many years in the steel industry, is dead at his home, East Liverpool, Ohio. He was founder of the Kidd Brothers Steel Co., at Alliquippa, Pa., and later came to East Liverpool where he organized the National Drawn Steel Co.

Chevrolet Has Large Factory Space

Having completed its manufacturing plants in Buffalo and Cincinnati, the Chevrolet Motor Co. has acquired for the first time, plant capacity consistent with its position as the second largest producer of automobiles in the world. The company now has 12 plants with a total floor space of 5,427,393 sq.ft., or more than 124 acres. The company employs 22,675 persons. Floor space at the main plant at Flint, Mich., has been increased to a total of 1,335,000 sq.ft. The assembly plant at St. Louis has a total floor space of 1,127,800 sq.ft. The Oakland, Calif., plant has been increased to 500,000 sq.ft. and the Tarrytown, N. Y., plant now exceeds this figure by 50 per cent. A large manufacturing plant at Janesville, Wis., formerly devoted to other business of the General Motors Corp., has been changed into a Chevrolet assembling plant. This has floor space of nearly 500,000 sq.ft. New Buffalo and Cincinnati plants will add over 500,000 sq.ft. to the total of the company's manufacturing space. Increase in production from 250 cars a day in 1921 to 2,500 a day this year has been made possible.

Conditions in Alsace and Switzerland

How the big companies in Alsace are developing and their labor problems—Switzerland having a hard time getting re-established—Railway electrification

BY OUR PARIS CORRESPONDENT

THE machine and machine tool industry of Alsace undoubtedly owes its manifest importance to the high development of the textile industry of this most industrialized of the old French provinces. By this means it has become the principal center in France for the manufacture of textile machinery.

The Société Alsacienne de Constructions Mecaniques at Mulhouse and Graffenstaden, the Société Schlumberger at Guebwiller and other plants notably at Guebwiller and Thann are equipped in a way which will enable them to meet any normal demands upon them for textile machinery, not only by the imposing industry of Alsace itself, but all France and to a very notable extent for export as well.

To cite two examples in detail:

The Société Alsacienne de Constructions Mecaniques alone, with its plants at Mulhouse, Graffenstaden and Belfort, employs 15,000 workmen with a most modern equipment. The plant at Mulhouse dates from 1826, founded by André Koechlin. Its product may be divided into these general classes: textile machinery, heavy machines and tools, electric motors, dynamos, turbines, transmission lines, and power station equipment in general. The company also manufacturers locomotives in its Graffenstaden works and at Belfort, also specializes in machinery for the chemical industries.

Large Companies

The Schlumberger company at Guebwiller dates from the time of Napoleon I, at which epoch were produced spinning machines for an affiliated industry belonging to the family. Finally the construction of such machinery for others came to be the pre-occupation of the plant and by the last quarter of the last century the output was conceived from the raw material to the finished product, a progression which has kept pace with the times since. The present output comprises most varieties of wood and metal working machinery as well as special textile machines which have come to be known by reputation throughout the world. The principal plant at Guebwiller suffered greatly from bombardment during the war, but has since been rebuilt and is in full operation.

In all some 25,000 workmen are employed in that branch of the industry devoted to textile machinery, with an annual production that reaches the value of 100,000,000 francs.

Other chief lines of output are stationary steam engines, turbines, locomotives, boilers, cranes, bridges, electrical machinery and its equipment appliances, etc. For the most part these plants are self-contained, having their own foundries. The foundry industry, as distinct in itself, is important, the chief units being located at Saverne, Mulhouse, Guebwiller, Graffenstaden, Belfort and Niederbronn.

The production of machine tools and smaller hand tools are specilized in plants at Strasbourg, Saverne, Mutzig and Molsheim. Heavy hardware is centralized at Mutzig and the stove industry is chiefly at Niederbronn, Saverne and Strasbourg. Building hardware—locks, hinges, fittings and steel safes are produced at Strasbourg and Mulhouse, while wire nets in iron, steel and brass are produced at Sélestat and Mulhouse. Cutlery is specialized at Klingental. The automobile industry flourishes at Strasbourg (Mathis) and Molsheim (Bugatti).

Obviously all this output, a decade ago of German parentage, is today accounted French. It enters France without paying duty and is naturally crowding the French manufacturer in competitive lines, also the American exporter to France where the lines cross or touch. Furthermore the bulk of this Alsacian product is just so much more added to that of France in home and export markets, accounting for a not inconsiderable portion of the 12,207,000 francs in value of machines and tools exported to the United States during the first six months of the present year. For the same period in 1922 the figures were 7,228,000 francs only. The increase in a single year is approximately 70 per cent, a fact which is significant, though it may mean much or little.

> "Alsace, like most other districts of Europe, is passing through an economic and industrial crisis. Here it is largely a problem of labor and the recruiting thereof in accord with laws in force in re-annexed Alsace. The question is one which deals with what is known as the 'infiltration of German labor.' With local manufacturing plants a certain control and supervision is possible, but perhaps not always carried out rigidly."

The Difficulties in Choosing "French" Workmen

Alsace, like most other districts of Europe, is passing through an economic and industrial crisis. Here it is largely a problem of labor and the recruiting thereof in accord with laws in force in re-annexed Alsace. The question is one which deals with what is known here as the "infiltration of German labor." With local manufacturing plants a certain control and supervision is possible, but perhaps not always carried out rigidly. In any case as nine-tenths of the population of Alsace is German-speaking this control is bound to be inadequate when it comes to recruiting additional workers in a rush season and hardly less so with respect to the usual labor turnover in big manufacturing industries. With farm and domestic workers the conditions are the same.

The sorry condition of the worker in Germany largely accounts for this and it is a laudable enough ambition on his part to want to sell his labor for francs across the border at the rate of a hundred million marks for the franc. The acute situation in Germany these last days has but aggravated the state of affairs in Alsace in the above respect and without question all along the French bank of the Rhine there is a certain amount of contraband labor continually finding employment to the supposed detriment of home labor. This at least is the French workers' view. The employers of labor do not wholly agree, above all when they are running under full head and there is a shortage of applicants for employment, for it is to be remarked that Alsacian industry has been exceedingly busy in most lines where in other districts in France there has been periodic intermittent slowing down. The Alsacian metal working industries may be taken for granted as being a very important factor in the home and foreign trade of France and the outsider should not ignore this in the working up of his foreign campaigns, above all in the electrical field.

Conditions in Switzerland

The anomaly of economic and industrial finance, to call it by that name, in Europe is the position of the Swiss franc virtually three hundred per cent of the value of the French franc and four hundred per cent of the value of the Italian lira. It is this very crisis of high valued currency which has put Switzerland in the position where its relations with its neighbors France and Italy are even more unsatisfactory than they are with the world at large. Swiss industry is at the lowest production ebb known since business statistics have been scientifically recorded, employment in many lines is at a like low level and the eight-hour law has done nothing to help the situation—indeed Switzerland, being a high-exchange country, it has worked just the other way about.

If not a country of big business Switzerland is at least a land of multifarious, highly developed industries from that of watch- and clock-making to the making of textile machinery of a peculiar excellence, besides automobiles, locomotives and electrical units and accessories, armament, refrigeration machinery and that famous specialty, files. A slowing down of trade abroad, a reduction of the buying power of the currencies of many of the low exchange countries of Europe and the still more potent competition of Germany and Czecho-Slovakia, have been steadily stagnating Swiss manufacturing industries for the past thirty months.

This by no means indicates that Switzerland is lying down on the job. When an order for textile machinery or spring knitting needles, in competi-

tion perhaps with a long delivery date from elsewhere is in sight, Swiss manufacturers are only too eager to bid and usually secure a fair share of such business. Only these last days we learn of a Swiss company of four million francs just organized to aid in the development of industries and trade at home and abroad, and almost at the same time of a power station being built in Dahlen, Latvia by Swiss engineers, and the statement that within two years time Switzerland, so far as her railways are concerned, will have become the first completely electrified country in the world, incidentally saving its present yearly expenditures abroad for coal.

Direct Electric Route

Appropos of the electrification of Swiss railways it is pertinent to mention that when this has been entirely brought about as well as the newly conceived German electrified line from Hamburg to the Swiss frontier it will mean that by way of the Saint Gothard tunnel—one end in Teutonic Switzerland and the other end in Italian Switzerland, with the co-operation of the Italian railways to Genoa, Germany will have direct electric railway communication with the Mediterranean. The fear of the French is that this combination will throw Switzerland's business to the Italian port to the detriment of Marseilles and Cette in France, which latter during the war was practically a Swiss seaport.

Recently France, the Orleans Railway in particular, one of the seven great trunk lines, has been purchasing electric locomotives in Switzerland. The Brown-Boverie Co. of Baden, Switzerland, has under construction for this company two electric locomotives of 4,000 hp. capable of speed of 130 kilometers per hour. The Brown-Boverie affiliated companies at Secheron and Soleure in Switzerland are at present working entirely on behalf of the Swiss Federal Railway on its electrification scheme.

Other Rail Improvements

The Zurich Oriental Bank is co-operating with British interests for the construction of railways in Anatolia, the reconstruction and equipment of 1,440 kilometers which were destroyed during the Greek occupation and 1,900 kilometers of new line, of which a considerable portion of the equipment will be furnished by Switzerland.

The Swiss engineering industry, after the manifest compression of the last three years, appears to be recovering somewhat as is shown from the first six months exports of engineering products in 1923, that reached 71,000,000 francs. Those branches which are suffering the most are locomotives, agricultural machinery, milling machinery and steam engines. Those on the increase are textile machines, printing machinery and machine tools.

Government statistics published at the end of 1922 showed that there were 8,054 industrial plants in operation in Switzerland, a number like unto that of 1911, but a notable decrease from those tabulated in 1918. Significantly the greatest falling off was in that devoted to metal and wood working industries, the crisis in the clock and watch making industries alone accounting for the closing down of 250 establishments.

Pamphlets Received

Commerce of the Dominican Republic. The Pan American Union, Washington, D. C. The exports and imports of this Republic are listed as to value and quantity.

Agricultural Credit Facilities under the Federal Reserve Act. Federal Reserve Board, Washington, D. C. An explanation of how the small banks may function and how farmers may receive financial help from the Federal Reserve Board.

Labor Legislation of 1922. U. S. Department of Labor, Washington, D. C. The various laws passed in the different states of the union that will affect labor.

Mayari Pig Iron. The Bethlehem Steel Co., Bethlehem, Pa. A well bound book describing Mayari pig iron which is termed "a natural nickel-chromium alloy iron for making high grade castings." This is publication No. 26.

Industrial Plants. Charles T. Main, 200 Devonshire St., Boston, Mass. Volume No. 3 contains many illustrations of industrial plants where Mr. Main and his associates have been engineers. There is a great variety of products made in the plants shown.

Year Book of the Merchants' Association of New York. The Merchants' Association of New York. Woolworth Building, New York City. This book contains 394 pages of text in which the annual reports of various committees, the aims and objects of the association, the list of members and other data, are to be found.

Fourteenth Census of the United States. Department of Commerce, Washington, D. C. The number and sex of occupied persons in the United States.

Fourteenth Census of the United States. Department of Commerce, Washington, D. C. The age of occupied persons in the United States.

Foreign Commerce Handbook. Foreign Commerce Department. Chamber of Commerce of the United States, Washington, D. C. In this handbook a large number of sources of information, especially interesting to those who are engaged in or contemplating foreign trade, are grouped under alphabetical headings. Consular, postal and legal regulations are covered, together with matters of export finance and a variety of other topics. In a few pages at the back of the book are noted some of the foreign trade topics on the program of the Foreign Commerce Department for the coming year.

Warehousing and Transportation Economies in Distribution. The Chamber of Commerce of the United States. Washington, D. C. This pamphlet is prepared by the Domestic Distribution Department and contains valuable information on the subject.

Trade Catalogs

Engines. The Fulton Iron Works Co., St. Louis, Mo. This is a large catalog in which are illustrated and described all sorts of Fulton-Diesel engines in power plants where they are used.

Molding Machines. The Adams Co., Dubuque, Iowa. Labor-saving equipment for the foundry in the line of molding machines and flask equipment is to be found illustrated and minutely described in this booklet. Specifications for various foundry equipment are also included in the text.

Oxygen. M. Keith Dunham, 110 S. Dearborn St., Chicago, Ill. "Oxygen from the Air" is the title of this well bound booklet in which are described by text and illustrations the uses of oxygen and the production process by the Oxeco method.

Welding and Cutting Equipment. The Torchweld Equipment Co., Chicago, Ill. This catalog covers the complete line of oxy-acetylene welding and cutting apparatus made by the company. It also contains cross sectional views of equipment with detailed explanations.

Portable Planers and Key-Seaters. The Morton Manufacturing Co., Muskegon Heights, Mich. This is bulletin No. 2 with general specifications of the two products and general text about both of them.

Gasoline Handling Tanks. S. F. Bowser & Co., Inc., Fort Wayne, Ind. Various receptacles and methods of dispensing oils and gasoline in plants are shown by illustrations, drawings and text. An explanatory note in the booklet states that this is the most complete catalog ever published on the subject.

Drawing, Blanking and Forming Dies. The Kinite Co., Milwaukee, Wis. Twenty-four pages of text and drawings describe fully the products of this company. Letters from satisfied users are reproduced.

Motors. The Reliance Electric & Engineering Co., Cleveland, Ohio. Type-T heavy duty reliance motors for direct current are fully described and illustrated in this Bulletin No. 2014. Tables of ratings and diagramed illustrations are also included.

Tachometers. The Bristol Co., Waterbury, Conn. The many different styles for the various uses in factories of this company's products are shown in Bulletin No. 317 that has recently been issued.

Air Hoists and Elevators. The Whiting Corp., Harvey, Ill. The uses of air hoists in most factories with tables of sizes are illustrated in this booklet. Trolleys, pulleys and other accessories for hoists and elevators are also described.

Hydraulic Riveters. The Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill. A folder showing the hydraulic riveter, a table of specifications, and some terse descriptive matter has been issued by this company.

Air Compressors. The Sullivan Machinery Co., Chicago, Ill. Bulletin No. 77-G with full details regarding the Sullivan "WA-6" air compressors and parts has been issued.

Electrocator. The Hansen Electrocator Co., 80 Boylston St., Boston, Mass. This new precision instrument is described in a six-page folder. Its many virtues are set forth by the manufacturer with diagrams and drawings illustrating the new instrument.

Data Sheets. The Lees-Bradner Co., Cleveland, Ohio. Loose-leaf data sheets covering mathematical data relating to gearing together with considerable matter explaining and describing the operation of the Lees-Bradner gear tooth grinder. Some interesting notes on helical gears are also included. Additional sheets are to be published from time to time.

Elevating Platform Truck. The Wright-Hibbard Industrial Electric Truck Co., Phelps, N. Y. A four-page folder showing the uses of the product in various factories by illustrations and descriptive matter in which is put forth the advantages of the "Wright-Hibbard" truck.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Agency for the following is wanted in Brisbane, Australia: air compressors, fans and blowers, pulleys and transmission equipment, pumps, engineering tools and woodworking machinery. The reference number is 8003.

Forthcoming Meetings

American Society of Mechanical Engineers. Annual meeting, Dec. 3 to 6, in New York City. Calvin W. Rice, 29 W. 39th St., New York City, secretary.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8. Headquarters, Grand Central Palace, New York City.

Society of Automotive Engineers. Annual meeting, Jan. 22 to 25, at the General Motors Building, Detroit, Mich. Coker F. Clarkson, 29 W. 39th St., secretary.

Foreign Trade Council. Eleventh annual convention at Boston, June 4, 5 and 6. O. K. Davis, India House, Hanover Square, New York City, secretary.

New and Enlarged Shops

Machine Tools Wanted

Ill., Chicago—Electrical Heating Appliance Co., 1721 West Adams St.—bench lathe with screw machine attachments, or screw machine, ¾ in. capacity.

Ill., Chicago—Illinois Central R.R. Co., 135 East 11th Pl., J. J. Bennett, Purch. Agt. —54 in. heavy duty motor driven lathe.

Ill., Chicago—Tinners' Machine Wks., 30 South Clinton St.—punch presses from No. 0 to No. 3.

Mich., Addison—Wiley Battery Shop, R. Wiley, Purch. Agt.—complete equipment, tools and electric press for repair shop.

Mich., Lansing—H. G. Porter, 1308 East Franklin Ave.—10 to 14 in. engine lathe.

Mo., St. Louis—R. G. Urben, Bway. and Salisbury St.—lathe, drills, gasoline pump, tank, etc., for automobile repair shop and service station.

N. Y., Binghamton—G. R. Nelson, Chenango and Eldridge Sts.—drill press, vise, tools, etc., for new garage.

N. Y., Buffalo—E. F. Neubecker, 204 Sussex St.—garage tools and equipment.

N. Y., Clayton—C. Huntington, Clayton House—tools, press, equipment and small bench tools for new garage.

N. Y., Geneva—Fisher & Payne, Carter Alley—automatic boring, tapping, milling and drilling machine tools; lathes; riveting machines, power presses, etc., for the manufacture of automobile bodies.

N. Y., Hoosick Falls — C. H. Lovejoy Chaplet Co., Inc., E. Ashworth, Mgr.—three automatic screw machines, same as Brown & Sharpe No. 00.

N. Y., Mount Vernon — Eureka Garage, 213 11th Ave., E. Herz, Purch. Agt.—tools, repair equipment, presses, etc., for proposed $60,000 garage.

N. Y., Rochester—Rochester Boiler & Tank Co., 217 North Water St., D. F. Murray, Pres.—machinery, tools and foundry equipment for expansion program.

N. Y., Utica—S. Zogby, 617 South St.—presses, tools and repair shop equipment for garage.

O., Columbus—Jewell-Bassett-Jewell Co., 246 North 4th St., W. S. Jewell, Jr., Mgr.—grinding machine and lathe, about 20 in., for service station.

O., Toledo—W. B. and J. Boice, 1730-32 Norwood Ave.—machinery, machine tools, lathe and equipment for proposed machine shop.

O., Toledo—E. O. Skelton, 4403 Willys Parkway—drill press, emery stand, tools and equipment for garage.

O., Canton—Timken Roller Bearing Co., Dulber Ave., S. W.—roller bearing machinery for proposed $250,000 factory.

Okla., Commerce—M. L. Morgan, Box 265 —lathe, emery stand, wheel and belting for machine shop and garage (used preferred).

Okla., Commerce—R. Sanders—drill press and lathe for garage (used).

Pa., Altoona—W. S. Lee, 1309 7th Ave.—equipment, tools and drill press for garage.

Tex., Cleburne — J. A. Taylor — 20 in. shaper for machine shop.

W. Va., Huntington—J. J. Weller & Sons, Robson-Prichard Bldg.—electric drill for fabricating steel; stiff leg derrick and hoist; overhead crane for drop body.

Wis., Ogema—A. Struve—automobile repair machinery, tanks and pumps for proposed garage and repair shop.

Ont., Ottawa—Ottawa Electric Ry., 248 Albert St., F. D. Burpee, Supt.—garage equipment.

Que., Quebec—Z. Beaudet, 18 Champlain St.—lathe for garage.

Que., Quebec—A. Morin, 106 St. Patrick St.—small lathe and general garage tools.

Machinery Wanted

Ala., Fairfield—Rushton Corp.—ice making machines for proposed $152,000 ice factory.

Ala., Montgomery—Southern Cabinet Co., 601 McDonough St.—lathe, planer, cutoff saw and rip saw.

Ala., Selma—Central Alabama Lumber Co.—machinery, including saws, planers, belting, etc., to replace that which was destroyed by fire.

Conn., Bridgeport—E. F. Constr. Co., 78 Wells St.—portable sawing outfit.

Del., Dover—State Highway Dept.—receiving bids until Nov. 21 for one 20 ton platform scales.

Ill., Chicago — Chicago, Indianapolis & Louisville R.R. Co., 608 South Dearborn St., J. H. Liebenthal, Purch. Agt.—one 300 cu.ft. air compressor and one 5 ft. radial drill.

Kan., Galena—B. F. Draper, 119 Main St. (cabinet maker)—electric power wood lathe, Universal saw and belt sander (used).

Kan., Galena — Galena Evening Times, Main St., A. S. McNay, Purch. Agt.—Miller saw and trimmer; Miller feeder and job press (used).

Kan., Leavenworth—The Times, 4th and Shawnee Sts.—16, 20 or 24 page Duplex, Hoe, Simplex or Goss newspaper press.

Ky., Louisville—Hellmueller Baking Co., 434 Baxter Ave.—equipment for proposed $70,000 bakery.

Md., Ocean City—T. D. Mason—mechanical equipment for steam laundry.

Mass., East Brookfield—Daniels Mfg. Co. —narrow horizontal cloth dryer machine that will dry from 27 to 30 in. wide.

Mich., Addison—H. S. Van Etten—complete blacksmith shop equipment, to replace that which was destroyed by fire.

Mich., Blissfield—G. J. Schultz—machinery and equipment for proposed factory for the manufacture of small automobile parts at Adrian.

Mich., St. Joseph—Auto Specialties Mfg. Co.—20 ton melting furnace for proposed $70,000 hard iron cleaning department building.

Mo., Independence—S. Swihart—shoe finisher, leather stitcher, shafting, belting, pulleys and bearings.

Mo., Joplin—T. Hughes, 1206 West 6th St.—belt driven bread wrapper, belting, dough mixer, pulleys and hangers for bakery.

Mo., Joplin—Kansas Exploration So., c/o St. Joe Lead Co., R. Blanke, Purch. Agt.—sludge tables, belting, pulleys, hangers, bearings and shafting for proposed $60,000 concentration plant.

Mo., Kansas City—G. H. Dickson Mfg. Co., Hotel Lafayette, 1205 Troost Ave. (manufacturer of tools and dies)—bench press.

Mo., Kansas City—F. B. Hornung, 3030 Main St.—multi-color job printing press.

Mo., Noel—Noel Bakery—one 1½ bbl. belt driven dough mixer, also belting.

N. Y., Batavia—G. M. Hopkins, 31 Lyon St.—machinery and equipment for new plant for the manufacture of specialties.

N. Y., Bath—E. L. Green Knitting Mills (manufacturer of outer knitted garments)—machinery and equipment for new plant.

N. Y., Binghamton — Noyes Comb Co., Water St., J. K. Noyes, Purch. Agt.—special machinery and equipment for proposed plant.

N. Y., Buffalo—F. Eiemba, 85 Armbruster St.—equipment for bakery, ovens, etc.

N. Y., Conewango Valley—P. Nickerson, R. F. D. 1 (automobile repair shop)—electric welding outfit (used).

N. Y., Falconer—Falconer Furniture Mfg. Co., M. M. Martin, R. F. D. 77, Jamestown, Purch. Agt.—woodworking machinery and equipment for proposed plant.

N. Y., Flint (Stanley P. O.)—Flint Cold Storage, Inc.—equipment, complete ammonia type cooling system, conveyors, hangers, pulleys, etc., for proposed $200,000 cold storage plant.

N. Y., Frankfort—Acme Road Mchy. Co., G. M. Mitchell, Purch. Agt.—machinery for proposed $225,000 factory at Salem.

N. Y., Geneva — O'Malley Candy Co., Klube Block—complete candy making machinery and equipment for proposed $75,000 factory.

N. Y., Home's Cave (Central Bridge P. O.) —J. L. Casper & Son, Inc. (manufacturer of furniture)—ten roller bearing hanger boxes for 1 15/16 in. shafting to fit from point hangers, must be split type.

N. Y., Jamestown — Jamestown Case Goods Corp., E. Holmberg, c/o Jamestown Chair Co., 20 Winsor St., Purch. Agt.—woodworking machinery, and equipment for proposed furniture plant.

N. Y., Little Valley—Little Valley Bakery, E. Robbins, Purch. Agt. — complete equipment for bakery, to replace that which was destroyed by fire.

N. Y., New York—Columbia Plush Co., 39 West 19th St.—60 in. plush loom.

N. Y., Norwich — Abbott-Kohn Ribbon Co., Berry St.—looms, special machines, equipment, hangers, pulleys, etc., for proposed $75,000 addition to plant.

N. Y., Oneida — Oneida Bottling Wks., 145 Cedar St., F. Wallace, Purch. Agt.—complete machinery and equipment for bottling works.

N. Y., Pavilion — Pavilion Natural Gas Co.—gas drilling outfits and equipment.

N. Y., Penn Yan—Taylor Chemical Co.—special machinery and equipment for proposed addition to plant on Keuka Lake.

N. C., Charlotte — Hugtite Clothes Pin Co., 417 South College Ave.—rip saws, cutoff saws and lathes.

N. C., Elizabeth City—Foreman Derickson Veneering Co.—machinery for proposed $50,000 factory for the manufacture of barrels, 3,000 barrels daily capacity.

N. C., Hamlet—Chamber of Commerce—prices on machinery for the manufacture of boxes, crates and berry containers.

N. C., High Point—High Point Folding Chair Co.—cutoff saw, rip saw and planer.

N. C., High Point—Ideal Table Co.—machinery, including lathes, planers, cutoff saws and rip saws, to replace that which was destroyed by fire.

O., Cleveland—Rawson Safety Guard Co., 639 Long Ave.—spot welder (used).

O., Columbus—Buckeye Casket Co., 371 South High St., E. B. Raidon, Genl. Mgr.—woodworking machinery (after Jan. 1, 1924).

O., Port Homer—Ohio Valley Clay Product Co., E. W. Cooper, proprietor—clay working machinery for proposed $260,000 tile works.

O., Toledo—Chevrolet Motor Co., 3137-57 Maplewood St.—machinery and equipment for proposed $66,000 addition to factory.

O., Toledo—Great Lakes Refining Co., Front St.—machinery and equipment for new $150,000 refinery.

O., Youngstown — Warner Tire Service Co., 1220 Market St., S. Warner, Purch. Agt. —complete tire repairing machinery, also equipment for charging batteries.

Okla., Commerce — Elliott Electric Shoe Shop, Main St.—Landis curved needle shoe stitcher for electric power.

Okla., Sulphur — Consumers Light & Power Co.—equipment for ice plant, including ice making machinery and raw water plant.

Pa., Blairsville—Natl. Plate Glass Wks. —$2,000,000 worth of equipment and machinery for new plate glass works.

Pa., Erie — Curtis Mfg. Co., 12th and Raspberry Sts.—oil tanks and special machinery for the manufacture of milk cans.

Pa., Forty Fort (Kingston P. O.)—A. L. Parks, Wyoming Ave.—machinery and equipment for proposed addition to bakery.

Pa., Pittsburgh—Park Way Welding Co., 100 West Park Way, N. S. (welding, cutting and brazing)—open end bending rolls ¾ in. and under for 5 or 6 ft. plates; rotary shears to cut ¾ in. and under.

Tenn., Knoxville—Duncan Mchy. Co., P. O. Box 265—one rebuilt gyratory crusher.

Tenn., Nashville—Nashville Paper Stock Co., 2nd Ave. and Church St.—paper cutters and presses.

Tex., Navasota—Western Public Service Co., P. Freeman, Supt.—35 ton motor driven ice machine, etc.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—No. 2 foundry iron quoted as low as $20@$21 per ton at Birmingham. Buyers not quite satisfied that bottom has been reached in iron prices. Coke declining with pig iron. Steel bars still $2.40, with structurals at $2.50 per 100 lb., f.o.b. Pittsburgh. Steel consumers show tendency to believe that prices have stabilized at present levels. A very small amount of cutting under is reported, mostly on steel sheets. Tin plate tending upward.

Advances—Electrolytic copper advanced ⅛c. per lb. Nov. 1, making a total increase of ¼c. for the week; rise due to increased domestic demand. Zinc up 5c. per 100 lb. in New York, during week. Antimony rose ⅝c. in New York and 2c. per lb. in Chicago warehouses.

Declines—Steel sheets lower in Chicago. Tin down ⅝c. and lead ⅛c. per lb. in New York. Old metals, fabricated brass and copper declined in Cleveland.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$26.05
Northern Basic	25.00
Southern Ohio No. 2	25.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	29.00
BIRMINGHAM	
No. 2 Foundry	23.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.25
Virginia No. 2	28.17
Basic	25.00
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	25.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	28.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	26.77
Basic	26.77
Bessemer	27.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.00
No. 12	3.10	4.64	3.80	4.05
No. 14	3.20	4.69	3.85	4.10
No. 16	3.40	4.79	3.95	4.20
Black				
Nos. 17 and 21	3.70	4.95	4.45	4.70
Nos. 22 and 24	3.75	5.00	4.50	4.70
Nos. 25 and 26	3.80	5.05	4.55	4.75
No. 28	3.85	5.15	4.65	4.85
Galvanized				
Nos. 10 and 11	4.00	5.15	4.70	4.85
Nos. 12 and 14	4.10	5.25	4.80	4.95
Nos. 17 and 21	4.40	5.55	5.10	5.24
Nos. 22 and 24	4.55	5.70	5.25	5.40
No. 26	4.70	5.85	5.50	5.55
No. 28	5.00	6.15	5.80	5.85

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded.	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded.	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0,17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	0%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold drawn shafting or screw	4.65	3.90	4.55
Cold drawn flats, squares	5.15	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 5/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			13.37½
Tin, 5-ton lots, New York			42.87½
Lead (up to carlots), St. Louis	6.45	New York	7.12½
Zinc (up to carlots), St. Louis	6.30@6.35	New York	6.80

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.50	27.00	25.50
Antimony (Chinese), ton spot	9.62½	10.50	9.50
Copper sheets, base	21.25	20.50	23.00
Copper wire, base	15.50	18.25	16.25
Copper bars, base	19.75	21.50	19.50
Copper tubing, base	24.00	26.50	23.00
Brass sheets, base	17.50	21.25	18.75
Brass tubing, base	22.50	26.25	20.50
Brass rods, base	15.25	17.25	15.75
Brass wire, base	18.00	21.25	....
Zinc sheets (casks)	10.25	10.45	....
Solder (½ and ½), (case lots)	29.50	29.00	27.50
Babbitt metal (83% tin)	52.00	52.00	42@45
Babbitt metal (35% tin)	25.00	17.50	18@22
Nickel (ingot and shot)	29.00	....	....
Nickel (electrolytic)	32.00	....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00

Shop Materials and Supplies

METALS—Continued

Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.75	11.50	11.00
Copper, heavy, and wire	10.75	11.00	10.25
Copper, light, and bottoms	9.50	9.00	9.25
Lead, heavy	5.75	5.25	5.75
Lead, tea	4.75	4.00	4.75
Brass, heavy, yellow	7.00		6.75
Brass, heavy, red	8.75	9.25	8.50
Brass, light	6.25	5.00	6.00
No. 1 yellow brass turnings	7.00	5.75	6.50
Zinc	3.75	2.75	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$25.10	$22.85	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.40	18.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	13.00	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13¼x13¼, per lb	11.00	36.00 per M	.10
Wiping cloths, 13¼x20½, per lb		52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.98	1.05	1.14
Lard cutting oil (50 gal. bbl.) per gal	.55	.50	.67½
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	297	.35	.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30–10%	30–10%	30–10%
Heavy grade	20–5–2½	30%	20–5–2½%
Rubber and duck:			
First grade	50–10–5%	50–10%	40–10%
Second grade	60–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton		3.50@4.00
Coke, prompt foundry, Connellsville	per net ton		5.00@5.50
White lead, dry or in oil	100 lb. kegs		New York, 14.00
Red lead, dry	100 lb. kegs		New York, 14.00
Red lead, in oil	100 lb. kegs		New York, 15.50

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0354	$0.0354	$0.0304
Cold finished shafting	per lb.	0.0465	0.0465	0.039
Brass rods	per lb.	0.1525	0.1575	0.17
Solder (½ and ½)	per lb.	0.295	0.295	0.265
Cotton waste	per lb.	.10@.13	.10@.13	.09@.11½
Washers, cast iron (½ in.)	per 100 lb.	6.50	6.50	6.00
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.02
Lard cutting oil	per gal.	0.55	0.55	0.55
Machine oil	per gal.	0.297	0.297	0.33
Belting, leather, medium	off list	30–10%	30–10%	40–5%
Machine bolts up to 1x30 in.	off list	40–10%	40–10%	40%

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40–10%	60%	45–5%
1⅛ and 1¼x3 in. up to 12 in	15%	50–5%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	25–10%	$3.50 net	
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30–10%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	
Hex. head and hex. nut bolts	List net		65–5%
Lag screws, coach screws	40–10%		60–5%
Square and hex. head cap screws	60%	70%	70–10%
Carriage bolts, up to 1 in.x30 in.	30–10%	50%	40–5%
Bolt ends, with hot pressed nuts	40–10%		55%
Tap bolts, hex. head, list plus	35%		
Semi-finished nuts, 9/16 and smaller	60%		
Semi-finished nuts, ⅝ and larger	55%	70%	80%
Case-hardened nuts	40%		
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	0.50	3.50	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	0.50	3.50	2.50
Nuts, cold punched, sq., per 100 lb. Off list	0.50	3.50	2.50
Nuts, cold punched, hex., per 100 lb. Off list	0.50	3.50	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	50–10%	60%	60%
Rivets, tinned	50–10%	60%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3.60	$3.75
Cone heads, ditto (net)	5.60	3.80	3.85
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb.	0.25		0.15
⅝ in. diameter *EXTRA*	0.15		0.15
½ in. diameter *EXTRA*	0.50		0.50
1 in. long, and shorter *EXTRA*	0.50		0.50
Longer than 5 in. *EXTRA*	0.25		0.25
Less than 200 lb. *EXTRA*	0.50		0.50
Countersunk heads *EXTRA*	0.35		$3.70 base

Tex., Tyler—Tyler Printing & Calendar Co.—feeder unit, 12 x 18 in. with a.c. motor, also Chandler and Price press.

Va., Roanoke—Roanoke Ice & Cold Storage Co.—equipment for 100 x 130 ft. addition to ice plant.

Va., Wytheville — R. P. Johnson (machinery dealer)—brick plant, 25,000 daily capacity (used preferred).

Va., Wytheville — Rector's Laundry — mechanical equipment for steam laundry.

W. Va., Elkins — P. Williams — coal crusher, 200 ton daily capacity.

Wis., Appleton—A. Stingle Baking Co., 968 College Ave.—mechanical baking equipment for proposed $40,000 bakery.

Wis., Beloit—T. B. Goodall, 433 Broad St.—gasoline storage tanks and pumps for proposed filling station on High and Milwaukee Sts.

Wis., Eau Claire—Lange Canning Co., Mill St., G. J. Lange, Pres.—canning and conveying machinery for proposed $50,000 cannery.

Wis., Manitowoc—The city, c/o A. H. Zander, Clk., City Hall—rock crushing outfit, including crushers, screens, conveyors, etc., for city gravel plant.

Wis., Milwaukee—A. Golembiewski, c/o Gurda & Gurda, Archts., 2nd Ave. and Mitchell St.—air compressor, gasoline storage tanks and pumps for proposed $40,000 garage.

Wis., Milwaukee—A. Heath Co., 21st and Wells Sts.—mechanical oven for proposed $40,000 addition to bakery.

Wis., Milwaukee—Shellmar Products Co., 1613 Humboldt Ave.—printing presses, special color process, for proposed $50,000 printing plant.

Wis., Neenah—E. Defnet, Secy., 157 East Forest Ave.—cooling and refrigeration machinery for proposed $40,000 storage plant.

Wis., Stevens Point—Journal Printing Co., 114 North 3rd St.—presses, belting and shafting for new plant.

N. S., Stewiacke—Dickey Woodworking Mills—planing mill machinery.

Ont., Amherstburg—Canadian Glass Co., Ltd., F. G. Hoklitzell, Sarnia, Purch. Agt. —complete equipment for the manufacture of glass, etc.

Ont., Hawkesbury — Sparkling Waters, Ltd. (manufacturer of aerated waters, etc.), C. Lapierre, Purch. Agt.—bottling equipment.

Ont., Port Colborne—J. Diffen, Welland, and R. W. Wright, Dunkirk, N. Y.—brick making plant.

Que., Chapeau — P. J. Vanasse — forge, small tools, etc., for blacksmith shop.

Que., Charlesbourg — Z. Daigle — tire presser, small tools, forge, etc., for blacksmith shop.

Que., Ile aux Chats (Valleyfield P. O.)— Pure Ice Co., Ltd.—complete plant for the manufacture of ice.

Que., Montreal—Canadian de Vains Process Co., Ltd., c/o L. G. Bell, 107 St. James St.—special machinery for the manufacture of cellulose, pulp, paper, products and byproducts.

Que., Montreal—G. Fecteau, 29 Monk Blvd.—gasoline tank, pump and air compressor for garage.

Que., Montreal—Fyon & Fyon, Manon St. and Papineau Ave.—gasoline tank and pump.

Que., Quebec — A. Auger, 18 Turnbull Ave.—air compressor, gasoline storage tank and pump.

Que., Quebec—W. J. Hawkins, 21 Aberdeen St. (marble and granite)—cutting and polishing tools.

Que., Quebec—E. Poulin, 133 Dupont St. —air compressor outfit for garage.

Metal Working Shops

Calif., San Francisco—The Victor Oxyacetylene Equipment Co., 884 Folsom St., awarded the contract for the construction of a 2 story shop. Estimated cost $18,000. Noted Nov. 1.

Calif., Sausalito—C. Mason, 31 El Monte Lane, has had plans prepared for the construction of a 2 story garage on Water St. Estimated cost $45,000. R. S. Chew, Rialto Bldg., San Francisco, Engr.

Conn., Cromwell—The Warner Hammer Co. is having plans prepared for the construction of a 2 story, 80 x 80 ft. factory. Estimated cost $40,000. Private plans.

Conn., Hartford—Kinsley & Smith, 571 Main St., are having plans prepared for the construction of a 2 story, 50 x 175 ft. garage. Estimated cost $40,000. F. C. Walz, Trumbull St., Hartford, Archt.

Conn., Waterbury—P. Laskas, 1844 East Main St., is having plans prepared for the construction of a 1 story, 60 x 130 ft. garage on Meriden Rd. Estimated cost $40,000. F. L. Lauper, 16 Albion St., Waterbury, Archt.

Ill., Chicago—The Crane Co., 836 South Michigan Ave., is having plans prepared for the construction of a 2 story, 160 x 500 ft. foundry at 4100 South Kedzie St. Estimated cost $1,000,000. Graham, Anderson, Probst & White, 80 East Jackson Blvd., Archts.

Ill., Chicago—The Hydrox Beverage Co., 2400 Lake Park Ave., awarded the contract for the construction of a 1 story, 75 x 197 ft. garage and service station on Lake Park Ave. near 24th St. Estimated cost $40,000.

Ill., Chicago—D. S. Klafter, Archt., 64 West Randolph St., is receiving bids for the construction of a 1 story, 100 x 264 ft. garage at 2501-25 East 75th St. for B. Weiss, c/o Architect. Estimated cost $100,000.

Ill., Chicago — E. G. McClellan, Archt., 7441 Cottage Grove Ave., is receiving bids for the construction of a 1 story, 200 x 200 ft. garage and service station on Indiana and 63rd Sts., for V. Cunningham, c/o Architect. Estimated cost $75,000.

Ill., Chicago—Randall Bros., c/o M. O. Nathan, Archt., 123 West Madison St., awarded the contract for the construction of a 1 story, 120 x 150 ft. automobile sales room and garage at 3519 West Harrison St. Estimated cost $50,000.

Ill., Chicago—G. Sachs, 1569 South Kedzie St., and J. J. Novy, Archt., 2434 South Ridgway St., are receiving bids for the construction of a 2 story, 125 x 135 ft. garage and service station on Homan and Ogden Sts. Estimated cost $50,000.

Ill., Springfield—G. J. Kable, 417 West Monroe St., awarded the contract for the construction of a 1 story, 76 x 181 ft. storage garage on 3rd St. Estimated cost $40,000.

Ky., Louisville — The Louisville Gas & Electric Co., 311 Chestnut St., plans to build a 1 story garage and repair shop on 7th St. and Ormsby Ave. Estimated cost $40,000.

Ky., Louisville—The Louisville Taxicab & Transfer Co., 2nd and Walnut Sts., plans to build a 3 story, 140 x 200 ft. garage and office building on 9th and Liberty Sts. Estimated cost $200,000.

Mich., Detroit—The Kroger Grocery & Baking Co., 1812 Clay St., awarded the contract for the construction of a 1 story, 82 x 390 ft. bakery and garage. Estimated cost $100,000. B. H. Kroger, Florence Ave. and Eden Park Entrance, Cincinnati, O., Pres. Noted Nov. 1.

Mich., Marquette—E. W. Cork & E. J. Davitt awarded the contract for the construction of a 3 story, 72 x 122 ft. garage. Estimated cost $75,000. Noted Aug. 30.

Mich., St. Joseph—The Auto Specialties Mfg. Co. plans to build a 1 story, 100 x 100 ft. hard iron cleaning department building and a 100 x 200 ft. foundry. Estimated cost $70,000 and $100,000 respectively.

Minn., Minnesota—L. Kinsell, 604 Builders Exch., awarded the contract for the construction of a 2 story, 132 x 157 ft. garage and office building on 5th Ave., S. and 3rd St. Estimated cost $140,000. Noted June 14.

Mo., St. Louis—The Chevrolet Motor Co., 3044 West Grand Blvd., Detroit, Mich., awarded the contract for the consrtuction of a 2 story, 25 x 60 ft. automobile factory on Union St., here. Estimated cost $20,000.

Mo., St. Louis—The Mendenhahl Motor Co., 2317 Locust St., is having preliminary plans prepared for the construction of a 4 story, 37 x 155 ft. automobile sales and service building. Estimated cost $100,000. W. P. McMahon, Title Guaranty Bldg., Archt.

Neb., Omaha—I. Goldstein, 218 South 19th St., is having plans prepared for the construction of a 3 story, 80 x 119 ft. garage on 19th and Capital Sts. Estimated cost $90,000. J. T. Allan, 224 Brandles Theater Bldg., Archt.

N. Y., Brooklyn — The Columbia Machine Wks. & Malleable Iron Co., 269 Chestnut St., plans to build a 1 story, 74 x 491 ft. machine shop and foundry on Chestnut St. and Atlantic Ave. Estimated cost $194,000.

N. Y., Buffalo—The Pratt & Letchworth Co., 189 Tonawanda St., malleable iron works, awarded the contract for two 1 story, 52 x 120 ft. and 70 x 212 ft. factories. Estimated cost $85,000.

N. Y., Geneva—Fisher & Payne, Carter Alley, plans to build a plant for the manufacture of automobile bodies on West Hamilton St.

N. Y., Mount Vernon—The Eureka Garage, 213 11th Ave., plans to rebuild its garage, which was destroyed by fire. Estimated cost $60,000.

N. Y., New York—The Stewart-Warner Speedometer Co., 551 West 52nd St., awarded the contract for the construction of an office building and service station on West 65th St. Estimated cost $400,000.

N. Y., New York—S. Young, c/o M. Rothstein, Engr. and Archt., 26 Court St., Brooklyn, will build a 1 story garage at 242 East 98th St., here. Estimated cost $60,000.

N. Y., Salem—The Acme Road Mchy. Co., Frankfort, will build a 1 story, 85 x 300 ft. factory on Railroad St., here. Estimated cost $225,000. Noted Oct. 25.

N. Y., Tarrytown—The Chevrolet Motor Co., Kingsland Pt., awarded the contract for the construction of two 3 story, 80 x 150 ft. and 80 x 80 ft. additions to its plant.

O., Canton—The Timkin Roller Bearing Co., Dulber Ave., S. W., plans to build a 2 story, 200 x 300 ft. factory. Estimated cost $250,000. This is a part of $750,000 expansion program.

O., Cleveland—The Amer. Register Co., 3618 Payne Ave., manufacturer of hot air furnace registers, awarded the contract for the construction of a 1 story, 76 x 100 ft. addition to its factory. Estimated cost $40,000.

O., Cleveland—The Globe Brass Mfg. Co., 5532 Perkins Ave., awarded the contract for the construction of a 1 story machine shop and foundry on East 55th St. Estimated cost $60,000. H. F. Schroeder, Pres. Noted Sept. 6.

O., Cleveland — The McCauley Storage Battery Co., c/o J. F. McCauley, 1060 St. Clair Ave., is having plans prepared for the construction of a 1 story, 35 x 128 ft. factory and warehouse on Chester Ave. and East 24th St. Estimated cost $40,000. Private plans.

O., Cleveland — D. J. Silverman, 3237 East 116th St., is having plans prepared for the construction of a 1 story, 72 x 113 ft. garage on Union Ave. near East 123rd St. Estimated cost $40,000. L. Skolnik, 6th St., Clair Bldg., Cleveland, Archt.

O., Lorain—The Natl. Stove Co., a subsidiary of the Amer. Stove Co., 827 Chouteau St., St. Louis, Mo., plans to build a 2 story, 100 x 220 ft. factory to double capacity of plant, here. Estimated cost $100,000.

O., Toledo — The Chevrolet Motor Co., 3137-57 Maplewood St., awarded the contract for the construction of an addition to its factory. Estimated cost $66,000.

O., Toledo—Ranson & Randolph, Superior St., manufacturers of dental supplies, are having plans prepared for the construction of a 3 story factory. Private plans.

Pa., Phila.—Fable & Co., Inc., 837 North 3rd St., awarded the contract for the construction of a 2 story, 60 x 176 ft. sheet metal factory at 510-12 North 3rd St. Estimated cost $40,000.

Pa., Phila.—T. F. Slattery, St. Girard Bldg., will soon award the contract for the construction of a 1 story, 78 x 97 ft. garage on 59th St. below Chestnut St. Estimated cost $30,000. N. Hulme, 1524 Chestnut St., Phila., Archt.

Pa., Sharon—J. Meyer awarded the contract for the construction of a 1 story, 60 x 170 ft. garage on North Main St. Estimated cost $80,000.

Wis., Markesan—W. Dehn awarded the contract for the construction of a 1 story, 60 x 100 ft. garage and repair shop. Estimated cost $40,000. Noted Oct. 11.

Wis., Milwaukee—A. Golembiewski, c/o Gurda & Gurda, Archts., 2nd Ave. and Mitchell St., is having plans prepared for the construction of a 1 story, 60 x 120 ft. garage on Lincoln Ave. Estimated cost $40,000.

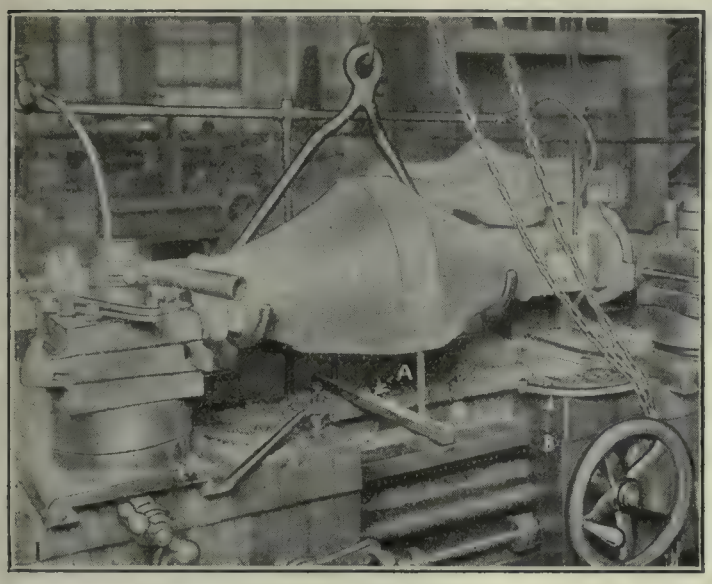
Wis., Milwaukee—L. Hunt, Archt., 210 Mason St., is receiving bids for the construction of a 1 story, 60 x 160 ft. addition to garage for the Ogden Ave. Garage Co., 305 Ogden Ave. Estimated cost $40,000.

Wis., Milwaukee—Logemann Bros., 3130 Burleigh St., manufacturer of baling presses, are having plans prepared for the construction of a 1 story, 52 x 150 ft. erecting shop. Estimated cost $40,000. E. R. Liebert, 432 Bway., Archt.

Wis., Waukesha—The Thompson Malted Food Co., Riverside Dr., will soon award the contract for the construction of a 2 story, 52 x 64 ft. addition to factory and a 1 story, 50 x 100 ft. garage. Estimated cost $40,000 each. H. J. Esser, 82 Wisconsin St., Milwaukee, Archt.

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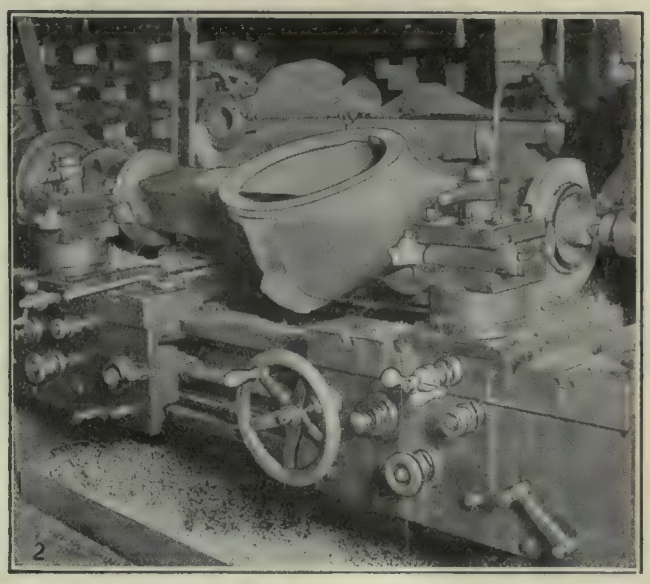


FIG. 1—HANDLING THE HOUSING INTO THE LATHE. FIG. 2—TURNING BOTH FLANGES AT ONCE

Building the Housings for the Sheldon Truck Axle

By FRED H. COLVIN
Editor, *American Machinist*

First of a series showing the sequence of operations and the methods used in making heavy duty axles—Machines, fixtures, tools and inspection practice

IN MANY ways the product of the Sheldon Axle Co., Wilkes-Barre, Pa., is a typical example of the advancement in transportation methods. Organized many years ago to make axles for horse drawn vehicles, the plant has developed into one devoted almost entirely to building rear axles for motor trucks of various sizes, although a small portion of the plant still turns out axles for horse drawn vehicles. A peculiar phase of this feature of the business is that the latter department continues its activities, and shows signs of the elimination of the horse.

Beginning with a large size axle housing for trucks carrying 5 tons, we find a steel casting weighing on the average, 392 lb. These castings are purchased from an outside foundry and are first inspected thoroughly before going to the machining department. Here the first operation is to turn the flanges on both ends simultaneously in the lathe shown in Figs. 1 and 2. The lathe has two carriages and it has been found advisable to use two operators on the work. This obviates the necessity of using a helper and greatly decreases the time required for machining. In Fig. 1, the housing is just being lowered into position by means of the double hook attached to a chain hoist.

The axle is held on a mandrel having a cone at each end. These cones have three high spots, or ribs, for centering the rough casting. One cone is fixed to the mandrel while the other is removable, being held in place against the casting by means of a large nut.

In order to be sure that the mandrel is correctly centered in the axle housing, the housing is lowered into position in the lathe with the carrier face down, as shown in Fig. 1. The gage *A*, consisting of a square bar and two uprights, is placed across the ways of the lathe and the position of the castings tested by the two pins shown. Should the face prove to be too high or too low, the housing is removed from the lathe and the mandrel adjusted by placing metal strips, or shims.

between the contact points of the cones and the housing. This adjusting is very seldom necessary as the castings come very true to pattern. Also shown in Fig. 1, at *B*, are the snap gages used in measuring the two diameters turned on the ends.

The turning operation itself is shown in Fig. 2, tools in both posts being at work simultaneously. This view also shows the general construction of the housing, the carrier face and the way in which a portion of each flange is cut away to accommodate the brake rigging.

After the turning, the axles pass a ten per cent inspection and go to the Ingersoll milling machine, shown in Fig. 3. The first operation here is to mill the carrier seat and the spring pads at each end, at one setting. The cutters on the central spindles machine the carrier seat and those on the end, the spring pads. There is also shown the type of fixtures used for holding the housings by the ends that have just been turned. The housings are located by means of the gage *A*, which tests the parallelism of the carrier-face with the milling machine table.

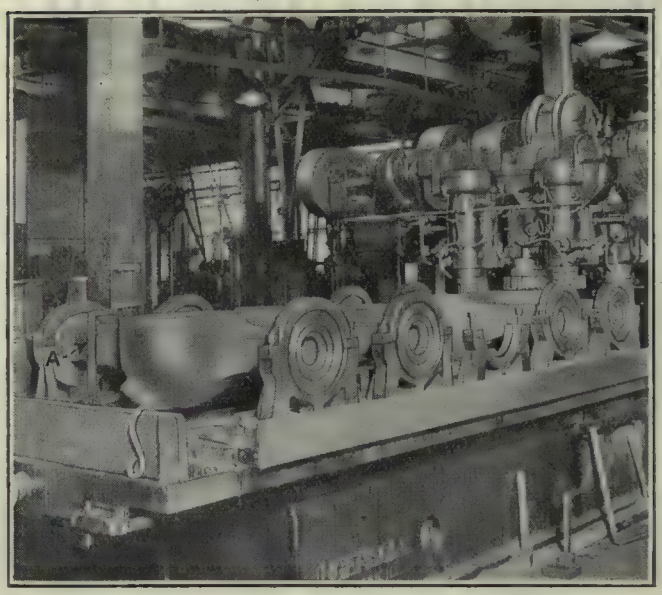


FIG. 3—MILLING CARRIER-SEAT AND SPRING-PADS

Changing the cutters on the two inner spindles for ones of smaller diameter provides for the next operation, the milling of the two bracket seats, and the three other sides of the spring pads near the ends. The practice is to run a lot of housings through for the first milling operation, handling the housings in preference to changing and setting the milling cutters. This method enables a ten per cent inspection to be made between the two milling operations.

After the cutters have been changed, the remainder of the milling is done without removing the axles from the fixtures. The clamps are simply loosened and the housings turned over so as to present the other spring pad surfaces for milling.

The method of squaring the axle housings after milling the first spring pads is to use locating blocks having tongues and grooves on their inclined surfaces, which make it easy to secure any height adjustment within their range, and at the same time keep the upper and lower surfaces parallel.

The flanges on the ends of the housing are drilled, while the housing is held on a turntable fixture, as shown in Fig. 4. The table carries locating blocks and screw clamps as shown at *A*, while the end pieces *B* and *C* form the bushing plates for guiding the drills. The flanges are held by the clamps shown. This drilling arrangement is mounted on an old lathe which is provided with a special, multiple-spindle drilling head *D*, driven from the lathe spindle. It will be noted that a special cone pulley has been provided so as to allow a wide driving belt on the steps most used. The indexing of the turntable and the work is controlled by the lever *E*.

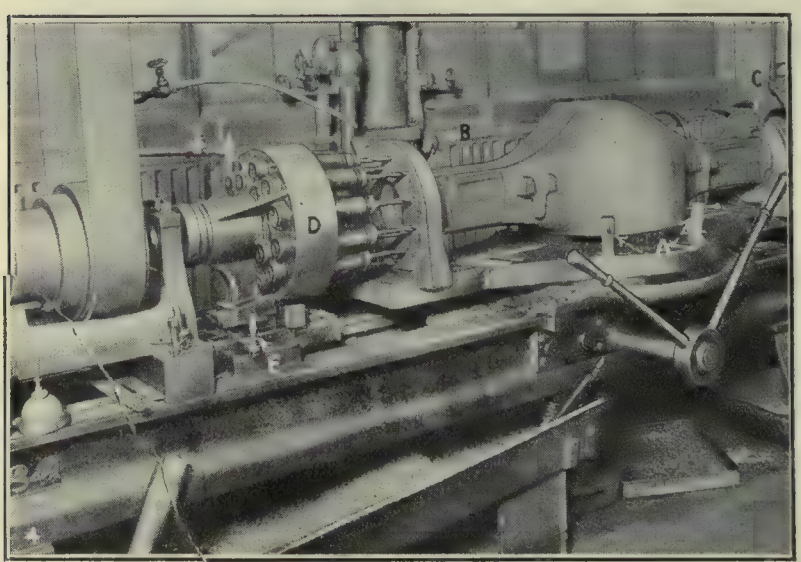
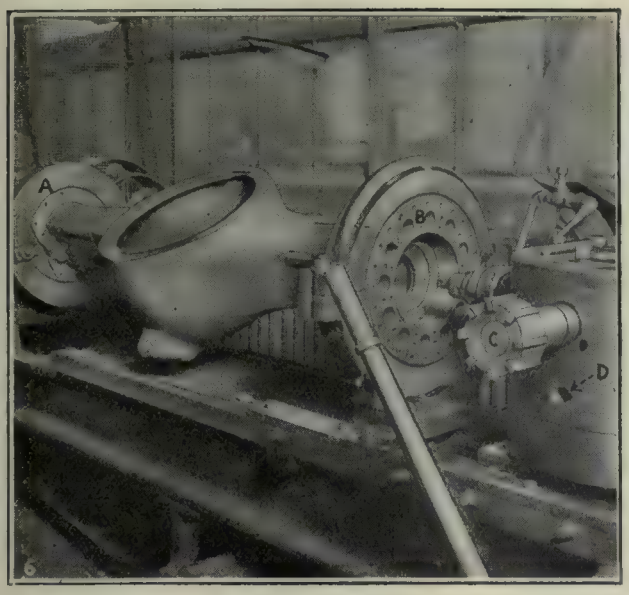




FIG. 4—DRILLING END FLANGES. FIG. 5—MACHINE FOR BACK-FACING FLANGE HOLES

After the holes are drilled, they are back faced on the machine shown in Fig. 5. The housing flange rests in the support at *A* and is indexed by the plug *B*, which fits in the drilled holes. The back facing is done by the cutter *C*, which is mounted in the adjustable head shown. This enables it to be adjusted to accommodate both circles of different diameters, and a sliding-key drive allows the facing cutter to be moved into the work by means of the lever *D*. The facing cutter carries a pilot which centers in the drilled holes.

The ends of the housing are next bored on the lathe shown in Fig. 6, which has been especially rigged up for this work. The housing is centered on the face plate *A*, by its flange, which fits into the recess shown, and is driven by pins fitting some of the drilled holes



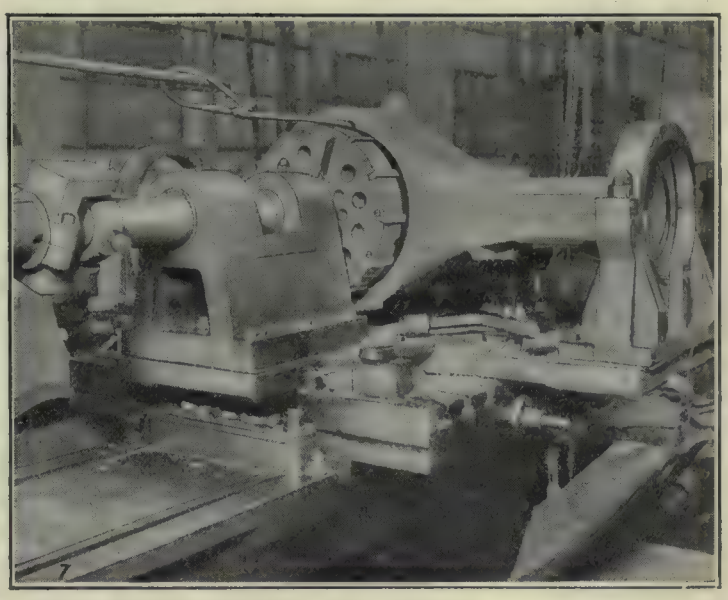


FIG. 6—BORING END OF HOUSING. FIG. 7—BORING HOUSING FOR CARRIER

The outer end is supported in the carrier *B*, which revolves with it, running in the special steadyrest provided for this purpose. The hole is first roughed out with a flat cutter in a boring bar and finished with the cutter shown at *C*. The turrett is indexed on its periphery, one of the holes being shown at *D*.

Boring a 17-in. Hole

After another ten per cent inspection, the carrier hole is bored on the fixture shown in Fig. 7, which is mounted on an old boring machine of the movable-table type. This boring cutter is 17 in. in diameter and is supported on a heavy spindle, running in a substantial head. The housing is held by the flanges at each end in a fixture very similar to those used in the milling operations. The carrier is squared by its large face and the boring cutter is driven by the floating joint shown at the left.

Drilling for brackets and other connections is performed in special fixtures which locate the holes with reference to the flanges at the ends of the housing. All that remains to be done is the drilling of a few other holes, the tapping of those which are necessary, and the burring, after which a one hundred per cent inspection is made before the housings go to the assembling department.

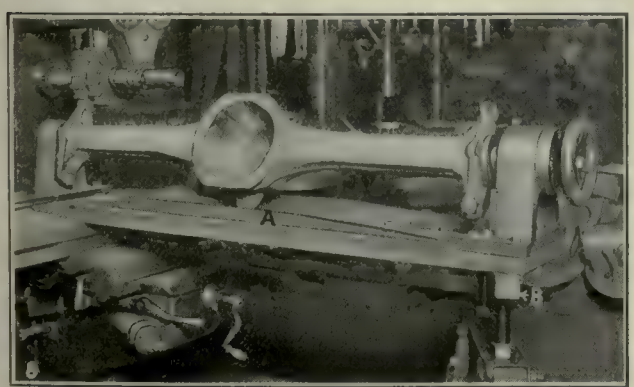
As many of the operations on the housings of different sizes are very similar, only three are shown for the machining of the small size axle. Both ends are first bored and faced and the bearing surfaces hand reamed. The carrier seat and brackets and pads are milled and then the housing comes to the special fixture, shown in Fig. 8. It consists of a substantial base *A*, having two uprights. The outer end of the fixture is supported on the square bar *B*, which is adjustable by means of the screws shown, the screws being mounted on a shop horse made for this purpose.

In this operation both sides of the brake-carrying spider are milled by the large straddle mills shown, on the Milwaukee milling machine. The housing is swung into two positions, one for each arm of the spider and is then turned end for end and the other spider milled in the same way. The feed of the milling machine table slides the outer end of the fixture on the supporting bar *B*. These housings weigh but 100 lb. each in the rough and are, therefore, handled with ease.

Drilling the End Holes

The end holes are drilled in another turntable fixture, Fig. 9, of a design modified from that shown in Fig. 4. It is mounted on an engine lathe and a smaller special multi-spindle drilling head having a ball thrust is provided for drilling all the holes at once. The different sizes of drills used will be seen at the left.

The fixture for drilling the carrier seat is shown in Fig. 10. The bushing plate is separate from its support, as can be seen at *A*, and is located by the pins *B*. The brackets *C* and *D* carry spring-pad bushings for



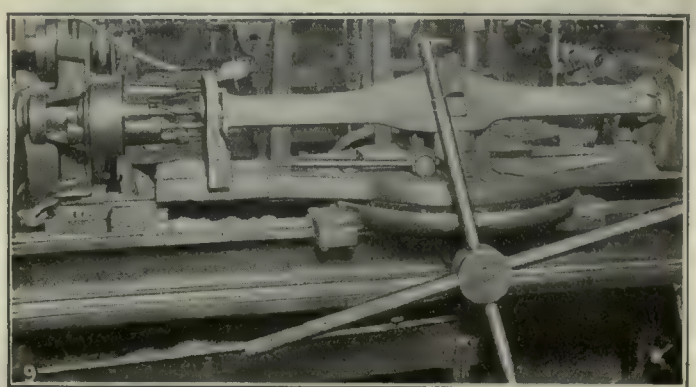


FIG. 8—MILLING BRAKE SPIDERS ON SMALL AXLE. FIG. 9—DRILLING BRAKE SPIDERS

an axle of a somewhat different type which is handled in this same fixture.

The remaining holes are then drilled and spot faced, the ends of the spiders are split for clamping, the holes

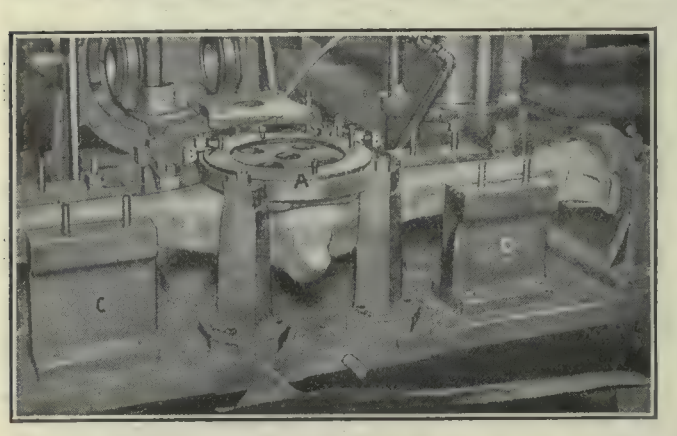


FIG. 10—DRILLING CARRIER SEATS ON SMALL AXLES

for the carrier studs, brackets and brake clamps are tapped and any chipping and burring which may be necessary, is done. After a careful inspection of each housing it is ready to go to the assembling department. Here, in some cases, it receives a few additional operations before taking its place in a completed axle.

Teach Your Boy a Trade—Discussion

By Robert D. Harper

The articles that have appeared on page 872, Vol. 58 and page 392, Vol. 59 of the *American Machinist*, under the above title apparently ignore a very important side of the question, i.e., why boys of good parentage do not wish to learn trades.

When we consider that a boy spends eight years in an elementary school, where the majority of teachers do not look with favor on their bright students learning a trade or doing manual work for a living, it is not hard to understand the dislike of these boys for trade work. One has only to think back to one's elementary school graduating class and recall the voice of the teacher asking how many are going to enter high school. She makes the appeal as strong as possible because (in a good many instances) her rating depends on the number she sends to high school. She does not tell us that a classical high school course without a college career would help very little in earning a living. Nor does she tell us that the country can absorb only 10 per cent of the population in professional activities, or that if all who entered high school, finished a professional course, they would have slim chances of employment. She implied that bright American boys could do nothing else.

Society Does Not Appreciate Mechanics

Naturally, nearly all of the boys, in good localities at least, went to high school. Here they came in contact with bookish men and women, and intentionally or not, they absorbed the idea, that working with the hands was only for the newly arrived immigrant. Brain work is the only occupation for a gentleman. Even if a boy were mechanically inclined, he would hesitate to learn a trade when he graduated, for to him it would have meant a loss of social prestige and standing, which means a lot to a boy 16 to 18 years of age. If he had to go to work, he took a position in a store, office or bank, and in time began to look down upon the mechanic. He prided himself that he was above them.

Unfortunately, his family is likely to agree with him in this attitude. They forget that in this country the social level is reached by the economic ladder, and that as the income of the various trades continue to increase, their plane will soon be above that of the clerical worker. The great white collar class is to a great extent the result of this false pride, although, no doubt, there will always be those who believe in letting their heads save their hands even at an economic loss.

It would seem that the elementary schools should really teach the dignity of labor and recommend those boys who are mechanically inclined to learn a trade, even though they are bright American boys. They should teach that the boy who earns his living by the use of his hands needs a trained mind, and that he can be as cultured as a boy in a clerical occupation. Early impressions are hard to overcome, so the attitude of the schools toward manual labor will have to change before boys of good parentage will consider learning a trade.

A Perpetual Appraisal System of Value

By William R. Basset

President of Miller, Franklin, Basset & Co., Inc., New York City

The perpetual inventory of raw and finished stock is now almost universally accepted as essential to the close executive control of any manufacturing business.

The perpetual inventory, or appraisal, of equipment is an almost equally valuable aid to the management, although it has not yet been widely adopted. A physical appraisal, because it is expensive to make, is a comparatively infrequent happening in most concerns. In the four to ten years between appraisals, great changes take place in value and location of the equipment, which, unless reflected in the manufacturing costs and in the income tax returns, may have serious affects upon the profits.

The best way to gather overhead is by departments. Each department's overhead includes a round sum for depreciation on equipment. If a machine is moved from one department to another, changes in the overhead to reflect that change should be made. Too often it is not. In a concern operating under a cumbersome bookkeeping system, I once saw depreciation charged on an expensive machine for years after the machine had been sold for scrap. In the same plant, one department carried the same amount of depreciation charges after additions had been made which doubled the amount of equipment in that department.

An excellent perpetual appraisal record consists of one card or loose-leaf sheet for each machine. These records can be grouped by departments. On the card is recorded the first cost, the freight, the cost of installing, the cost of major repairs, the depreciation rate and amount, and the present value. If the machine is moved to another department, that fact is noted on the card, and the card is transferred in the file to the new department.

There you have a complete record of every bit of equipment in the plant, by itself, and not buried with a mass of other figures in some general capacity account. It is easy to operate, and invaluable as a control.

Recent Developments in Precision Bench Tools

By B. A. BEHREND
Consulting Engineer, Boston, Mass.

The screw-cutting bench lathe—Universal quick-change gear box adapted to relieving attachment—Thread milling and taper attachments—A tilting turret—Second article

ONE of the most useful tools, capable of application to almost any conceivable operation that can be performed on a lathe, is the screw cutting bench lathe, designed in its general features like an engine lathe. In our experimental department we use a Rivett lathe with lead screw and longitudinal and cross feeds, which is a very remarkable tool, having great possibilities. We soon found, however, that it was not entirely adaptable to the special work which we wished to do. In the first place, the setting-up for

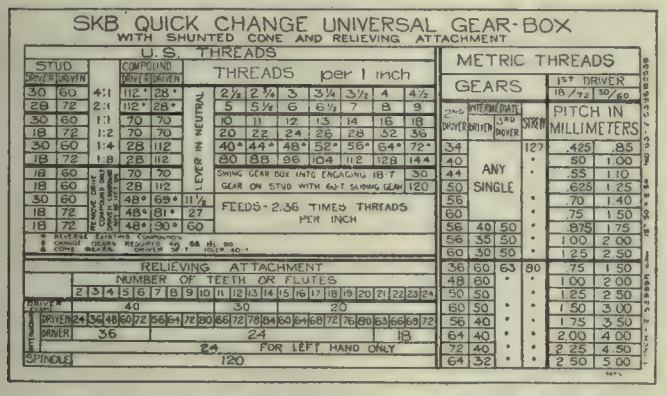


FIG. 17—TABLE OF GEARS FOR STANDARD AND METRIC THREADS

each number of threads, standard and special, required a good deal of time, and, in the second place, the automatic feed was rarely used, as changing it implied each time a different combination of gears, a task which the operator likes to shirk. He therefore did not use the automatic feed at all, but resorted to hand-feed. To obviate these drawbacks, we devised a gear box, which enabled the cutting of all standard threads without special set-ups, as well as a change of the feeds within a wide range, without making changes in the gears. The problem which we set ourselves was to devise the gear box in such a manner, first, that the smallest number of gears was used between the lead screw and the spindle; scondly, that the gear box could be used for setting up for cutting special threads, and even standard threads, if they were to be cut with especial accuracy, with a minimum of intermediate gears specially cut for the purpose; thirdly, that gears could be set up for cutting metric threads; fourthly, that the gear box could be used for the operation of a universal relieving attachment for relieving cutters with straight and spiral teeth having from two to twenty-four flutes or teeth; fifthly, that the gear box could be used for operating a traverse milling attachment for milling long spiral leads. A further extension of this device has been made to obtain a speed range for the spindle of the lathe from 1/20 r.p.m. to 1,200 revolutions per minute.

It was necessary to depart from the commonly known designs of gear box, as we wished to make the gear box in principle, in such a manner that it could be used, not only on this particular type of a lathe, but also on other lathe beds not equipped with gear boxes. An investigation of the existing gear boxes showed that the range of threads provided by them did not answer our requirements, the size of the gear box becoming prohibitive if all the standard threads were to be included in a box of the design commonly met with.

In Fig. 17 a table is given representing the list of threads that can be cut with the new gear box. The table also contains a list of metric threads that can be

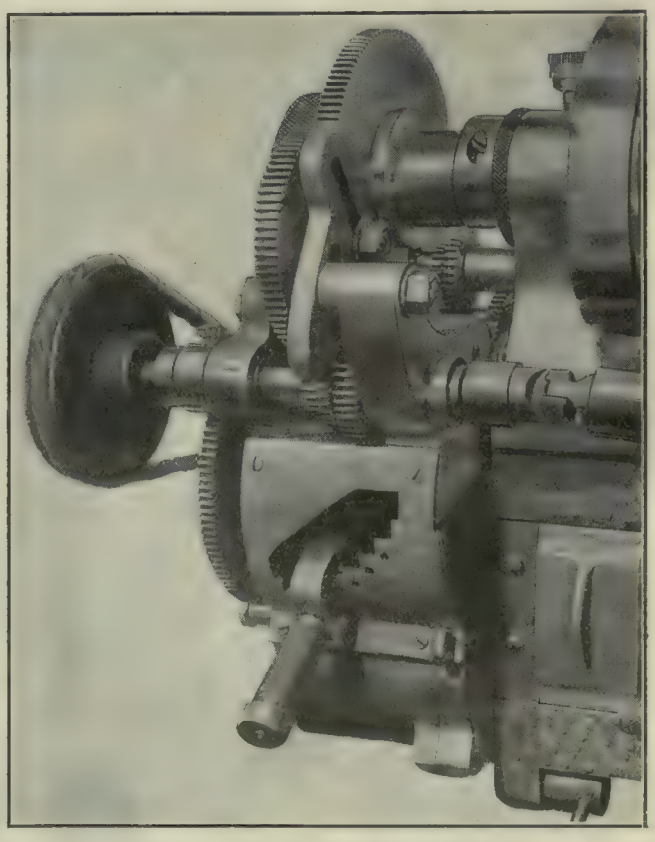


FIG. 18—NEW GEAR BOX (FRONT)

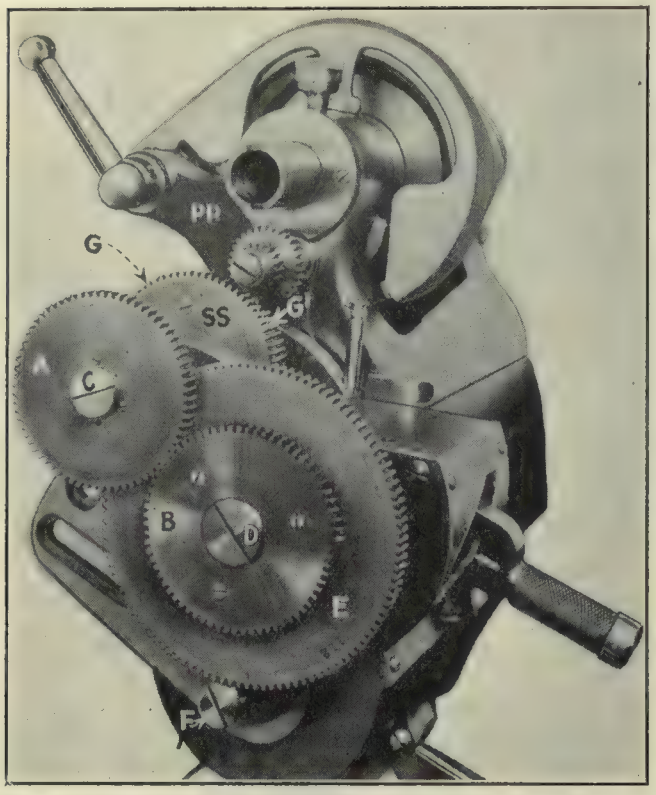


FIG. 19—NEW GEAR BOX (END)

obtained readily by means of special gears, and further there is given a table showing the gears necessary to obtain from two to twenty-four teeth, or flutes, backed off in connection with the use of the universal relieving attachment.

To show somewhat in detail the operation of this gear box there is given in Fig. 18 the front view of the gear box, on top of which are mounted the gears for the relieving attachment. The bracket for the relieving attachment may be permanently set up without in any way interfering with the use of the lathe or of the gear box.

In Fig. 19 the end of the lathe is shown with the sliding gears mounted on the gear box to secure the multipliers of 2, 4, 8, and 16. There is a double pinion *PP* mounted on the stud, and in this particular lathe the stud revolves at twice the speed of the spindle. A sliding gear *SS* engages with the pinion *PP*, so that either the large or small pinion may act as the driving pinion. In Fig. 19 is shown the gear *A* engaging with gear *B*, on which the sliding pinion, attached to the handle of the gear-shifting mechanism is mounted. From shaft *C* to shaft *D* a ratio of one to one or one four can be obtained, as the gear concealed by *A* has 28 teeth and the driven gear has 112 teeth. By adding another set of gears, this ratio of one to four or one to one can be changed to a ratio of four to one. This is done by reversing the gears *A* and the one behind it and gears *B* and *E* and mounting the gears *B* and *E* on shaft *C* and gears *A* and the one behind it on shaft *D*.

As both Figs. 18 and 19 show, the gear box can be turned about the feed rod *F* and locked in position. This makes it possible to bring into mesh the large gear *G* with the large gear of the double pinion *PP* or the gear *G* with the small gear of the double pinion *PP*. Thus, two more combinations can be obtained all through the range of the gear box. This arrangement enables us to cut 30 and 120 threads, which are usually not obtainable in the standard gear boxes except with special set-ups. By properly proportioning the numbers of teeth in the double pinion and the sliding gears meshing with it, a great variety of special threads can be secured.

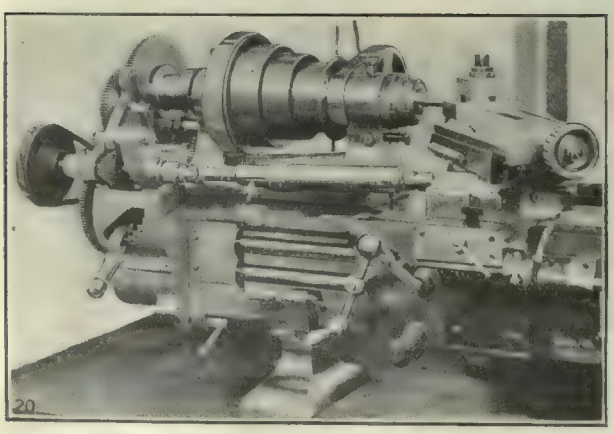
How the Relieving Attachment Is Driven

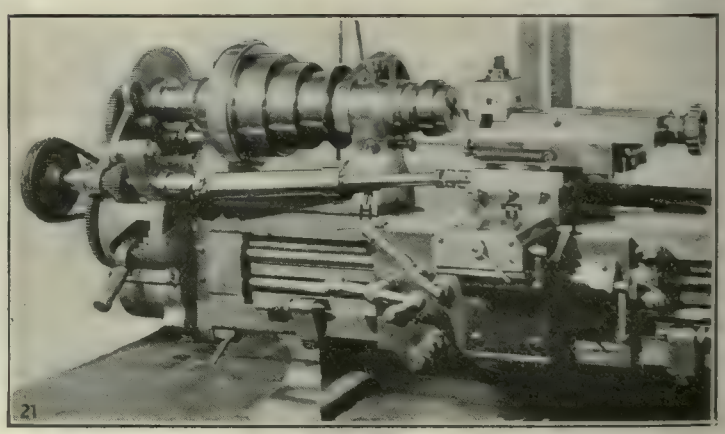
On top of the gear box is mounted a train of reduction gears, which permits the connection of the driving shaft *H* with a universal relieving attachment, as is shown in Figs. 20 and 21. In order to drive this arrangement satisfactorily, it is advisable to change from the cone pulley drive to a pulley mounted directly on the drive shaft for the relieving attachment. As it is arranged in our laboratory, we are using the main drive on the cone pulley and driving through the back gears, and from the back gears through an auxiliary countershaft to the drive shaft of the relieving attachment. This is not shown in the illustrations. Figs. 20 and 21 show the ease with which the relieving attachment can be swung from any angular position to a position parallel with the lathe bed.

The relieving attachment and gear box were executed for our experimental department by the Waltham Machine Works.

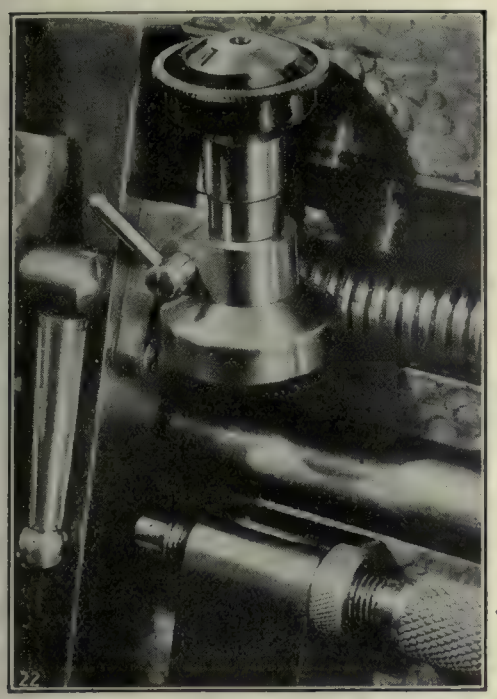
The thread dial, shown in Fig. 22, has a range of 3 in. and has mounted on it a bezel which can be turned to one of the main division lines on top of the dial. When screw cutting, the gears in the apron are disconnected by throwing out of mesh one gear in the train.

It has been found useful in our laboratory for quick and moderately accurate screw cutting to use a thread-milling attachment, which is shown in its general set-up





FIGS. 20 AND 21—UNIVERSAL RELIEVING ATTACHMENT AND DRIVE



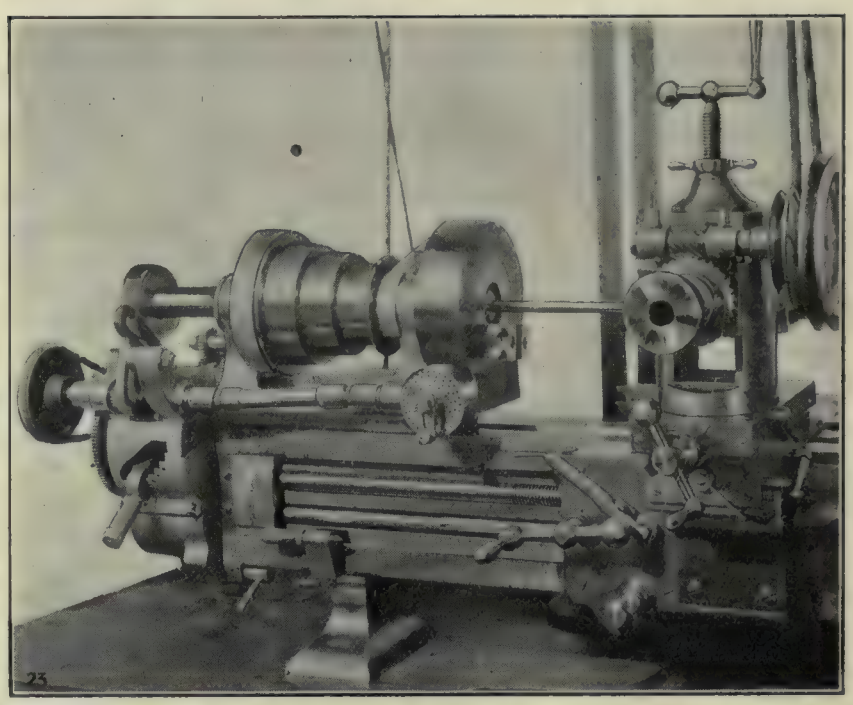


FIG. 22—SCREW CUTTING DIAL WITH ADJUSTABLE BEZEL. FIG. 23—THREAD MILLING ATTACHMENT ON LATHE

in Fig. 23 and in detail in Fig. 24. The experimental work on this attachment was done by the Waltham Machine Works. It is now produced by the Rivett Lathe & Grinder Corp. in connection with its traverse milling attachment, originally devised by Edward Rivett, and as improved by us by making it firm and substantial by the addition of the clamping levers shown at *A* and *B* in Fig. 24, and by putting a circular T-slot in the base of the column. In the spindle is

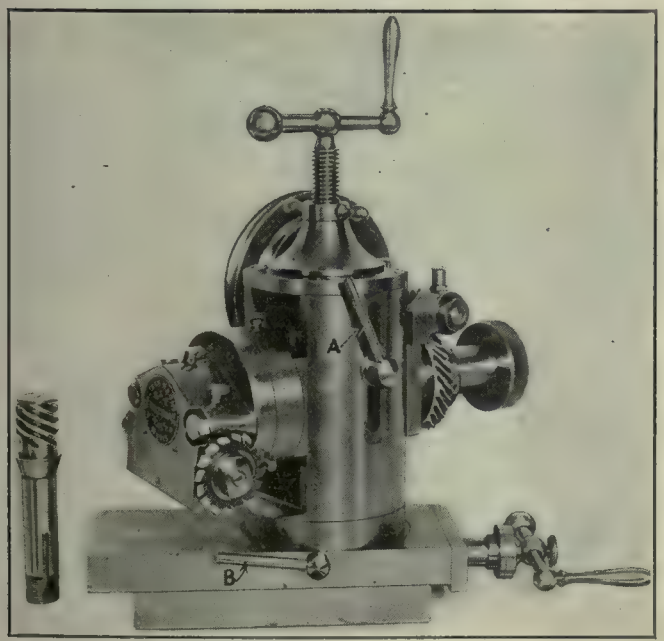


FIG. 24—THREAD MILLING ATTACHMENT SHOWING COLUMN AND CUTTER HEAD

mounted a collet with a 45-deg. worm, engaging in a right angle drive, and driving a spindle having the standard 3 and 45-deg. tapers, on which is mounted the thread-milling cutter. All standard threads can be milled readily with this attachment, and the only difficulty encountered was in securing the low speed necessary for driving the work. This speed was obtained, as

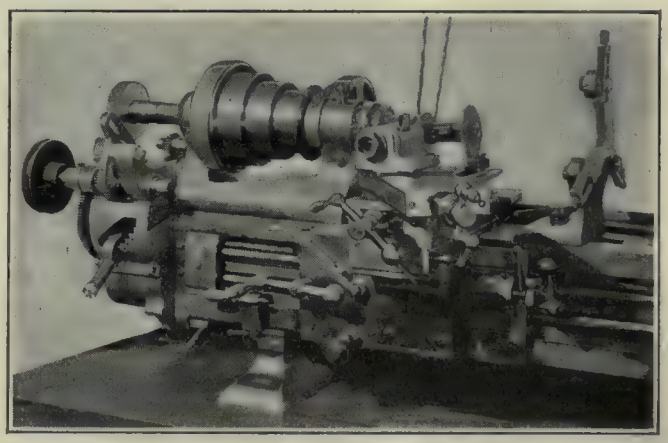


FIG. 25—LATHE SET UP FOR THREAD GRINDING

shown in Fig. 23, by means of an attachment originally devised by Edward Rivett for milling long lead spirals. It consists of a worm gear mounted on the spindle nose, and operated by a worm, the drive ratio being one to forty. It is a type of spiral head, and, in fact, a standard spiral head could be used advantageously for this purpose. In later designs we modified this arrangement and omitted altogether the use of the spiral head for thread-milling, by securing in another way the required reduction in work speed.

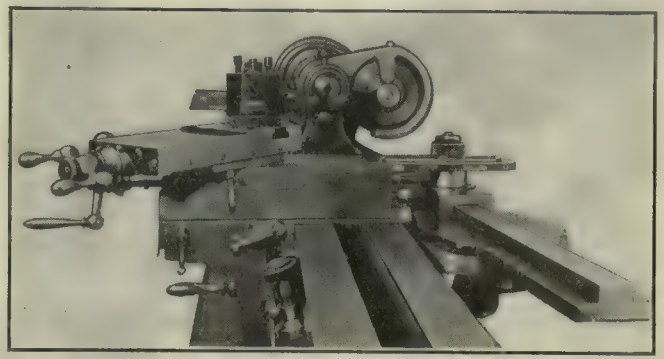


FIG. 26—TAPER ATTACHMENT, SLIDE REST AND THREADING DIAL

However, the arrangement shown in Fig. 23 has been very successful, and it has given us the benefit of a thread-milling machine, as we did not have enough work of this character for the installation of a special single purpose machine. It is evident from an examination of Fig. 23 that the order of the drive is from the worm to the worm-gear which is mounted on the

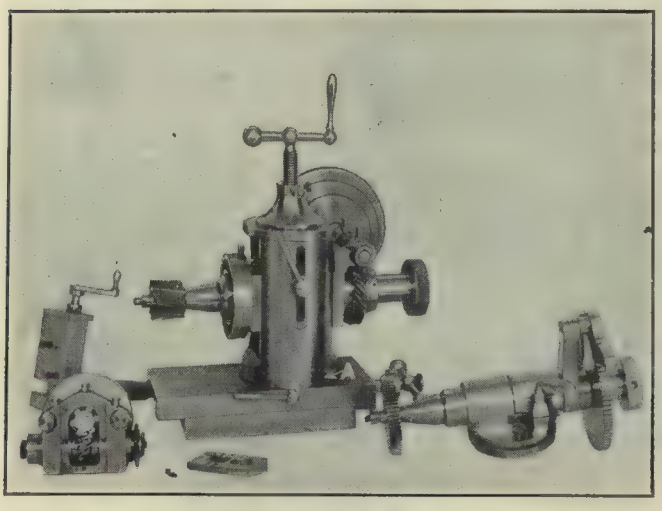


FIG. 27—MILLING ATTACHMENT, SHOWING INDEXING QUILL, THREAD MILLING DEVICE AND VISE

spindle nose, and thence through the spindle to the stud and through the gear box to the lead-screw.

There is shown in Fig. 25, a slide rest with a thread-grinding attachment, the illustration being plain enough to show the general arrangement. There is also shown in this picture a modified form of back rest.

In Fig. 26, is shown a modification of a taper attachment, which is easily understood without further explanation. It is always in position, and its neat and clean appearance represents a great improvement over the type ordinarily supplied.

For occasional milling operations we recommend a

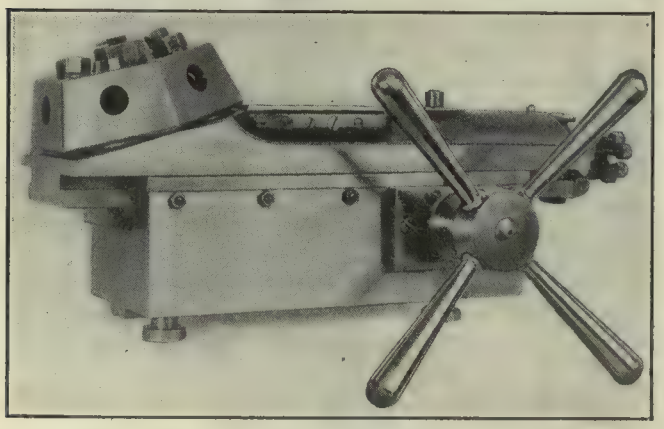


FIG. 28—TILTING TURRET

modification of the older form of commercial traverse miller, now supplied by the manufacturer, in the form indicated in Fig. 27. This figure shows the mounting of a block with a circular T-slot below the graduated ring *A*. It also shows a small vise, the thread-milling attachment, and a chuck and arbor holder, with quill and index plate. Occasionally, these milling attachments are very useful, but generally, all milling should be done on a separate bench milling machine, such as will be described in the concluding article.

There is shown in Fig. 28 a tilting turret, made for us by Hardinge Brothers, Inc., Chicago, which allows collapsible dies to swing. Turrets of this type will fit any bench lathe, and they are very useful in making the bench lathe into a screw machine. At the Emerson Co. in Medford there are two of these turrets in use in making parts for the Slocomb internal micrometers.

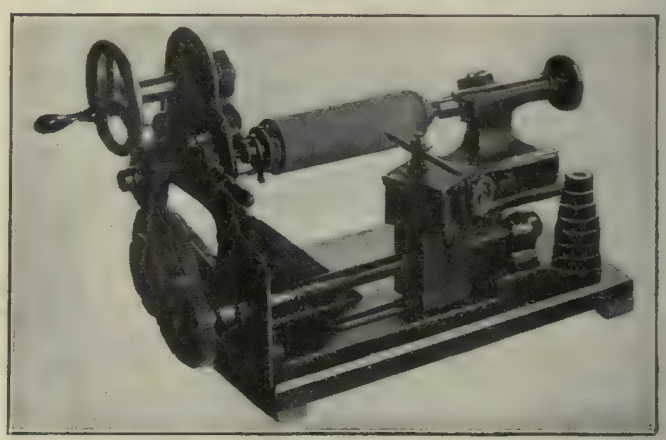
By the adoption of the devices described in this article, the Rivett Lathe & Grinder Corp. has inaugurated a great advance in its older type precision screw-cutting bench lathe.

Machine for Demonstrating Change Gears and Threads to Students

BY JAMES FORBES
Director, Southbridge Vocational School

The machine illustrated herewith was designed and built by the students of the Southbridge Vocational School, Southbridge, Mass., at the plant of the American Optical Co. It has been found very useful for teaching students simple and compound gearing, as well as the principles of thread cutting.

From the illustration, it will be seen that various



CHANGE GEAR AND THREAD DEMONSTRATOR

problems in change gears can be worked out very satisfactorily; and as the machine is supplied with a lead screw, the distance traveled by the nut can be readily determined.

The machine is provided with a split felt roll, which is constructed so as to enable a piece of drawing paper to be wound around its periphery, thereby enabling threads of different pitches to be traced by the pencil mounted on the nut. It is possible to trace a thread with this arrangement, and by opening up the roll and removing the paper, to study the helix angles of different pitches of threads.

Owing to its compactness and simplicity, the machine can be readily handled by the students.

Shop systems and methods which ignore the personality of the men and consider them as so many machines, are weak in that particular feature. No one or two men can do all the thinking necessary for a whole shop and unless the men not only are allowed, but are encouraged, to think about the work, the shop loses by it. This is one of the secrets of success of many a small shop that may apparently have no excuse for existence.

What About Automobile Shops?

By A. L. De LEEUW and K. H. CONDIT
Consulting Editor, *American Machinist* Editor, *American Machinist*

Lack of uniformity in shop practice discussed in third article —Some tools not being driven to capacity—Screw machine departments good—Flood lubrication infrequently applied

LACK of uniformity in the machine shop practice on parts essentially similar in nature was an outstanding feature in the automobile shops we visited. It was not at all surprising to observe such a lack of uniformity in the railroad repair shops and a good deal of emphasis was laid upon it in the articles, "What's Wrong with the Railroad Shops," published almost a year ago. The railroad shop is primarily a repair shop and for that reason one expects to find variations in practice resulting from widely different equipment and from the effect of tradition. The automobile shops on the other hand are purely production shops. Most of the tools they use are essentially production tools and they do not differ widely in principle. The industry is so young when compared to the railroad industry that it has hardly had time to acquire very many hampering traditions. Even so there was the widest variation between speeds and feeds employed in exactly similar machines, on very much the same work in different shops. There must have been one best combination.

WHY should the cutting speeds used in crankcase milling be four times as high in one shop as in another?

Why should lard oil be used on one turret lathe and soda compound on its neighbor working on the same job?

Why should milling jobs be set up so that the cutter is endeavoring to lift the fixture off the table?

Flood lubrication of milling cutters is generally admitted to be essential to maximum output. Why is it not used more generally in the automobile shops?

These are a few of the questions that come up when one has visited the big automobile production plants.

In this connection we have in mind particularly the milling operations which form so large a part of automobile shop practice. The milling machine is distinctly in its element in the automobile shop and should certainly reach its highest development there. Many of the models now in use, in fact, would hardly have been developed as soon as this had it not been for the needs of the automotive industry. Yet we found machines where the roughing and finishing cutters were so close together that both of them were in the work at the same time, as a result of which the finish was not all it might have been. Some instances of set-ups where the cutter spent considerable time cutting "wind" were noticeable but it is a pleasure to be able to say that they were exceptions to the general rule.

In one or two of the shops we noticed milling machines that were not being pushed to anywhere near their capacity by their operators. In some cases the machines themselves were too frail to stand the cuts that should have been applied. In other instances the operators evidently thought they were, which amounted to the same thing in the end. The men had been so used to the limited output of old style or worn out tools that they were afraid to use their new equipment for what it had been designed to do.

In some of the shops it was very noticeable that no attention had been given to the proper direction of rotation of the cutters. On machine after machine the cutter was doing its level best to lift the fixture off the table. In a few instances it was impossible to correct the error because of local conditions. In others the correct rotation could have been secured by running the piece through the other way. In still others the fixtures had been so designed that they had to be run through the way they were and nothing could be done about it.

The finest example of lack of uniformity in practice was one where three duplex milling machines, side by side, were all working on the same job, one that required two separate facing cutters. On one machine both cutters were going in the right direction, on the next machine both were going in the wrong direction, while on the third machine one was going in the right and the other in the wrong. And nobody seemed to know why.

Job on Wrong Machine

In another department we saw a first-class operator working an end mill gingerly out of the side of a tough steel casting. The machine was a new one, the cutter was in good shape and the fixture was above criticism, yet by the very nature of things extreme care was required on the part of the operator to prevent digging in and a smash up with the type of cutter he had to use on that particular material. There was no reason at all why the job should not have been done in considerably less time with a pair of interlocking side mills.

When it came to coolants the lack of a definite policy was much more evident in some shops than in others. In one place we saw two turret lathes of the same make

working on the same job, one using a soda solution the other lard oil.

The theory of flood lubrication and its importance in securing maximum production is evidently not universally understood. We saw a great many machines whose output could have been materially increased had flood lubrication of the cutter been applied. On some of these machines the supply of coolant was entirely adequate for flood lubrication but the discharge nozzles were not properly arranged and no guards had been provided. It might almost be said that where flood lubrication was in evidence production in general was at the highest point reached in any of the shops indicating that the men who knew most about high production methods were fully aware of the importance of flood lubrication.

The lack of uniformity in shop practice which we have endeavored to bring out through quoting particular cases indicates that all is not as it should be in shop management. There was a day when the man who knew most about shop practice was the man in charge of the shop but that is not always the case today. The shop is a bigger shop, the methods employed are much more highly developed and complications innumerable have added to the problem. As a result the man in charge must be primarily an executive. If he has a thorough knowledge of shop practice so much the better. If he has not, the assistant in charge of mechanical details will have to work pretty much on his own responsibility. In very few shops is there any means of checking up on what he does. Even if the manager should be an experienced shop man it is questionable whether he would find time to do very much in the way of checking up on his mechanical supervisor.

Problem of the Mechanical Supervisor

We believe that this situation has much to do with the lack of uniformity displayed. No matter how good the mechanical supervisor may be when he comes on a new job he has certain good ideas and inevitably a few bad ones. Within a reasonably short time he has put his good ideas into effect and improved the practice in the shop to that extent but after that he has only the bad ideas left and he will stock up for them as tenaciously as for the good ones because they seem entirely sound to him. If he had someone to walk around the shop with him periodically and offer suggestions that occur to a man who is not too close to the job he could easily profit by the ideas thus received. As it is he is doing the very best that can be expected under the circumstances.

No corporation would think of letting the work of its accounting department go unaudited even if the law would permit it to do so. Why should it not take a similar attitude toward its machine shop methods? If the works manager has not the knowledge or the time necessary to conduct such an audit it would be necessary for him to rely upon someone else. In the case of the big corporations such assistance should be readily obtainable from members of the advisory staff employed by them. We are convinced that even the few suggestions we are able to make in these articles are sufficient proof that such an auditing of shop practice is an entirely feasible thing and would work greatly to the benefit of the industry.

Before we leave the subject of milling a word ought to be said about the rather wide use of square cornered teeth on large size cutters. Apparently the weakness of such a cutter tooth as compared to a tooth with a 45-deg. bevel at the corner is not widely understood. The beveled tooth probably has 100 per cent longer life than the one with the square corner. There are pieces, of course, where the beveled tooth cannot be used on account of the engineering design but there are surely a great many more where the piece can be changed by the designing engineer to permit the use of the beveled-tooth cutter without sacrificing anything in the way of utility or appearance. As a matter of fact many weak sections would probably be strengthened by the substitution of a 45-deg. fillet for a sharp corner.

The screw machine departments of the automobile plants we visited are highly important parts of the industry and are generally excellent. We did see a few things, however, to which exception might be taken and which we are recording in the hope that they may serve as suggestions to the heads of screw machine departments everywhere.

It was noticeable for instance that one shop was employing a multiple spindle machine for making a small stud where the total output necessary for three months' factory production was produced in one week. There is no objection to getting production through rapidly but the use of a machine of this type for such a piece means that a large stock of product must be carried or else the tooling must be changed frequently.

Side by side with this job were several single spindle machines working constantly on another job. It happened to be a job that could have been done perfectly well on the multiple spindle machine and to better advantage. It would seem here that better efficiency could have been secured by the shifting around of the jobs.

In another place we saw a battery of special machines which were used for final reaming of pieces made on automatics. Evidently somebody did not trust the screw machines to turn out a finished job. Whether the lack of confidence was in the machine themselves or in the way they were operated did not appear.

As for the special machines, they were not particularly efficient. The same work could have been done on multiple spindle equipment available in the current market with a reduction in the number of operators by five sixths. In other words, one man with the better machine could do the work of six with the old type.

Among other criticisms of screw machine work we might include the employment of turning operations where forming would have been better. Also the too wide setting of dogs so that an unnecessary amount of "wind" cutting took place. It might also be mentioned that quite a few jobs were on machines that were really too big for them. In most cases this was not the fault of the engineers or the head of the screw machine department. It was simply a case of not having a machine of the right size available. At the same time the production costs could have been lowered if a proper balance of machine equipment had been provided, for the machine overhead on the small part produced on the large machine was disproportionately high.

As to turning operations there is not a great deal to be said, for in the larger shops most of the turning is done on specialized machines that are highly efficient. Particular attention has been paid in them to rigidity of construction and proper supporting of the tool to allow for its being pushed to the limit. We did see a few cases where tool overhang was excessive but they were the exception to the rule. The same may be said of grinding of tools by the machine operators.



The Lathe Department

Where Machine Tools Are Made

Landis Machine Company

Incorporated 1903

Milling and Grinding Department



The Tool Room





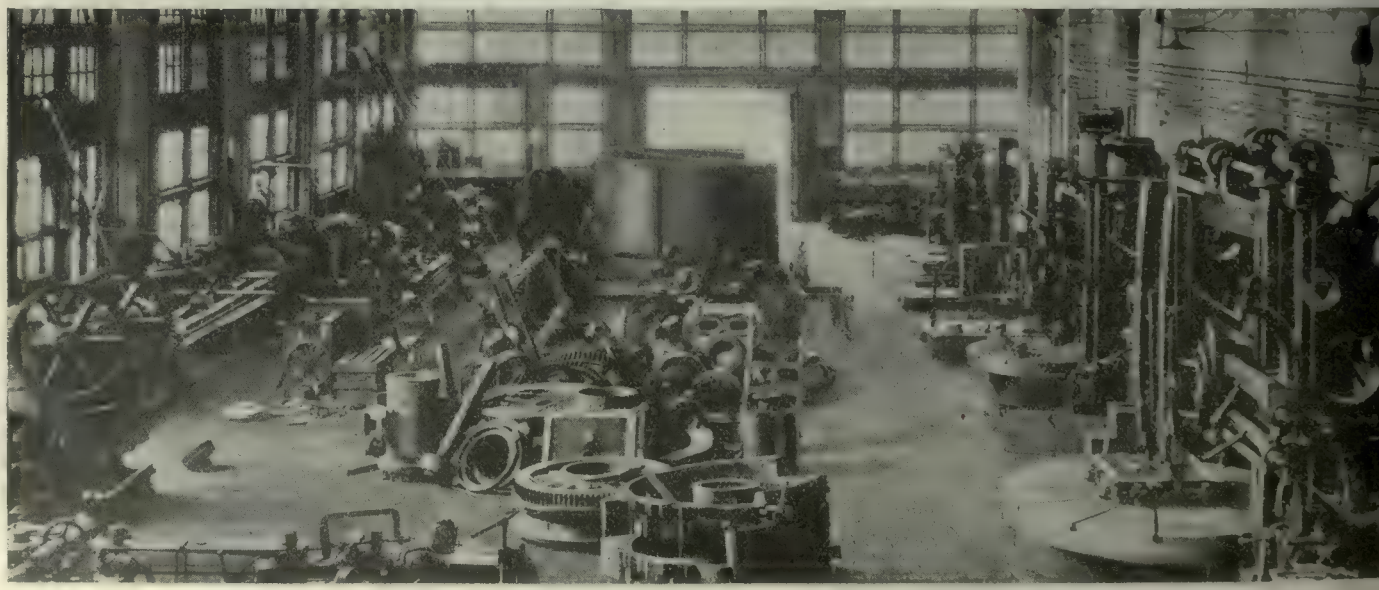


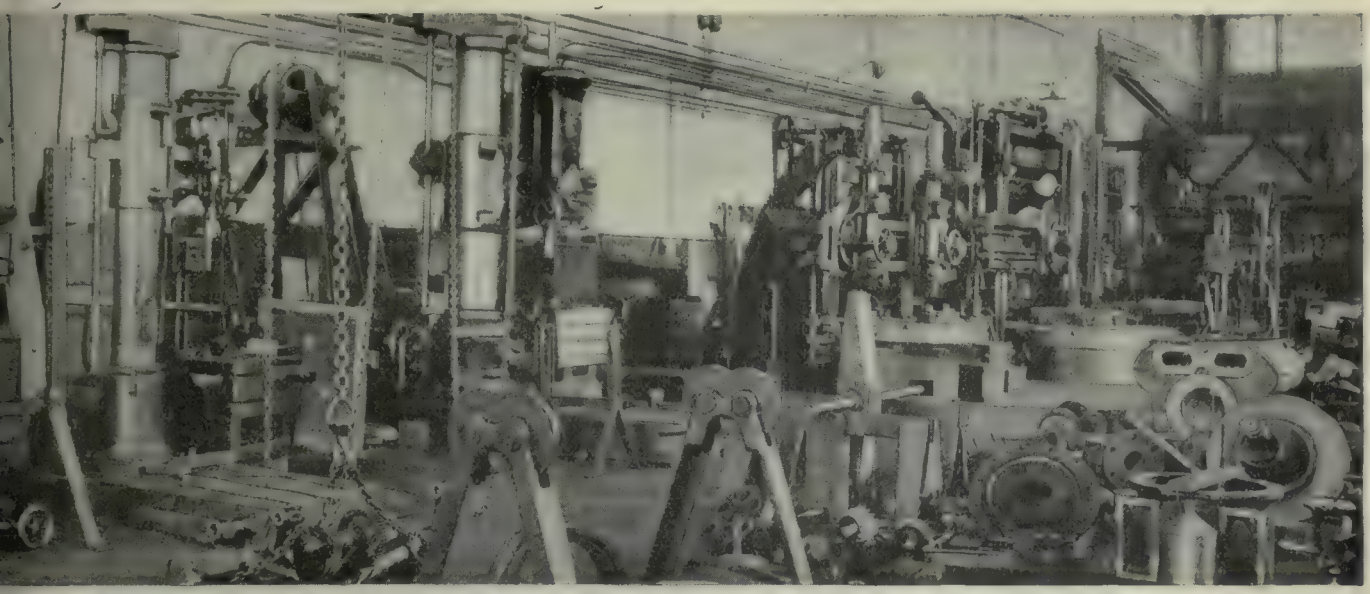
Many Machine Tools Are

WHEN the flapper clerk in your office is chewing gum does she think about how it is made and the machinery used in its production? Not on your life she doesn't. All she cares about is the gum itself and whether she has the price to get it.

Much machinery is necessary for the production of chewing gum. Then it must be wrapped and made into packages—all by machinery. To build and keep in repair the many machines, machine tools are required. The picture at the top of this page and the one on the left are from the machine shop of The William Wrigley, Jr. Co., Chicago, Ill., maker of chewing gum. Here the production machines are repaired and new ones built.

The time is here when the delectable waffle appeals to your palate. You cover your waffles with syrup and taste the delicious combination. You know how the

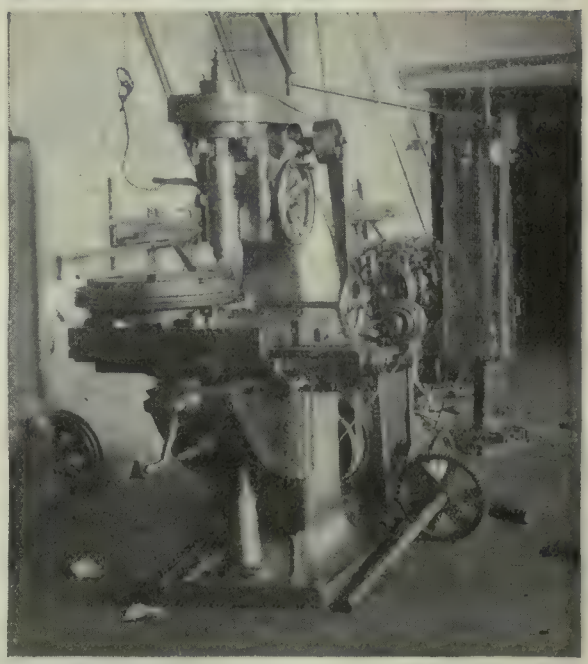




Used in Unexpected Places

waffles are made—friend wife is an expert—but how about the syrup? The raw material must go through many processes before it becomes syrup, requiring much heavy machinery. Then cans, labels and boxes must be made for shipment. All the necessary machines have to be repaired and new ones built from time to time and that's where machine tools come in.

The last picture on the opposite page and the ones on this page are from the machine shops at the plant of the Corn Products Refining Co., Argo, Ill., where Karo Corn Syrup and other products are made. The first two pictures are from the shop where heavy machines are built and repaired. The one at the right shows one of the machines used in making and repairing dies and tools for the can-making department. The picture at the bottom is of the shop where light repairs are made and experimental work is done.







Machinery Helps Sort Parcel Post

Parcels are delivered by chutes to the tables as may be seen in the foreground of the picture above. The bags have colored tags attached, each color representing a geographical destination, and are kept in continual motion so that each bag comes before the sorter at stated intervals. This device occupies much less room than stationary racks of bags having equal capacity and saves the time formerly lost by the sorter in walking to and fro from bag to bag.

Below is a close-up view showing the sorter's platform and tables together with the merry-go-round of bags.



Casting Crown Brasses and Hub Plates in Place—Discussion

A group of letters from railroad master mechanics telling how locomotive crown brass and hub plate repairs are handled on their respective railroads

THE METHOD of casting locomotive crown brasses and hub plates in place which is in use at the Lackawanna Railroad shops and which was described by Fred H. Colvin on page 479, Vol. 59, of the *American Machinist*, struck us as so good an example of advanced practice that we asked a number of railroad shop officials to comment on it and compare it with their own practice. To conform with the policies of several of the railroad managements it has been found necessary to omit the names and connections of the authors of the various letters abstracted below. The eleven points of view expressed give an excellent cross-section of present-day railroad shop practice on crown brasses and hub plates.

First Shop

We cast the crown brass and liner in our foundry in nearly every case. This method gives very good results and saves a lot of machine work. From our engines of the 4-6-0 class we have obtained as high as 115,000 miles and in nearly all instances the engine runs from the time it leaves the shop until it has to be brought in for general repairs. The shop here is small and we get out only four or five engines a month. As a rule the engine is in the shop about four weeks.

We also cast crown brasses in all locomotives except the Mikado. Before casting the brass we cut dovetailed grooves into the boxes, both for the crown brass and hub wear liner. Arbors of the proper size are set in the box and the brass is poured around it. We have very little trouble with them at any time.

Second Shop

Our driving box is machined to receive the crown brass, this work being done on a slotter. A dovetailed groove is turned in the face of the box that goes next to the wheel. The crown brass is turned to fit the driving box, a shoulder being left to stop the brass when pressed into the box. This leaves the brass projecting about an inch beyond the box on the end where the wear plate is to go.

After these brasses are fitted and pressed (hydraulically) into place, the boxes are then sent to the brass foundry and a brass liner is cast onto the face of the box. The boxes are then sent to boring mills where they are bored to fit the axle and the hub liners faced off until each box face is the proper distance from the engine frame.

The inside of the wheel hub is faced off on a lathe and to this face is bolted the hub liners. These hub liners are cast of common gray iron and are turned and faced to fill the space between the hub and driving box, allowance being made for the proper amount of lateral motion, about $\frac{1}{8}$ in.

After the engine has made a certain number of miles in service these boxes are taken down and the lateral motion is taken up by casting on new brass liners as outlined above. Our locomotives are supposed to make 100,000 miles from one general overhauling to another. In a general overhauling every part, of course, is thoroughly inspected and overhauled but it is not always found necessary to remove the cast-iron hub liners.

Here is a point that I think is against casting the crown brass and wear plate together. When we first began the use of the Mikado type of locomotive, the piston heads were of cast steel. Around the outside rim of these heads a ring was cast into which the grooves for the packing rings were turned. These false rings that were cast onto the steel heads were continually coming loose and turning around on the steel heads. It was finally suggested to put screw bolts into these steel heads and let the heads of the bolts project above the outside rim of the steel head. This worked all right so far as the prevention of the turning went but the rings were still loose after a short time. The plan of preheating the steel head before pouring the metal on was tried and the fault was corrected.

I fear from the above experience that the crown brasses might become loose. This is caused by the unequal expansion of the two metals, or rather the contraction of the brass while the steel is really expanding.

Third Shop

I read the article regarding pouring driving box brasses and from my experience I am sure it will not give very good results. The pouring of crown brasses is not a new idea, but in order to have any success at all the boxes must be heated to about 900 deg. before pouring. If this is not done the brass will be loose. Even when the box is heated the brasses are not perfectly tight.

We do not pour our crown brasses for the reason that it is almost impossible to get them perfectly tight and the quality of brass is not so good. We believe by purchasing our crown brasses from a reputable manufacturer of brass we get a better and more uniform grade of material.

Our practice is to machine the rough crown brass and press it in leaving a projection about one inch above the box and then pour the hub face around it.

If the work is properly done in the shop and the engine is properly maintained and lubricated, crown brasses should run two shoppings or from 150,000 to 200,000 miles. Hub faces should run from shopping to shopping under the same conditions.

Abnormal hub face wear is brought about by the same cause as flange wear. This can be prevented if work is properly done in the shop. If it is, when the engine has made her mileage and receives class 4 repairs about ten days in the shop is required. If, however, the engine is shopped on account of sharp flanges and hub wear, it will be in the shop from two to three days.

Fourth Shop

In considering the method of adjusting lateral motion on driving wheels by application of liners, the type of locomotives and the conditions under which they are used (such as passenger or freight), are factors to be considered in comparing mileage derived from their use. On narrow firebox locomotives the clearance at rear driving wheels is limited, the same amount of wear cannot be allowed and in consequence the amount of mileage is reduced.

We have used steel or brass liners on driving-wheel hubs for years with fair results, the main objection being on account of their getting loose or broken. These liners were used in conjunction with babbitt-lined boxes. This method was replaced about three years ago and the liners are now cast on the face of driving boxes.

The driving boxes are prepared by having dovetailed recesses cut on the face and the metal poured into a mold of the desired thickness. To procure further adhesion, the face of the driving box has several holes drilled at an angle and about ⅝ in. deep. The driving wheels are maintained at original thickness by the application of steel plates welded to the face of hubs.

Boxes treated in this way will generally run from one shopping to the next or from 25,000 to 30,000 miles for heavy freight locomotives and on lighter locomotives from 40,000 to 50,000 miles. Some of the lighter passenger engines give as many as 90,000 miles between shoppings.

Some of the heavier locomotives have wearing blocks clamped to axles between the driving boxes which assume considerable of the lateral wear. The crown brasses are generally worn enough to warrant replacement at the same time that lateral wear is adjusted.

The lateral wear between driving wheels is taken up at the same time that other parts are being readjusted or replaced and does not cause any additional delay of engine in the shop.

Fifth Shop

Our practice of applying lateral plates on boxes is to dovetail the box and preheat it before the molten brass is poured. Crown brasses are separate and are first pressed into the box and lateral brass poured around them. Lateral brass is mostly composed of scrap crown brass. Its life varies and is determined by the service but will average around 80,000 miles.

We do not renew the crown brass at the same time, unless it is too thin to apply a shim, providing it is loose in the box. If it is not loose and it has the required standard allowance for thickness, it is recrowned and placed back on the journal. Our practice is to shim all but the main boxes on a classified repair unless the crown brass is thin and then a new brass is applied. It is then possible to double and sometimes more than double the mileage of crown brass.

Locomotives in for the taking up of lateral motion are in the shop on an average of six days. This takes care of our different types of power. Our facilities are far from modern and if they were modern no doubt faster time would be possible. Rod work is taken care of when recrowning boxes, and rods should also be lined up where needed so that when the locomotive goes back into service the rods and boxes are in good shape.

Sixth Shop

We have poured some brass hub liners onto driving boxes but have never poured the crown brass in connection with the hub liner, the crown brass always being separate and pressed in first.

With separate brass hub liners we secure about 75,000 to 80,000 miles before they require renewing and the crown brass is usually worn sufficiently to require renewal at that time. We generally do this when giving the engine heavy or general repairs.

Brass hub liners are not general practice, however, and have only been applied on a half-dozen or more engines that I know of. The standard practice on this road is to apply the crown brass and fill up the hub plate space with babbitt.

Seventh Shop

The method of the Lackawanna railroad is practically identical with the method which has been in use on our road for several years. The only difference is that instead of using cast-iron cores we use dry sand cores. The process has been very successful on our road and has eliminated entirely the loss of hub liners which frequently happened when the hub wear plate was put on the box separately.

These hub plates will wear to the point where lateral motion is excessive before the crown brass requires renewing and our practice is to apply a loose hub liner made of sheet steel of thickness necessary to take up the lateral. These liners are made in two pieces and after being placed in position the edges are welded.

We formerly poured the hub wear plate on the box after the crown brass. On account of the trouble caused by these hub plates being lost on the road we began, about four years ago, to pour the hub plate integral with the crown brass itself.

Eighth Shop

Our driving box crown brass is a separate casting and is machined to fit the box on a Morton drawcut shaper with special attachment. It is then pressed in the box using from thirty to eighty tons pressure, according to the size of box.

If the brass liners on the shoe and wedge faces of box are ¼ in. or more thick, they are planed central to crown brass. If less than ¼ in. the old liners are planed off and new ones cast on. The liners are anchored by two diagonal dovetail grooves, ¾ in. wide, ¼ in. deep, planed full length of box, making it impossible for the liners to fall off.

If the hub face of the driving box is worn ⅛ in. deep, it is grooved out on a boring mill ¼ in. deep and the same diameter as the hub on the driving wheel. A piece of ⅜-in. boiler plate is electrically welded on the box which brings it back to standard. The crown

brasses are then bored out central with the shoe and wedge face on a horizontal boring mill, two at a time.

Driving wheels are counterbored out ½ in. deep and a two-part brass liner is applied. It is fastened with 8 copper rivets ⅝ in. diameter. The thickness of liner is determined by the thickness of flange on driving box. Any variation in width of engine frames and on the face of the box is made up with the thickness of this liner.

Ninth Shop

Most of the larger shops at the present time are casting hub wear plates right into the driving boxes. We, however, have no facilities for doing this work and still use the babbitt liners which last from shopping to shopping. I do not know but they give us as good service as the brasses and are more cheaply applied.

Our method is to take some strips of front end or smoke box netting and spot weld them onto the boxes before pouring on the babbitt. We use probably about 10 of these on a box and I do not know a single case of these liners losing off.

On our heavy power it is not often the wear of the crown brasses that is the cause of renewal but generally owing to the brass getting loose in the box. This is because the end sometimes gets warm due to the grease sticking and not getting up to the journal or from lack of care in refilling in our roundhouses. We do not shim any crown brasses on modern power.

On the modern power in this district we usually renew the main driving box brass about every eight months. At the same time we have to give the engine a partial change of flues owing to our extremely bad water condition as we have one section where flues have to be renewed about every four months.

The mileage we get from hub plates varies but as a rule we get 60,000 or 70,000 or even 100,000 miles from our front and back boxes. This is a matter that is largely controlled by soil conditions of the right of way. Where you have sand with considerable wind, both your bearings and hub plates will wear much more rapidly than where a heavy soil prevails. With heavy soil we have very little trouble from hot bearings.

Tenth Shop

In checking up the mileage on the various classes of locomotives on our line I find that we are making in the neighborhood of 180,000 miles with driving brasses, and are getting about 60,000 miles on engines before lateral motion has to be taken up. I also find that we take up the lateral motion three and four times before the crown brasses are worn sufficiently to remove them.

We do not practice pouring the driving brasses on this division. We do, however, pour the hub plates and also the shoes and wedge wearing surfaces on driving boxes with brass only, no white metal being used.

One of our divisions does pour the driving boxes in connection with hub plates but after doing it for some years they are now giving it up. The reason is that it seems practically impossible to hold driving brasses perfectly tight under this method and they are going back to the old method of pressing brasses in by means of the hydraulic press.

It is quite possible that the care taken at the Lackawanna shop to swab the metal core with oil before pouring such brass, may result in securing a crown brass casting which will stay tight longer than ours.

The pour method for the hub plates and shoes and wedge surfaces is very satisfactory and superior to anything else we have ever tried. We have been using it for the past twelve or fifteen years.

Eleventh Shop

The present practice followed by us calls for crown brasses to be machined all over. The driving boxes are slotted inside and the crown brasses are pressed into position. Hub face liners and shoe and wedge face liners are applied by pouring melted brass on the face of the box, the method of preparing the box for the application of these hub face liners being substantially the same as that followed by the Lackawanna.

Some time ago we made a trial of driving boxes having crown brasses and hub face liners cast in them, in accordance with the practice described as being standard on the Lackawanna. These driving boxes and brasses gave satisfactory service, but the arrangement was found to be undesirable for the reason that outlying roundhouse points were not equipped to apply new brasses by this method.

We find that as a rule the hub face liners wear out much faster than the crown brasses. It is, therefore, desirable to make the hub face liners entirely independent of the crown brass in order that the hub face liner may be renewed without removing or disturbing the crown brass. We are able to handle driving box brass work in this manner under our present practice, but it seems to me that it would be difficult to renew the hub face liner without disturbing the crown brass in a box having brasses applied in accordance with the Lackawanna practice.

We require the material in crown brasses to meet certain specifications which are quite exacting as to chemical and physical requirements. It seems to me that the practice of casting crown brasses in place in driving boxes at a number of different shops would make it difficult if not impossible to control the quality of material entering into these brasses. Our present practice as regards hub face liners is to provide material for these liners by melting up scrap brass which accumulates at the various shops. This material has proven satisfactory for lateral and shoes and wedge face liners.

We have experienced some trouble in the application of hub face and shoe and wedge face liners by the provisions above described. The heat from the melted brass in some cases causes the boxes to become badly warped and has no doubt been responsible for failure of a number of boxes, due to cracks developing in them. The tendency would, no doubt, be increased if the present practice of casting brass liners in position in the boxes were to be extended by including the crown brass.

I feel that the practice of applying driving box brasses and brass liners to shoe and wedge and hub face meets the requirements of the service in a satisfactory and economical manner.

There's a difference between abusing a lathe by overworking it and abusing it through carelessness or cussedness. Mighty few lathes are overworked either by depth of cut or too much speed or feed but many show scars and dents from wrenches and work falling on them which could have been prevented by a little care. It's running near to the overworking line that gets out the work.

Swaging Automobile Axles

By John Williams

AN INTERESTING application of the process of swaging to the making of axles for automobiles is shown in the accompanying illustrations whereby several turning operations are eliminated and a saving of stock affected that amounts to many tons in the course of a year's production. The drawing Fig. 1 shows the axle as it comes from the swaging operating.

The bar of stock from which the axle is made is 28 in. long, 3 in. shorter than the finished piece. Not only is the bar extended to gain the extra length, but the metal is made denser by the hammering of the swaging dies so that the structure is improved. The swaged

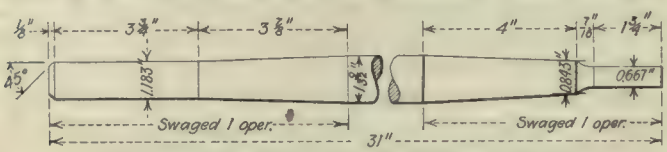


FIG. 1—DRAWING OF COMPLETED AXLE

ends are finished directly by a grinding wheel without intermediate lathe work.

The reducing member of the outfit, shown in Fig. 2 is a No. 6 H. S. Type Langelier swaging machine, water jacketed to conduct away the excess heat and preserve the temper of the dies. It is fitted with an automatic acting, air operated chuck to hold the work so that the workman has but to take a heated piece from the furnace, place the cold end in the chuck and move it forward by means of the capstan-wheel. The piece is gripped and released without conscious effort on the part of the operator.

A Langelier continuous rotary furnace, Fig. 3, heats the axles for the swaging operation. They are held

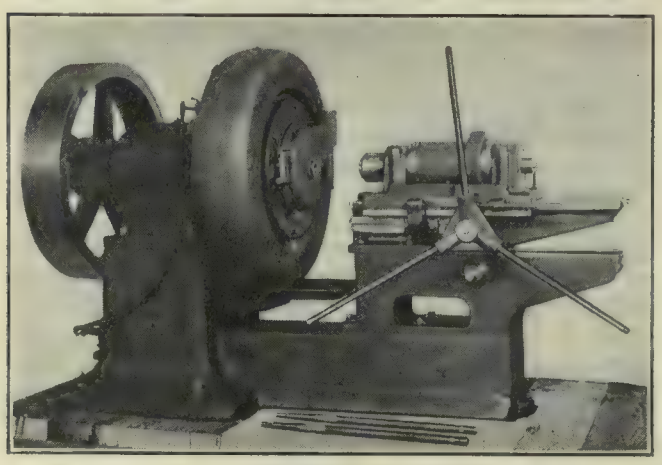


FIG. 2—THE SWAGING MACHINE

in an upright position by means of two circular tables keyed to the continuously rotating central shaft. Cup-shaped supports are bolted to the outer edge of the lower table to receive the lower ends of the pieces, while spring clamps around the periphery of the upper table pinch them at a point sufficiently removed from the upper end to allow a proper length to be heated. The vertical position of either or both tables can be altered by means of a rack and pinion movement to suit various lengths of work.

The furnace proper consists of an annular chamber enclosed at the top and sides by specially molded U-section fire bricks. The chamber does not form a complete ring; a section of the circle sufficient to provide loading space being cut away. The chamber is open at the bottom all the way around and the entering end is also open.

The central shaft is driven through the medium of worm-wheel and worn by a round belt from the countershaft of the swaging machine. A pair of 3-step cone pulleys provide for changes in speed according to the nature of the work. The rate of speed may be varied

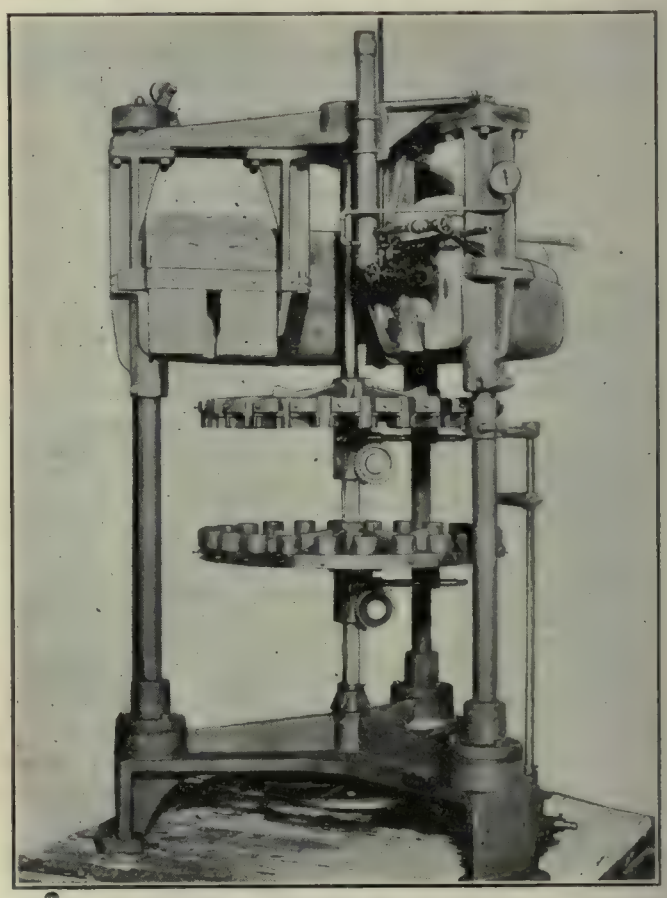


FIG. 3—THE ROTARY FURNACE

from 1 rev. in 3 min. to one rev. in 6 minutes. There are 24 positions to the table. As the operator sets each piece in succession into the holding device, it is carried slowly around the circle with its upper end projecting into the fire chamber. The length to which it is heated is determined by the vertical position of the carrying tables, and is sharply defined; a distinct advantage in hot swaging operations.

If the carrying tables are revolving at their slowest rate, 1 rev. in 6 min., it requires something over 5 min. to raise the heat of the first piece to the desired temperature, but as in the meantime the remaining positions have been loaded, the machine delivers a heated piece every 15 seconds after the first revolution. When a piece has passed through the cycle and is approaching the closed end of the annular fire-chamber, the operator grasps it by the cold lower end, lifts it slightly to disengage it from the cup of the lower table, and allows it to drop endwise out of the clamp of the upper table. Should he be delayed, or the furnace be moving too fast for him to keep up, the piece contacts with a tripping lever and automatically stops the rotative movement. A treadle re-engages the clutch when the operator is ready.

German Standards for Tolerances and Allowances in Machine Fits

By OSCAR R. WIKANDER

THE FIRST question for the individual manufacturer to decide is whether he shall adopt the unit bore, DINORM 777, or the unit shaft system, DINORM 778.

In order to keep the tool expense as low as possible it is, of course, advisable to confine oneself to the practically exclusive use of *one* of the above systems and this is, as a rule, possible.

The characteristic feature of the unit bore system is that for each basic size, all the bores have the same diameter and, within the same grade of fits, the same tolerance, while the different classes of fits are obtained by changing the size of the shaft. For each bore only one reamer (as long as the material remains the same), one plug gage (within the same grade of fits) and one arbor are necessary. Gears and other machine elements with internal bores can be manufactured in quantities and kept in stock, each part being suitable for any class of fits and interchangeable with any other part of the same bore.

For this and other reasons, which are explained at length in the DIN-BUCH, the unit bore system is, as a rule, the preferable one. It has been adopted by the locomotive and car builders, the machine tool, the automotive and the pneumatic tool industries.

In the unit shaft system, the shaft diameter and, within the same grade of fits, the shaft tolerances, are the same for each basic size and the different classes of fits are obtained by changing the size of the bore. For each bore as many reamers, plug gages and arbors are necessary as are classes of fits being used.

For each basic size there is, however, only *one* size of shaft, and cold-rolled or drawn material can in many cases be used without requiring any machining whatsoever. But even when machining is necessary, the economical advantages of using a uniform size of shaft or pin are often considerable.

For transmissions, for example, it is necessary to use the unit shaft system, because it must be possible to place standard pulleys, couplings, etc., anywhere on the shaft and because it is customary to use cold-rolled shafts without machine work. Similar considerations will lead to the adoption of this.

BIG CLEARANCES — DIN 170

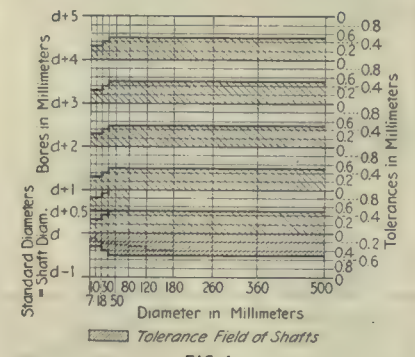


FIG. 1

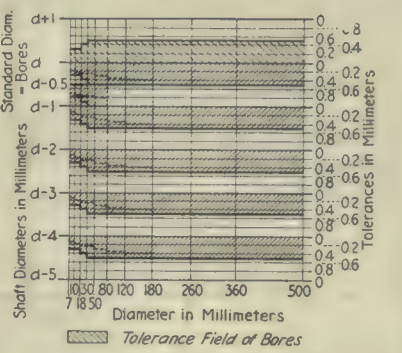


FIG. 2

1—For "Big Clearances" which correspond to a coarser Grade of Fits than "Coarse Grade of Fits," the following minimum clearances are used: 0.5, 1, 2, 3 and 4 millimeters.

2—These clearances are indicated by the difference of the dimensions given on the drawings; for example, in case of 1 mm. clearance: shaft 35 ϕ, bore 36 ϕ. *One* basic size for shaft and bore is not used and the "big clearances" are therefore not "machine fits" in the more restricted sense of the words.

3—The shaft dimensions indicate always the maximum size, the upper variation being *O*, the lower negative. The bore dimensions indicate always the minimum sizes, the lower variation being *o*, the upper positive. The variations must be given in figures according to Din 406, Sheet 3; for example: shaft 35 ϕ — 0.5, bore 36 ϕ + 0.5.

4—If two parts do not move in relation to each other, and it is only required that the one shall enter the other, shaft and bore may be made to the same nominal size, the minimum clearance thus being zero.

5—As a guidance for the upper variations of the bores, 30 *PE* may be used up to 50 mm. ϕ, and 0.5 mm. for all sizes above 50 mm., as shown in the following table:

Base	7 to 10	above 10 up to 18	above 18 up to 30	above 30
Upper Variation	+ 0.3	+ 0.3	+ 0.4	+ 0.5
Lower Variation	0	0	0	0

6—As a guidance for the lower variations of the shafts, 30 *PE* may also be used up to 50 mm. ϕ, and 0.5 mm. for all sizes above 50 mm. ϕ, as shown in the following table:

Shaft Diameter	7 to 10	above 10 up to 18	above 18 up to 30	above 30
Upper Variation	0	0	0	0
Lower Variation	— 0.3	— 0.3	— 0.4	— 0.5

In case cold-drawn steel is used the drawing tolerance *C* for drawn material, according to DIN 669, should be used (commercial quality). The lower variation curves for such material (—15 *PE*) are indicated with dotted lines in Figs. 1 and 2.

7—Standard diameters should, as a rule, be used for the shafts and the clearances should be provided for in the bores (Fig. 1). If, however, no drawn material is to be considered, it is possible to use standard diameters for the bores and provide for the clearances in shaft dimensions.

April, 1923.

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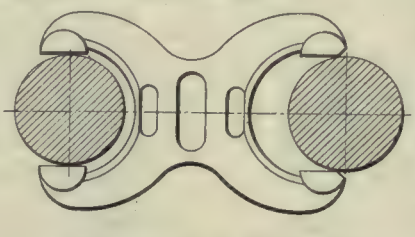
Pressitz
Fine Grade of Fit
Unit Bore System

DIN 54

Symbol for Pressitz: *P*

The "Pressitz" is used for parts which must remain tight under all conditions and which are fitted together by means of heavy pressure. Before a "Pressitz" is adopted it should be considered whether the maximum and minimum tightness (see columns 4 and 5) are suitable for the purpose and, if necessary, tests should be made to ascertain whether the fit suits the requirements. The strength of the union depends on the shape and material of the parts. For certain press fits for heavy machinery a greater tightness is desirable.

"Go" end
The weight of the gage shall suffice to force it over the shaft.



"No Go" end
It must not be possible to push the gage over the shaft. It must at the most stick to the shaft.

Dimensions in Millimeters

Range of Diameters	New Gage Variations		Calculated Tightness For New Gages.[1]		Worn Gage "Go" End		Kind of Gage
	Upper "Go" End	Lower "No Go" End	Minimum	Maximum	Permissible Wear	Variation	
1 to 3	+0.015	+0.010	0.001	0.015	0.0015	+0.0165	Snap Gage
Above 3 up to 6	+0.022	+0.015	0.003	0.022	0.0020	+0.024	
Above 6 up to 10	+0.030	+0.020	0.005	0.030	0.0025	+0.0325	
Above 10 up to 18	+0.038	+0.025	0.007	0.038	0.0030	+0.041	
Above 18 up to 30	+0.045	+0.032	0.010	0.045	0.0040	+0.049	
Above 30 up to 50	+0.060	+0.040	0.015	0.060	0.0045	+0.0645	
Above 50 up to 80	+0.075	+0.055	0.025	0.075	0.0050	+0.080	
Above 80 up to 120	+0.090	+0.065	0.030	0.090	0.0060	+0.096	
Above 120 up to 180	+0.105	+0.080	0.040	0.105	0.0070	+0.112	
Above 180 up to 260	+0.130	+0.100	0.055	0.130	0.0080	+0.138	
Above 260 up to 360	+0.155	+0.120	0.070	0.155	0.0090	+0.164	
Above 360 up to 500	+0.180	+0.140	0.080	0.180	0.0100	+0.190	

[1] Corresponding bore: *B* according to DIN 19.
Standard Temperature: 20 deg. *C* = 68 deg. *F*.

March, 1923.

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system in some cases of heavy machine construction, for certain kinds of electrical apparatus, etc. Up to the present time it has been adopted by the transmision machinery and the textile machine builders. Many efforts have been made by German experts to combine the advantages of the unit bore and the unit shaft systems, in order to obtain *one* universally acceptable system. The most noteworthy of such combinations is the one proposed by Gottwein. He uses the Gleitsitz, in which the unit bore matches with the unit shaft as a bridge between the two systems. For all fits, looser than the Gleitsitz, he used the unit shaft and for all fits tighter than the Gleitsitz, he uses the unit bore system. While this system in some cases is preferable to the ones mentioned, it does not fully utilize the advantages of either and has, therefore, not been found worthy to take their place.

Regarding other suggestions, we refer to the above DINBUCH No. 4, Passungen, by Wm. Gramenz, Chief Engineer, Dinorm, Berlin.

It may be of interest to note that, after careful consideration, *one* of the two larger electrical manufacturers in Germany has adopted the unit bore system, while the other has adopted the unit shaft system, and each seems to have made the proper selection. The difference in opinion is due to the fact that one of the firms manufactures very large quantities in certain lines of machinery, while the other excels in a somewhat different line.

In order to obtain economical production it is, of course, of the greatest importance that the grade and class of each fit be properly selected. These selections require, however, considerable knowledge of tolerance questions and, in order to assist the manufacturer, recommendations of suitable fits for a number of typical applications have been published in the DINBUCH. These recommendations go further into details than those published up to the present time by the A.S.M.E. Plain Gages Committee (see *American Machinist*, page 71, Vol. 57), but it is nevertheless expected that the specialists in each line will have to co-operate in order to establish and standardize on the most suitable fits for all important applications.

The extra fine grade of fits (Edelpassung) is only used for the Festsitz, Treibsitz, Haftsitz, Schiebesitz and Gleitsitz and only in cases where severe requirements are made as to the uniformity of the product.

The fine grade of fits (Feinpassung) is used for all classes of fits and is sufficient for all normal requirements.

The following examples illustrate the use of the various classes of fits in the above two grades:

Pressitz (*P*), is used in general machine design for bronze rims on cast-iron gears and worm gears, bushings or bearings in frames, housings, gear wheels and connecting rods, and for couplings.

Festsitz (*eF* and *F*), is used in machine-tool design for wheel rims, bearing bushings, hubs, stop rings, etc. In automotive construction, for bushings in wheel-hubs. In reciprocating-engine design, for cranks and levers on shafts, when Pressitz cannot be used, and for cylinder linings. In general machine design, for inserted pivots in rolls, worm gears, all parts which have to sustain shocks while in operation, such as gears in crushers (when Pressitz cannot be used), wheels of industrial trucks, railway motor gears, etc.

Treibsitz (*eT* and *T*), is used in machine-tool design,

for gears, which must be removable (Festsitz therefore unsuitable), but must fit tight on the shaft. Such gears must be locked on the shaft.

Haftsitz (*eH* and *H*), is used in machine-tool design, for parts which are held with keys and seldom removed, gears on lathe spindles, clutch disks, hand wheels, etc. In automotive construction for levers and gears on their shafts, when their removal by primitive means must be possible. In reciprocating-engine design, for gears, cams and eccentrics for the operation of regulators and valves and on cams or crankshafts, flywheels, etc. In general machine design, for turbo-runners, clutches, gear wheels, brake disks, tight pulleys, flywheels, cranks for light duty, driving and driven parts in general (when they are mounted at the end of a shaft and a tighter fit is not necessary), electrical armatures, packing-box linings, hardened bushings for valve levers and the like.

Schiebesitz (*eS* and *S*), is used in machine-tool design, for parts which frequently have to be removed, stationary axles in their seats, etc. In reciprocating-engine design, for the cylindrical offset of the piston rod in the crosshead, fork pins in the valve gear, etc. In general machine design, for centrifugal runners on their shafts.

Gleitsitz (*eG* and *G*), in machine-tool design, for center pins in tail stocks of lathes, column guides of radial drilling machines, chucks on drill spindles, speed-changing gears on their shafts, mills on their seats, handles in hand wheels, index pivots in dividing heads, etc. In reciprocating-engine design, for all parts requiring a "sucking fit," such as pistons for oil brakes. In general machine design, for clutch disks, friction clutches on their shafts and the like.

Enger Laufsitz (*EL*), is used in machine-tool design, for idlers, spindle bearings for grinding machines, speed change-gears, etc. In reciprocating-engine design, for wristpin bearings, valve stems, indicator pistons, etc. In regulator design, for pistons for various purposes. In general machine design, for sliding couplings.

Laufsitz (*L*), is used in machine-tool design, for bearings for high-grade drive shafts, main bearings for lathes, milling and drilling machines. In automotive construction, for bushings and bearings for cardan, crank, and camshafts and for connecting rods. In regulator design for all bearings on revolving weights, sleeves on shaft, guides, etc. In general machine design, for use in bearings in transmissions and in worm gear boxes.

Leichter Laufsitz (*LL*), is used in machine-tool design, for feed screws, for tool holders and for shafts supported in many bearings.

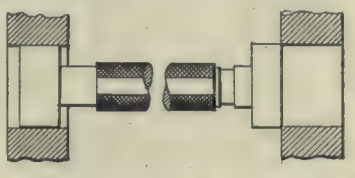
Pressitz
Fine Grade of Fit
Unit Shaft System

DIN 55

Symbol for Pressitz: *P*

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"Go" end
The gage shall enter the hole without being forced.



"No Go" end
It must not be possible to push the gage in. It must at the most stick at the opening.

Dimensions in Millimeters

Range of Diameters	New Gage Variations		Calculated Tightness For New Gages[1]		Worn Gage "Go" End		Kind of Gage
	Upper "Go" End	Lower "No Go" End	Minimum	Maximum	Permissible Wear	Variation	
1 to 3	—0.007	—0.015	0.001	0.015	0.0020	—0.017	Up to 100 mm. Plug Gage
Above 3 up to 6	—0.010	—0.022	0.002	0.022	0.0030	—0.025	
Above 6 up to 10	—0.015	—0.030	0.005	0.030	0.0035	—0.0335	
Above 10 up to 18	—0.020	—0.038	0.008	0.038	0.0040	—0.042	
Above 18 up to 30	—0.025	—0.045	0.010	0.045	0.0050	—0.050	
Above 30 up to 50	—0.035	—0.060	0.017	0.060	0.0060	—0.066	
Above 50 up to 80	—0.045	—0.075	0.025	0.075	0.0070	—0.082	
Above 80 up to 120	—0.055	—0.090	0.033	0.090	0.0080	—0.098	Above 100 mm. Flat Gage
Above 120 up to 180	—0.065	—0.105	0.040	0.105	0.0090	—0.114	
Above 180 up to 260	—0.085	—0.130	0.055	0.130	0.0100	—0.140	
Above 260 up to 360	—0.105	—0.155	0.070	0.155	0.0120	—0.167	Ball end Gage[2]
Above 360 up to 500	—0.120	—0.180	0.080	0.180	0.0140	—0.194	

[1] Corresponding shaft: *W* according to DIN 40.
[2] When flat or ball end gages are used somewhat tighter fits are at times obtained than with plug gages.

Standard Temperature: 20 deg. *C* = 68 deg. *F*.

March, 1923.

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Weiter Laufsitz (*WL*), is used in general machine design, for high grade transmissions and countershafts, high-speed machinery and in special cases, where a loose fit of great exactness is required.

Plain Grade of Fits (Schlichtpassung) is used in cases where the requirements in regard to uniformity of the fits are not very severe.

Schlichtgleitsitz (*sG*), is used in general machine design, for bores for stop rings, hand cranks, gear wheels, solid pulleys, couplings, etc., which have to be pushed over the shaft.

Schlichtlaufsitz (*sL*), is used in automotive construction, for hub bushings for front wheels. In reciprocating-engine design, for main bearings for crank shafts,

Tolerances for the Adjustment of Working Gages[1]

DIN 168

For limit gages the following tolerances from the ideal dimensions[2] are permitted:

1—The "Go" end shall have a unilateral tolerance in the direction opposite the wear, thus:

a—A positive tolerance in case of Plug, Flat and Ball-End Gages.

b—A negative tolerance in the case of Snap Gages.

2—The "No Go" end shall, in view of the negligible wear, have symmetrical bilateral tolerances, the total tolerance for the adjustment of the gage being the same as for the "Go" end.

u (1u = 1/1000 mm.)

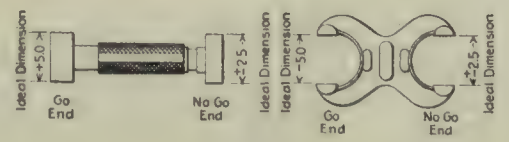
Range of Diameters in mm. Basic Sizes	Tolerances in case of							
	Extra Fine Grade of Fit				Fine Grade ofFit			
	Plug, Flat and Ball End Gages		Snap Gages		Plug, Flat and Ball End Gages		Snap Gages	
	"Go" End	"No Go" End	"Go" End	"No Go" End	"Go" End	"No Go" End	"Go" End	"No Go" End
1 up to 3	+1.5	±0.8	—2.5	±1.3	+ 2.5	± 1.3	— 2.5	± 1.3
Above 3 up to 6	+1.5	±0.8	—3.0	±1.5	+ 3.0	± 1.5	— 3.0	± 1.5
Above 6 up to 10	+2.0	±1.0	—4.0	±2.0	+ 4.0	± 2.0	— 4.0	± 2.0
Above 10 up to 30	+2.5	±1.3	—4.5	±2.3	+ 4.5	± 2.3	— 4.5	± 2.3
Above 30 up to 50	+3.0	±1.5	—5.0	±2.5	+ 5.0	± 2.5	— 5.0	± 2.5
Above 50 up to 80	+3.5	±1.8	—6.5	±3.3	+ 6.5	± 3.3	— 6.5	± 3.3
Above 80 up to 120	+4.5	±2.3	—8.5	±4.3	+ 8.5	± 4.3	— 8.5	± 4.3
Above 120 up to 180					+10.0	± 5.0	—10.0	± 5.0
Above 180 up to 260					+12.0	± 6.0	—12.0	± 6.0
Above 260 up to 360					+16.0	± 8.0	—16.0	± 8.0
Above 360 up to 430					+18.0	± 9.0	—18.0	± 9.0
Above 430 up to 500					+20.0	±10.0	—20.0	± 10.0

Din 168—Continued

Range of Diameters in mm. Basic Sizes	Tolerances in case of							
	Plain Grade of Fit				Coarse Grade of Fit			
	Plug, Flat and Ball End Gages		Snap Gages		Plug, Flat and Ball End Gages		Snap Gages	
	"Go" End	"No Go" End	"Go" End	"No Go" End	"Go" End	"No Go" End	"Go" End	"No Go" End
1 up to 3	+ 6	±3	— 6	±3	+10	± 5	—10	± 5
Above 3 up to 6	+ 6	±3	— 6	±3	+10	± 5	—10	± 5
Above 6 up to 10	+ 6	±3	— 6	±3	+10	± 5	—10	± 5
Above 10 up to 30	+ 7	±3.5	— 7	±3.5	+12	± 6	—12	± 6
Above 30 up to 50	+ 8	±4	— 8	±4	+12	± 6	—12	± 6
Above 50 up to 80	+10	±5	—10	±5	+14	± 7	—14	± 7
Above 80 up to 120	+12	±6	—12	±6	+18	± 9	—18	± 9
Above 120 up to 180	+14	±7	—14	±7	+22	±11	—22	±11
Above 180 up to 260	+18	±9	—18	±9	+28	±14	—28	±14
Above 260 up to 360	+22	±11	—22	±11	+36	±18	—36	±18
Above 360 up to 430	+26	±13	—26	±13	+44	±22	—44	±22
Above 430 up to 500	+30	±15	—30	±15	+50	±25	—50	±25

[1] Tolerances for the adjustment of inspection gages see DIN 171.
[2] Ideal dimension = basic size + (or —) variation.

Example for the range of diameters 30 to 50 mm. Fine grade of fit.



April, 1923. 2 (corrected) issue.

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connecting-rod bearings, crosshead guides, piston-rod guides, slide-valve rods, valve stems for combustion engines, shafts running in three bearings or subject to high temperature, pistons and piston valves in their cylinders, plungers in bushings and eccentrics. In general machine design, for bearings for dynamos, rolls, centrifugal pumps, ventilator shafts, loose rope wheels, packing box glands, sliding sleeves for couplings, etc. In locomotive construction, for wrist pins for valve rod crossheads.

Weiter Schlichtlaufsitz (*sWL*), in automotive construction for bearings for motor plows. In general machine design, for hub bushings for animal-drawn vehicles, bearings for agricultural machinery, transmission bearings. In locomotive construction, for centering of cylinder and valve box heads, packing box parts, width of piston rings and pivots of the reversing gear.

Rough Grade of Fits (Grobpassung), is used in cases where loose fits and great variations in dimensions are permissible, or where the fits have to be very loose in order to prevent the formation of rust to make the fit tight.

Grobsitz (*g1*), is used in general machine design, distance sleeves and parts which are stuck together in order to be welded. In mechanical apparatus construction, for bearings for lever switches, bores in hand levers and typewriter parts. In locomotive construction, for valve rod guides.

Grobsitze (*g3*), is used in general machine design, for bearings for agricultural and household machinery. In automotive construction, for fork pins for brake gears. In mechanical apparatus design, for lock pins for switch levers, axle bearings for drum switches, piston contacts and sheet iron covers. In locomotive and car construction, for bolts in the regulator gears for locomotives, pivots, and buffer bases.

Grobsitz (*g4*), is used in locomotive and car construction, for regulator shafts for locomotives, smoke chamber doors, spring and brake suspensions, brake shafts, coupling bolts. In apparatus design, for sheet iron housings.

The Human Equation in Making Gears

MODERN business depends more upon men than upon dollars. Given the opportunity of investing in a business with abundantly strong financial resources but with questionable management, and a struggling business but with high grade and trained management, any intelligent man would take the latter as having the best chance for the future. In Europe where business is conservative and old standards are adhered to, initiative is not so important a factor; but in America, the land of opportunity, we find it also the land of the opportunist and the man who forges ahead rapidly is the man just one jump ahead of the rest, seeing things just a little bit sooner than his competitors, flexible in his mind and flexible in his organization so that he is able to keep apace with the swift moving trend of our modern American business. No one man can provide all of the ideas or all of the advancements necessary for an industry and if he is able to thoroughly organize his industry from top to bottom with sympathetic, alert co-operation from each and every employee, he has to a large degree solved his problem of personnel. Ways and means to accomplish this should be the primary function of any industrial relations committee.

We have heard a great deal about the open and closed shops and about wages paid in the industry. Any man who is at all a student of economics knows the hardships and inefficiencies brought about when a shop is thoroughly unionized. It should not be necessary for a committee to suggest the answer to this problem. On the other hand, there are some industries and some localities that have inherited a policy that they cannot change and we believe it most desirable that they seek for the largest measure of constructive suggestions that shall enable them to live as far as possible in peace and harmony with their own situation.

After having carefully studied a very large number of wage questionnaires sent out by manufacturing associations, the writer feels that this is a field so thoroughly covered that the A.G.M.A. need not attempt duplication. After all these are local problems fixed by living conditions and wage conditions in each separate locality and in each separate shop. With a varying system of premiums, wage incentives, and similar extra payments, with an impossible classification of men working in various shops and on various qualities of work, we feel that the value of the questionnaire is exceedingly small in its practical standpoint.

Let us suggest then that we take our minds for a bit off these thoughts and deal with some of the other attributes of our industrial relations.

The Old Problem of Labor Turnover

Labor turnover costs far more than many of the slight variations in labor pays that worry us so much. Various estimates have been made as to the cost of breaking in a new man but even the lowest are staggering when we consider that many shops are absolutely heedless as to the change of men. It should be the function of the management to study their local conditions so carefully that their shop becomes a home for their employees and they cultivate their good will. No iron clad formula can be applied; in the small shops it is done by personal contact of the boss himself. In the larger shop it must necessarily be somewhat delegated. We believe, however, that under no circumstances can the right spirit be obtained if it does not very distinctly emanate from the head of the industry and if every member of the industry does not realize that the chief executive is interested in his employees and in their problems. Paternalism in the industry has been often condemned, yet the fact remains that the industries where the greatest loyalty is felt and where labor turnover runs lowest are those where the head is looked upon as the big daddy of the whole bunch. A good bouquet of flowers when an employee is sick or when a baby comes into the home will often do more to cement good will in the industry than many of our elaborate efforts through bulletin boards and pay roll inserts, but lacking in personal touch.

The future of America as a nation requires that every effort be put forth by the employer of today to help employees to think right. Tremendous agitation is seething throughout the country, prompted by European

Abstract of report of E. S. Sawtelle, Chairman of the Committee on Industrial Relations, to the American Gear Manufacturers Association, Fall Meeting, October, 1923.

experiments in Bolshevism or Communism. Organized labor is frequently asserting that it is the bulwark of safety against such agitation and many employers are misled through these claims. Actual facts usually demonstrate that the organizers are perfectly willing to draw into their ranks any agitator whatever if they feel that by so doing they can strengthen themselves in their craft. The surest safeguard against radical socialism is for a man to own something. The next best is for him to have a right viewpoint toward the other fellow who owns more than he does. Stock ownership properly safeguarded is a step toward larger democracy. Profit-sharing through wage incentives, production bonuses, or an actual sharing of profits, if it carries with it the personal touch of management, can be used very effectively in reducing labor turnover and in creating an organization that builds still greater profit. Above all these is the influence of a clean-living employer who does not flash his wealth before his employees and who is willing to give of his time to know his men personally as far as possible and to frequently talk with them individually and collectively about the mutual problems of their business or their personal lives. This was the secret of the old-fashioned little shop where the boss worked in with his men. It is the secret of our large shops where success in personnel has been accomplished.

Your committee feels that time can well be spent in studying reports on the various types of wage incentives and how they can be applied and the benefit obtained thereby. We feel that suggestions and experience on the question of training workmen and foremen will be of value; we feel that suggestions on managerial contact with men and welfare work are well worth careful consideration; despite the old adage that religion and business do not mix, we feel that a certain amount of religious influence has proved wonderfully successful in many shops toward building character in the workmen and promoting the ideal spirit of co-operation.

Certain companies have made spectacular progress along welfare and kindred lines and have stood as an example of leadership for their industries. We propose to investigate some of these and attempt to bring before our association some of the plans that they have successfully worked and the results to be obtained therefrom.

Again let us reiterate that no two personalities are the same, no two shops are the same, and that industrial relationship is 99 per cent a matter of applied personality. Hence this whole question is one that each man must solve for himself and we believe, as he approaches a solution, he will be working not only for the benefit of his own industry but for a more permanent stability of our whole nation.

Metal Cutting Tools—Discussion

By R. Poliakoff

In his discussion of metal cutting tools on page 64, Vol. 59 of the *American Machinist*, F. W. Elstub mentions the hollow curved top face tool, and states that it has been proved to the satisfaction of many users that such tools absorb considerably less power than equivalent straight faced tools.

The question raised by Mr. Elstub deserves more than

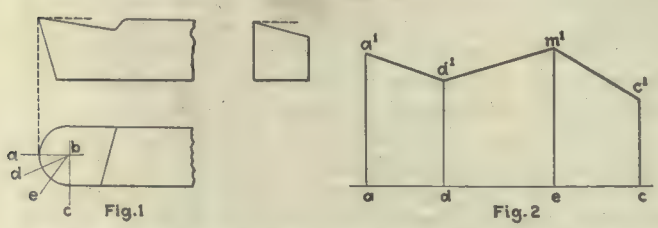


FIG. 1—THREE VIEWS OF A ROUND-EDGE TOOL. FIG. 2—CURVE SHOWING VARIATION OF CUTTING ANGLE

a passing remark and the writer discussed the same point with regard to a round nose tool about six years ago at a meeting of the American Society of Mechanical Engineers.

If we take the ordinary round-edge tool, as shown in Fig. 1, with the ordinary angles of front rake, side rake and clearance, we shall find by a very simple mathematical analysis that when the front rake is less than the side rake, as it usually is, the cutting angle changes from point to point of the edge. Let us assume that the chip and all its elements go off the point. The angle will have one value at the plane *ab*, the plane of the front rake, a lesser value at the plane *bc*, side rake, and intermediate values at intermediate points.

If we lay off the respective values of the cutting angles at the corresponding different points *a*, *d*, *e*, *c*, of the cutting edge, then these values would change like the curve *a'*, *d'*, *m'*, *c'*, as shown in Fig. 2. In other words, the angle will first decrease, then go up a little, then decrease again until it reaches the lesser value *cc'*, corresponding to the plane *bc*. These angles, with an ordinary round-edge tool and the usually accepted angles of side and front rake, therefore change in a curve with some peak points in it.

Friction of Elementary Chips

If we assume that the chip consists of elementary chips, each element going off the bar at right angles to the cutting edge, then these different elementary chips have to descend on inclined planes with changing angles, and necessarily one elementary chip is either retarded or accelerated in its downward movement by its adjoining chip. This retardation or acceleration must create inner friction and cause scratches on the hollow of the tool, every single scratch being the mark left by the elementary chip.

It is evident that in order to decrease this friction and thus the power required to remove the chip, as well as to prolong the life of the tool by eliminating the scratches produced by the elementary chips, the tool should be of such a shape that all its cutting edges are equal at all points of the cutting edge.

In order to achieve this end, the surface inclosed by quadrant *adec*, Fig. 1, should not be a plane but hollowed out by a drill with its center point at *b* and having a radius *ab*, equal to *bc*, and its cylindrical body perpendicular to the plane of the quadrant. In this way all the cutting angles would be equal all the way through from *a* to *c* just as in the case of a straight-edge tool.

Of course, this calls for another way of preparing the turning tool, both with regard to machining and grinding, but this can be arranged. The writer introduced such a tool in the Laboratory of Technology at the Technical Institute, Moscow, Russia, and has also designed some grinding attachments to grind the hollow produced by the drill.

Wage-Incentive Systems

By EUGENE BOUTON

Group piece-work plan for major assembly units and machining departments — Workman's wages determined by total group earnings — Unit costs kept uniform — Prompt wage records

WAGE-INCENTIVE systems constitute one of the important problems of the industrial world. Many writers on wage systems, management and personnel administration cover their systems very well; but their articles are largely lacking in statistical information. In modern industry, the unit-cost of production is an important factor. It does not matter how much a man receives per hour or per day if his output is in proportion to his wages. There are many plants that are so well organized that they pay high wages and yet have a low production-cost, while other plants more poorly organized have a high unit-cost of production in spite of the fact that they are paying low wages.

Practically all managers of modern plants believe that some wage-incentive plan is necessary to attain the highest production possible. The subject of most discussions ragarding wage-incentive plans is: What is the proper system to install? Many men state that standard time is the best, while it is claimed by others that straight piece-work, group-bonus, premium and the like are much better. It would be interesting indeed to survey all the plants in the automotive industry to determine what wage-incentive systems are in use, to tabulate them in divisions, and thus show exactly which systems are most favored. Some of the systems now in use are highly complicated and involve a large amount of clerical work and maintenance expense. Using such systems, the employer does not know with certainty in advance just what the direct labor-cost will be, nor does the employee know what his earnings will amount to in a pay-period. As a rule, costs and earnings are compiled at the end of a pay-period or of every month.

No Universal Plan

Manufacturing conditions, as well as the manufacturing processes in the departments of a large plant, vary considerably and cause entirely different problems to arise. Therefore, a single wage-incentive plan which will fit all departments in an automobile plant satisfactorily is yet to be evolved. The straight piece-work system has been criticized severely by both employer and employe, sometimes unjustly because of the application of piece-work to operations which do not lend themselves to this form of wage-incentive. When the correct and applicable system is used, the opposition of labor is reduced to the minimum. However, there are many operations in connection with which straight piece-work is perhaps the best incentive-plan to apply. The same is true of other forms of wage-payment plans whenever one particular system is used throughout a factory.

A paper presented at the Production Meeting of the Society of Automotive Engineers, Cleveland, Ohio, Oct. 25, 1923.

The company I represent has adopted the group piece-work plan for the major assembly units and machining departments, a sample form being shown in Fig. 1 Straight individual piece-work, a record form for which is shown in Fig. 2 is used for small parts on which the operations do not lend themselves very readily to group piece-work and which are, in fact, apart from any group of men or operations which involve only one,

GROUP PIECE WORK

OPERATION AND ROUTING SHEET

Date 6-6-23 Group No. 101

Part Name INTAKE & EXHAUST MANIFOLD ASSEMBLY Part No. 7109A

Material Cast Iron Model 23 Req. per car 1 Sheet No. 1

OPER. No.	OPERATION	PRICE	HRLY PROD.	TOOL No.	TOOLS OR EQUIPMENT
1	The following operations on Part No. 7109, Exhaust Manifold, No. 7115 Intake Manifold and the Manifold Assembly to be worked as a group for the price per completed Manifold as shown:-	----	1.14		(See Below)
	Part No. 7109.				
	a. Bore exhaust end		18.6	700	Cincinnati Drill Holding Fixture
	b. Mill flanges		7.1	125	Brown & Sharpe Mill Double Mill Fixture
	c. Mill face pad		7.75	101	#3 Cincinnati Mill Double Mill Fixture
	d. Drill (7) 17/64" holes		23.1	38	Colburn Drill Press Drill Jig
	e. Mill air pad		21.8	249	#2 Cincinnati Mill Milling Fixture
	f. Drill & tap (4) 5/16"-18air pad holes for cover		22.9	273	Hamond Radial Drill Holding Fixture Drill Jig
	g. Tap (7) 5/16"-18 face pad holes and drill for & tap (2) 5/16"-18 exhaust flange holes		21.6	322	Hamond Radial Drill (2) Holding Fixtures (1) Drill template
	Part No. 7115.				
	a. Mill flanges		7.1	125	Brown & Sharpe Mill Double Mill Fixture
	b. Mill face pad		7.75	101	#3 Cincinnati Mill Double Mill Fixture
	c. Drill (8) 11/32" face pad holes		22.6	38	Colburn Drill Press Drill Jig.
	d. Spotface (7) bolt hole bosses		35.1	133	Cincinnati Drill Pres. Holding Fixture
	Manifold Assembly				
	a. Assembly intake & exhaust manifolds		6.13		Assembly Bench Holding Fixture
	b. Drill (10) 15/32" and (8) 7/16" flange holes.		19.5	119	Natco Multiple Drill Indexing Fixture
	c. Mill carburetor pad		22.9	315	#3 Cincinnati Mill Holding Fixture
	d. Drill (2) 25/64" holes for carbreter bolts and chamfer intake ports		16.9	133	Cincinnati Drill Holding Fixture

Remarks All operations to be worked as a group and the total earnings pro-rated among the number of men working in the group in proportion to their hourly rates.

Approved .....

FIG. 1—OPERATION AND ROUTING SHEET FOR GROUP PIECE-WORK

two or three operations to complete the part. The piece-work prices are established from data obtained in an elemental time-study. The time-study record is shown in Fig. 3.

The group piece-work plan is fundamentally the same as straight piece-work. A time-study of all the operations in the entire group is taken, reasonable allowances for fatigue, tools and contingencies are made, and the price is set based on the additive time. The group earnings are derived from the number of accepted finished units multiplied by the unit price. The indi-

vidual workman's earnings are prorated out of the group earnings based on his hourly rate and the number of hours worked. A simple method of figuring the individual earnings is that: The total group piece-work earnings divided by the total day-rate earnings of the group equals the factor by which is multiplied the workmen's day-rate earnings; this gives his prorated piece-work amount. Thus,

$$W = T/D \times H \times R$$

H = Hours worked
R = Hourly rate
T = Total group-earnings
D = Total group hourly-rate
W = Employee's total earnings

One of the important factors in the successful operation of the group plan is the differentiation of hourly rates. The most careful judgment should be exercised in rating the men according to their ability and to the skill required to perform the respective operations. All unskilled operators, including new men, should receive the minimum hourly-rate; skilled and semi-skilled workmen should be rated accordingly, above the minimum rate. Maximum and minimum hourly-rates are specified by the management and all rates must be within

INDIVIDUAL PIECE WORK

OPERATION AND ROUTING SHEET

Date 8-2-23

Part Name CRANKSHAFT BEARING CAP - FRONT Part No. 20123

Material Aluminum Model 32 Req. per car. 1 Sheet No. 1

OPER No.	OPERATION	PRICE	HRLY PROD	TOOL No.	TOOLS OR EQUIPMENT
1	Mill bottom surface	.0080	83	22	Cinn. Vertical Mill Milling Fixture
2	Drill (4) stud holes	.0130	47.4	120	Natco Multi. Drill Drilling Fixture
3	Ream (4) stud holes	.0077	83.2	568	Canedy Otto Drill Press
4	Spotface (4) stud holes	.0092	70	568	Canedy Otto Drill Press

Remarks Supersedes sheet dated 4-27-23 Approved

FIG. 2—OPERATION AND ROUTING SHEET FOR INDIVIDUAL PIECE-WORK

those specified. If a workman requests an increase in hourly rates, and the increase is favorably recommended by the department foreman, this can be granted without increasing the cost of the unit, as the workman simply receives a higher pro-rated share of the total group-earnings. This has been an important and satisfactory factor in the revision of rates, and balances better the earnings of the various operators according to the work which they perform.

Another feature of the group piece-work plan is the immediate determination by the foreman of the number of men required to produce according to any given schedule of units. For example, if it requires 100 men to finish 100 units per day and the schedule of production should drop to 75, practically 75 men would be required to produce 75 units. However, if the schedule should drop to 50, it would, in actual practice, require a few more than 50 men, due to the fact that each workman would have to perform more operations and individual production would be limited for that reason.

TIME STUDY RECORD

DATE PART NO.
NAME OF PART MAT'L OPER. NO.
DESCRIPTION OF OPER. MACH. NO.
DEPT. NO.
OPERATOR

SUB-OPER	TOOL NUMBER	NAME OF TOOL

TOOL SET-UP
TIME PRICE
FLAT TIME PER PIECE
TOOL ALLOWANCE PER PIECE
TOTAL TIME PER PIECE
60 = NO. PC'S PER HOUR
% OF = PC'S ON WHICH TO SET PRICE
= PRICE PER PIECE
BASE RATE PRICE PER 100

SUB-OPERATIONS	SPEED	FEED	DEPTH CUT	NO. OF CUTS	FEET MIN	ACTUAL TIME TAKEN	AVER
TOTAL							

PREVIOUS PRICE LUBRICANT BRINNELL
SCLEROSCOPE
REMARKS

SIGNED APPROVED APPROVED

FIG. 3—TIME STUDY RECORD

Likewise, when the schedule of production is increased, say to 150 units per day, it would not require 50 additional men in actual practice.

The group or cost price of each unit should be based on a schedule as nearly uniform as it is possible to set, and a slight fluctuation either upward or downward would not affect the price. Any wide variation in production would tend to change the original rate, and necessitate a slight change in the piece-work price of the unit. Little has been said by others about this feature of group work, but it is a factor to be reckoned with at certain times of the year when production fluctuates. However, how far from the original schedule we can go, either upward or downward, before the price is affected, is to be determined in any individual plant wherever the group prices are established.

When a new employee is added to the group, he can be allowed to work in the group two days at his regular day-rate before participating in the group earnings. After that period he is prorated among the group. Should the new employee be too slow, or not satisfactory to the rest of the group, he is taken out. In this way the company bears a portion of the expense of breaking in the new man, and so does the group. At our plant, as a rule, when a new employee is put into the group, he

is started off at the group price. In cases where the labor turnover would be exceedingly high for a short period, one way to handle the new employee is to place him on his hourly day-rate for a period of 2 or 3 days and deduct this amount from the group earnings; but, as stated previously, we have never had to apply this feature.

The employees are desirous of earning as much money as possible; therefore, their interest in the group is also to keep the number of employees down to the minimum. The spirit of teamwork is developed in each group, and the inefficient workers are eliminated by the other group-workers; this relieves the foreman to some extent of this phase of supervision.

An inspector's coupon is made out by the inspection department. It shows the number of units completed daily in each group, and the quantity OK'ed and rejected; and is turned into the time-keeping office not later than 8 a.m. the following day. From this inspector's coupon the time-keeping department makes up a group piece-work report showing all of the employees in the group, the number of hours worked and the group number to which the workman is assigned; the employee merely rings "in" and "out" upon entering and leaving the factory.

The question often arises as to the proper size of a group. We have found that the group should be limited to the unit itself. There should be no more than one group on any one unit. We have in operation one group of 92 men, and one group of 83 men; the smaller groups run as low as 3 men. Other groups are of 10, 15 and 20 men. Each group of men completes one unit. By having the group gaged according to the unit, there is no tendency for any of the prices or for production to be out of balance. For example, if two groups were engaged in one unit, one group might be short 2 or 3 men and not be able to furnish the second group with enough units to keep its men busy; the latter would be limited to what the first group produced; but, by having all in one group, the production would be balanced to suit the number of men engaged. There is a limit perhaps to the size of a group, but we have yet to find what the high limit is.

Whenever parts needed by a group-unit are required

GROUP PIECE WORK REPORT

NAME OF GROUP OR PART Cylinder Blocks — PART NO. 651 — GROUP NO. 102 — PG. 1 OF 1 PGS. — DATE 10-1-23

	CLOCK NO.	PIECE WORK: GROUP P. W. Hrs.	Rate	Amt.	Extras	TOTAL	OTHER P. W. Refer.	Hrs.	Amt.	Refer.	Hrs.	Amt.	TOTAL P. W	DAY WORK: REFER	HOURS Reg.	Spec.	Tot.	Day Rate	AMT	REFER	HOURS Reg.	Spec.	Tot.	AMT	TOTAL D. W. HOURS	TOTAL ACTUAL HOURS
1	565	9	.50	4.50	1.63½	7.36																				9
2	591	9	.60	5.40		8.83																				9
3	679	9	.50	4.50		7.36																				9
4	684	9	.55	4.95		8.09																				9
5	743	9	.50	4.50		7.36																				9
6	745	8½	.55	4.68		7.65																				8½
7	861	9	.50	4.50		7.36																				9
8																										
9																										
10																										
36																										
37																										
38																										
39																										
40																										
	TOTALS	62½		33.03		54.01																				62½

GROUP PRODUCTION

ITEM	Quan.	Rate	Amt.	Refer.
Cylinder Blocks	60	.90	54.00	A

GROUP CALCULATIONS

Total Earned $ 54.00
Less Extras
Balance
Total Group Hrs. 33.03
P. W. Hourly Rate 1.63½

SUMMARY

ACCT.	Hrs.	Amt.

REMARKS

BY H.J.Z.
CHECKED BY CHH
Posted

FIG. 4—GROUP PIECE-WORK REPORT SHOWING INDIVIDUAL EARNINGS

amount earned according to their hourly day-rates; it is illustrated in Fig. 4. The report is made in quadruplicate; the first copy goes to the pay-roll department, the record to the time-study department, the third to the foreman of the department and the fourth copy is retained by the time-keeping department. The foreman of each department is enabled to know before 10 a.m. each day just what each individual's earnings were for the previous day. This feature of the group system is highly favored by the employees.

Some of our employees have worked on group systems in other plants, and could not be informed what their earnings were until the end of the pay-period. The ability to inform the employee on a given day what his earnings were on the previous day is one of the reasons the method described is favored by both the company I represent and its employees. If an employee quits or is discharged, we can calculate his pay from the number of units finished at any hour of the day, inasmuch as we know how many units have been completed up to that time.

The only time-card used is an in-and-out card showing the employee's attendance. The time-cards are stamped by the time-keeping department, indicating the

for service, the service department issues a requisition in duplicate, one copy of which goes to the time-keeping department as a check against the number of pieces withdrawn. For example, the service department may require 100 valve-lifter assemblies. The engine-assembly group assembles the valve lifters that are paid for at a certain price per piece, and the total earnings from these service parts assembled are added to the group earnings and prorated among the entire group. All piece prices covering service parts are established from the time studies made on the component parts of the group when the group unit is originally timed. Thus, with a flat price on any group, the management, the cost department and the employees know at all times what the price per unit is. There are no bonus nor premium calculations which in any way vary the costs.

Any increase in workmen's hourly-rates does not affect the cost, and the one thing that the employer wants to know with certainty at all times is just what the direct labor cost is. A definite understanding is had between the employer and the employees as to the amount of work to be produced for the compensation to be received. Failure of some systems to accomplish this has been the principal reason for objections to other wage-

incentive plans. Some of these systems are so compli cated that the employee cannot understand them or figure his own wages; it is also necessary for the cost department to maintain a large clerical force to keep the proper records needed to secure costs. The costs so obtained are subject to fluctuations, and it is necessary to compile them for a period of from 6 to 12 months to obtain an average cost. It seems, then, that the ideal system is one which can be "sold" to the employer and the employee as well, and will tell at all times the definite work to be done and what the compensation therefor shall be. It appears that many systems have been wholly lacking in this respect, and are therefore undesirable in operation.

Our company and its employees feel that the group piece-work and the straight piece-work methods now in operation in our plant have met all of the principal objections generally experienced with other wage-incentive systems, and think that this system is satisfactory in every way.

Some Reminiscences

By F. L. Sylvester

THE article by Ernest Jones in the *American Machinist*, page 456, Vol. 59, on a device for drawing an accurate spiral brings to mind some experiences of the writer back in the early eighties when serving as patternmaker's apprentice with the Boston Blower Co., an offshoot of the Sturtevant company, and long since, I believe, reabsorbed by that concern. Harvey, foreman of the pattern room, was a man of many peculiarities, but a genius in his way, nevertheless.

While I was with the company they made over most of their blower casing patterns with a view to getting them lighter. The outline of a blower casing is a spiral, and this outline the draftsman had laid out in the regular drafting room manner by working from four centers. Harvey ignored these centers entirely, and turning up a block of such a diameter as would give the proper circumference to agree to the increase of the spiral, mounted it in the middle of his work table. Then getting out a long strip of paper he attached one end to the block, and wound the rest of the strip around it. When a pencil had been attached to the free end of the paper he was ready, and by keeping the paper taut and unwinding it he was able to make a spiral which put the draftsman's in the shade. The advantage of using a strip of paper rather than a string to guide the pencil was, of course, that the paper would not stretch.

Harvey's real hobby, however, was lathe work. It was here that his genius especially showed itself. In its equipment the shop had a Blaisdel patternmaker's lathe with Fox tail stock, that is to say, it was made to be offset or swiveled or both, and it had both quick and screw feeds to the spindle. This lathe was the pride of Harvey's life. On it, with the work mounted on the tail stock, he would cut gears, cams, and almost anything that could be brought along. The tools which he used for the work were made of drill rod, the cutting end being flattened and bent outward somewhat. The tools were held in the headstock in a special holder like a lathe center with the projecting end made straight, the hole or socket in which the tools were held being lengthwise in the holder, but out of center. Then by revolving the tool in its socket more or less it would cut varying sizes. In doing such work he would, of course, have to go to considerable trouble to rig up a proper mounting to hold it, so that he did not always make a saving of time, though he would get accurate work. Such accuracy was not always required, however, especially where the castings were to be machined.

One of his hobbies, which he claimed was his invention, was a boring bar for working out core boxes. The principle of it was the same as the present core box machine, but this bar was used in the lathe and the box, with guides attached to the ends fitting over the bar, was held up to it. For much of the ordinary machine pattern work a core box plane would be quicker and good enough, but for brass work where the cost of the metal made close work desirable, and where not much finish was allowed, the boring bar was very serviceable, and its use was not limited to either straight or half core boxes. A core box having varying sizes in its length could be made of a single piece of stock, and whole core boxes, by having both pins on the same edge, could also be made.

Harvey is now gone, and the Boston Blower Co. is no more; but the principle of using one's head about his work remains the same.

Is Your Production Man Popular?—Discussion

By W. W. Lawyer

The editorial on this subject on page 604 of the *American Machinist* brings out points that are worthy of careful thought. Is a production man human, actuated by similar ambitions and desires as other men? I have yet to come in contact with the man who desired unpopularity.

The arbitrator in a labor dispute by his decisions becomes popular or unpopular depending upon which side you are on.

Your picture of a production man, "the embodiment of a slide rule, a stop watch and a pad of paper," is well drawn alas in too many cases, for some employers seem to prefer young men with these qualifications only. If the results upon the workman from such treatment could be confined to the place of origin it would be a blessing to those employers who desire the confidence and co-operation of their help.

Memory seems to retain bad treatment longer than good, and confidence once destroyed is hard to reestablish.

Then there is another angle to this popularity, or lack of it. The management establishes what the hourly rates of pay shall be, likewise the premium or bonus earnings; and the man who sets the rates, times or tasks must do so in conformity with the policy of the management if he wishes to remain in their employ. He really is not the responsible party.

Now due to our economic conditions we all, whether employees or employers, seek to get for our product what we consider a fair return. But here is where the trouble begins, for as soon as some one tells us that 20 cents per hour and not $2 is fair or that 4 not 50 per cent profit is fair, they are not popular with us, for we know what is fair. Our self interest is much greater than our interest in others to such an extent that many are badly near-sighted, failing to see the inter-dependency of our social structure.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

A Simple Soldering Fixture

By Harry Moore

It is seldom that a fixture is designed for a soldering operation and even more unusual that it originates in a small shop. But many times a better job can be done if a fixture is used. A case recently occurred where a number of brass sheet metal rings had to be butt-soldered to a central cross rod, the other end of the rod being also soldered to the ring.

The difficulty of this soldering operation will be seen

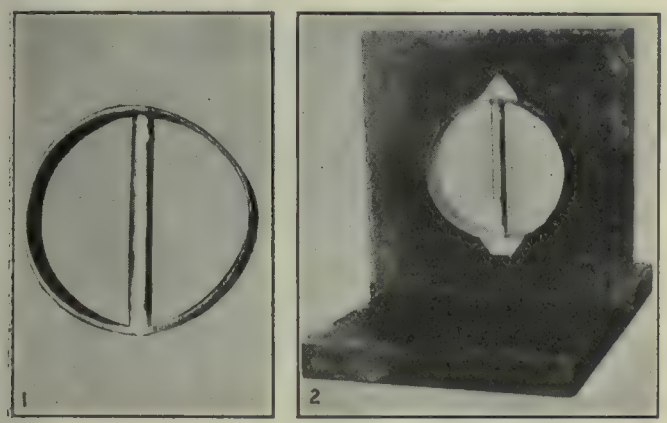


FIG. 1—A COMPLETED PIECE. FIG. 2—WORK IN THE FIXTURE

after a glance at the work shown in Fig. 1. Without some kind of fixture it would be a hard job closing the ends of the ring and holding them in contact while running a wall of solder round the cross piece and the joint.

With this difficulty in mind a square piece of sheet metal was cut out in the center the diameter of the finished rings and a V-shaped piece cut out on each side of the hole. A slab of metal was used for a base with a saw cut across it for holding the sheet metal as in Fig. 2. With this fixture the operation of soldering the ring was easily done.

The strip of sheet metal cut to proper length to form the ring was first curved and slipped in the hole in the holder where it assumed the proper shape, with the ends butting together. This joint was made to come at either side of the V's with the holder in the base so that the joint was at the bottom. The cross piece was next put in place with one end resting in the center of the joint. Then the center piece and both sides of the joint were tacked with solder. The holder was then turned over in the slot in the base and the other end of the rod tacked to the ring. With this done the lightly soldered ring was turned in the hole until the rod was in line with the V's.

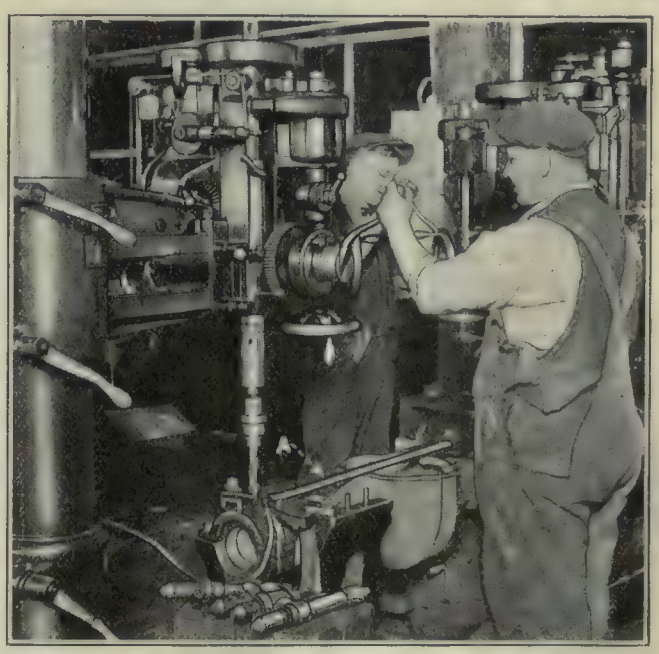
The final operation consists in running a wall of solder round each end of the rod, care being taken to melt the solder only on *one side* of the rod at the jointed end at a time. With a square sheet metal holder as shown the job could be instantly turned to any of the four positions required to complete the work.

The object of the cut out V's of course is to enable the work to be removed after soldering, the V's clearing any surplus solder on the outside of the ring.

Using Two Radial Drills at Once

By H. E. Crawford

The accompanying illustration shows the way in which the Sheldon Axle & Spring Co., Wilkes-Barre, Pa., utilizes two radial drilling machines on the same job. These machines are located in the assembling



USING TWO RADIAL DRILLS AT ONCE

department for the axles and are drilling the holes at the ends for spring pads and brake attachments. The two machines are so placed that their arms will swing past each other, and this arrangement makes what is practically a two-spindle gang drill in which each spindle is adjustable, so as to cover any point within the range of the arms.

The use of two men in this manner makes it easy to handle comparatively heavy castings and to turn out a large number of axles per day.

The illustration gives an idea as to the construction of the fixture in which the housing is held and the way in which the bushing plates can be adjusted to meet different requirements. Center distances are controlled by the square bar *A*. This fixture handles a variety of sizes of axle housings, and the adjustable bushing plates make it easy to change from one size to the other.

Overhanging Gear Drives—Discussion

By R. Kraus

On page 525, Vol. 59, of the *American Machinist*, in an article under the title given above, J. T. Towlson shows some examples of overhanging gear drives and invites the criticisms of his fellow engineers.

A defect common to that shown in his Figs. 2 and 3 is the increased distance between bearings. A further disadvantage of the drive shown in Fig. 2 is that the device will lock itself after the bearings have become worn, while that shown in Fig. 3 will cause hot bearings at an early stage, for the reason that no means of adjustment is provided.

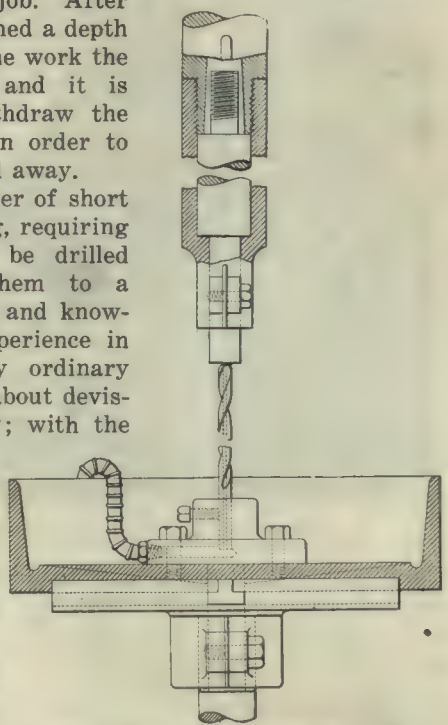
Back geared motor drives are very common, and the usual practice is to make the bearings as long as possible. Recessing them in the middle is to be recommended, for the reason that the bearing pressures are thus more equally distributed and at the same time a reservoir is provided for oil.

Drilling Deep Holes With a Vertical Drilling Machine

By J. A. Dalton

The drilling of deep holes of comparatively small diameter in a vertical drilling machine is, as every machinist who has had the experience knows, a tedious and aggravating job. After the drill has reached a depth of 2 or 3 in. in the work the chips will clog and it is necessary to withdraw the drill frequently in order to keep them cleared away.

Having a number of short shafts, 17 in. long, requiring a ½-in. hole to be drilled lengthwise in them to a depth of 13⅝ in., and knowing the usual experience in drilling them by ordinary methods, we set about devising a better way; with the result shown in the accompanying sketch.



DRILLING DEEP HOLES IN A VERTICAL DRILLING MACHINE

We first took out the machine spindle and threaded the lower end like the spindle nose of a lathe. To this thread we fitted a cast-iron sleeve, chambered out as shown to receive the shaft and split at the lower end to grip the shaft by means of a clamping collar and screw.

A ½-in. oil-tube drill, 15 in. long was then fitted to a pedestal so that it would stand upright on the machine table. We also made a cast-iron basin to fit over the table for the purpose of retaining the oil.

A passage drilled through the pedestal provided a means of getting oil to the drill, the oil being conveyed from a tank through a flexible tube. The pedestal was bolted in the center of the basin in line with the center of the machine spindle. Suitable channels cut in the bottom of the basin provided a means of egress for the oil through the central hole in the table to a receptacle beneath, from whence it was again transferred to the supply tank.

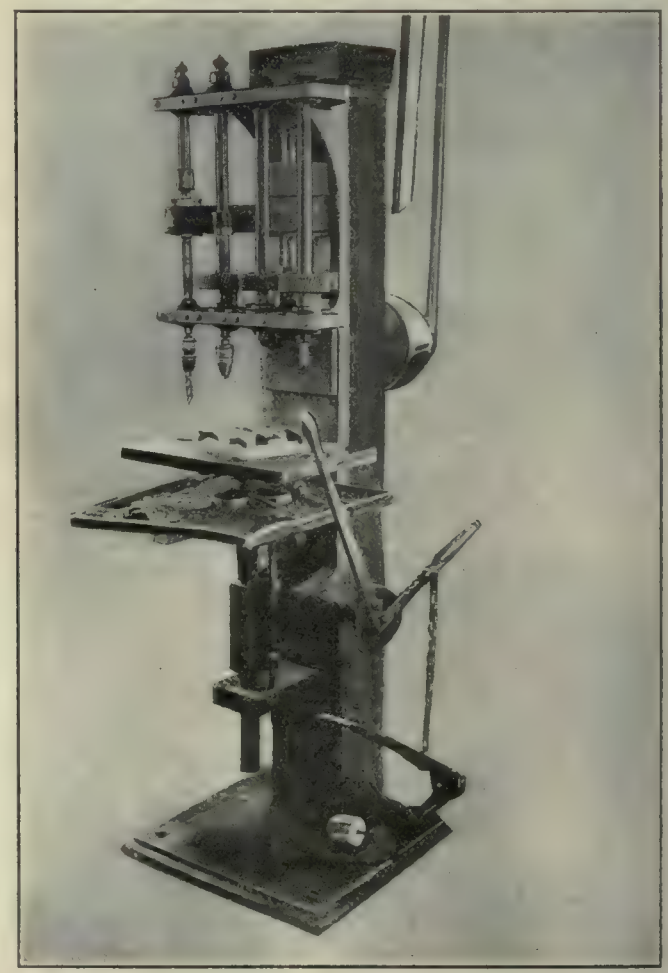
With this device and a copious flow of oil, the chips were washed away as fast as they were formed, and the time of drilling one shaft was cut from 45 min. to about 6 minutes.

A Patriarch Among Drill Presses

By John Williams

A drill-press that was designed and built during the civil war—and still in every day use, is shown in the accompanying illustration. Nor is it located in some backwoods shop where time is of little consequence, but in a factory where modern machinery is built.

The column is of cast iron, of box section, and was



DRILL-PRESS OF ANCIENT VINTAGE

evidently evolved by a designer who "guessed" it was heavy enough for the purpose; and he surely guessed right. The spindles have no vertical movement, as that is provided for by the table, which can be operated by hand lever or treadle as is most convenient. Note the means of increasing the "purchase" of the treadle as larger drills are used, by moving the link of the connecting chain a notch or two farther away from the center of the lever.

Probably the most notable feature of the machine is the helical gearing that drives three of the spindles.

I am of the opinion that the designer originally intended to drive all four of the spindles by belt, as the last one to the left is now driven, but having conceived the idea of helical (or "skew," as it was then called) gearing, or having seen a pair in operation, he was imbued with the desire to experiment.

One of the gears is keyed to the upright shaft behind the spindles, which shaft is driven by bevel gears in the usual manner and so located in regard to center distances that the driving gear clears all of the spindle gears. Two adjustable vertical studs, quite evidently an afterthought, are so placed as to take intermediate gears, one of which meshes with the driver and with two of the spindle gears while the other meshes only with the driver and the gear of the third spindle.

I am told that the designer made three or four sets of gears before he got a set that would run to his satisfaction, but that he finally did so is evidenced by the fact that the machine is still in use, driving modern high-speed drills at a rate that would have caused the old-time designer much consternation, and doing it with as little noise and fuss as if the gears had been cut on an up-to-date gear cutting machine.

Putting a Motor on the Ceiling—Discussion

By Milton Wright

On page 527, Vol. 59, of the *American Machinist*, in an article under the title given above, I. B. Rich says that a "block and tackle doesn't help a bit" in putting a motor on the ceiling "as it cannot get the motor up to the ceiling and hold it there unless" etc., etc. Now I can say from my own experience that a block and tackle (which term I take to include a chain fall) *may* help a lot in doing this kind of a job if the conditions are right.

I have had occasion many times to swing up motors from 5 to 25 hp. for overhead attachment and unless the ceiling in question is the underside of the roof, or, if a floor, is covered at the place directly over where the motor is to be hung by immovable machinery or other fixtures, I proceed as follows:

A 2½- or 3-in. hole is first bored in the floor above as nearly over the center of gravity of the to-be-suspended motor as may be calculated and the chain fall is then hung from the overhead timbers or from a timber placed across a couple of tall horses so that the hook of the hoist chain is directly over the hole. A suitable sling is then passed through the hole in the floor and attached to the motor below.

A motor may be hoisted to place by this method with as little difficulty as if no floor intervened, except that it will probably be necessary to block it when part way up and take another hitch with the sling, as it is unlikely that there will be sufficient height between the floors above to permit the lift to be made in one hitch.

Most motors have a separate base of cast iron, and putting up such a motor is thus a two-part job. Though the base is not nearly so heavy as the motor it is still heavy enough—even in the fractional hp. sizes—so that a millwright cannot really enjoy standing on a ladder and holding it up with one hand while he drives the lag-bolts with the other. The hole in the floor can be plugged up, if desirable, in one-tenth of the time that would be required to put up and take down the necessary staging on the floor below.

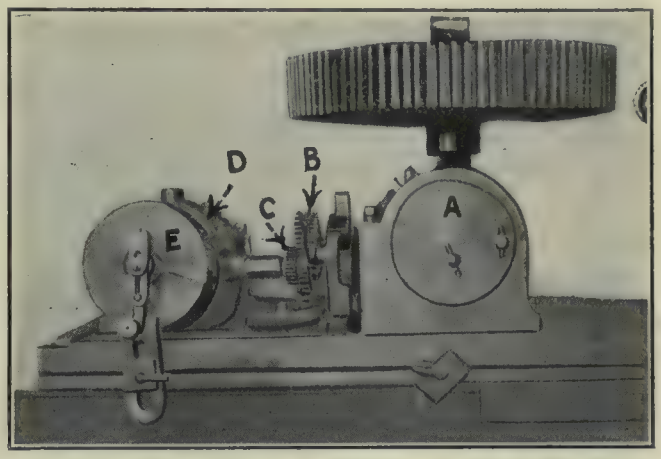
Indexing by Means of Two Dividing Heads

By Geo. L. Hickam

While rebuilding a 24 x 24 in. x 9 ft. Cincinnati planer in the shops of the Mechanical Engineering Department of Iowa State College, it became necessary to cut a 4-pitch, 91-tooth gear having a 4 in. face.

Our largest milling machine, a No. 3 Cincinnati, is not large enough to take a blank of this size mounted on a horizontal axis under the cutter, as is ordinarily done. We, therefore, held the blank in a horizontal position, as shown in the accompanying illustration. The work was then fed up against the cutter, the rim of the blank being supported by jacks placed under it.

We did not have the special indexing plate to suit the work, and owing to the position of the dividing head



TWO DIVIDING HEADS CONNECTED FOR INDEXING A GEAR

spindle, it was impossible to use differential indexing. However, we obtained the desired spacing by employing two dividing heads in the following manner. A standard No. 3 Cincinnati dividing head having a 40 to 1 ratio was employed. We then derived the formula:

$$\frac{40}{91} \times \frac{\text{No. of teeth in follower}}{\text{No. of teeth in driver}} \times \frac{\text{No. of holes in circle}}{\text{No. of spaces taken}}$$

$$= \frac{40}{91} \times \frac{56}{32} \times \frac{39}{30} = \frac{1}{1}$$

Using this formula, the set-up is as follows: The gear to be cut was held in place by using an extra Cincinnati milling machine arbor and bushings in place of a chuck, the arbor being mounted in the No. 3 dividing head *A*, as shown. A 56-tooth gear *B* was used on the worm shaft of the dividing head *A*, and a 32-tooth gear *C* on the worm shaft of the dividing head *D* of a No. 2 Cincinnati milling machine. Between these gears an idler was held in position by bolting the base of a vise to the milling machine table.

In getting the proper spacing, the crank of the head *D* was held stationary by bolting a *U*-strap to the side of the milling machine table. By using 30 spaces of a 39-hole circle, and turning the indexing plate *E* instead of the crank, the proper spacing was obtained.

A little study shows how the result was obtained by the two dividing heads. To get the 1/91 revolution indexing required for the cutting, the worm shaft of *A* must be turned 40/91 of a turn. The intermediate gearing and the head *D* enable this rotation to be accurately made. The gearing is such that 30/39 of a turn of the worm shaft or of the indexing plate of head *D* are required.

American Machinist

Established 1877

KENNETH H. CONDIT AND FRED H. COLVIN
Editors

November 15, 1923

Special or Standard Machine Equipment

THE aim of the production manager is always to secure a product of the proper quality at a minimum *net* price. It is this question of *net* however, which makes the problem much more difficult than it seems on the surface.

There are many instances where the net cost is way above the estimate because of failure to make suitable allowances for the delays which inevitably occur in using nearly all classes of machinery. Special machinery is built which shows a tremendous saving over the simple machines originally used and as long as the demand keeps them busy, the cost is pleasingly low. But when the machine which represents a $25,000 investment must stand idle half the time, the cost per piece goes up amazingly.

Furthermore, we all know from experience that the more highly specialized a machine the more apt it is to be out of commission, simply because there are more opportunities for parts to fail and mechanisms to get out of adjustment. And when a special machine, which represents eight or ten simple machines grouped into one, fails from the slightest cause, the whole eight or ten units are idle until the readjustment is made. The same delay frequently occurs when cutters become dull, which has a tendency to make the operator use a tool longer than he should for best results.

Highly specialized machines have their place in large manufacturing plants. They have made possible many little economies which total up to a large reduction in production costs. But in view of the large investment involved, the production managers of small or moderate sized plants will do well to consider the factors pointed out by Ralph E. Flanders in his recent paper on utilizing standard machines. This was reproduced in abstract on page 653, Vol. 59, of the *American Machinist*, and is well worth careful consideration.

We must bear in mind that, as mentioned in the beginning, it is the problem of *net* costs that makes it necessary to select both machines and methods with extreme care. And this must include a careful consideration of all the conditions which enter into the case.

Labor Turnover and the Use of Machinery

MANY PEOPLE have condemned the report of the so-called Coal Commission because of its failure to evolve a formula to end all coal strikes. The commission, of course, was not appointed with any such purpose in view. Its job was to find out the facts involved in the mining and distribution of coal and its voluminous reports certainly cover them pretty thoroughly.

One of the most interesting facts, from our point of view, is what might be called the stabilizing effect of machinery. In the section of the coal report devoted to labor conditions figures are given which show that the per cent of turn-over among machine miners is seventy-five. Of the pick miners, ninety-six per cent change jobs annually, while of the loaders, 109 per cent get tired of their jobs.

Mining machinery has met the same opposition from the workers as have other kinds of machinery when attempts were made to introduce them. That such opposition is foolish and contrary to the best interests of the men themselves has even been admitted by the president of the American Federation of Labor.

It has been common knowledge for many years that the introduction of machinery into an industry, while it may work temporary hardships, inevitably means more work for many more men in the long run. To the worker it spells better wages, to the manufacturer, bigger profits, to the consumer, cheaper goods. But here in the coal industry seems to be another factor, stabilization. Evidently the reduction in heavy labor and the improvement in pay tend to make the man more contented with his job.

Improvements in Railroad Shop Equipment

ONE HAS but to study the later equipment of some of our more progressive railroad shops to see a decided change for the better both in the machines themselves and in the selections which have been made. True, we occasionally find the entire appropriation expended on a wheel lathe or on back geared lathes for brass work which is not heavy enough to warrant their use. But other shops make similar mistakes at times and the trend is in the right direction.

Railway shop executives are taking a keen interest in newer and better methods of doing work and grinding is receiving more attention than ever before. There is also a tendency to eliminate unnecessary work and different plans are being tried to avoid the necessity of planing the babbitt in cross heads and to avoid other operations which are not necessary to the proper working of the locomotive.

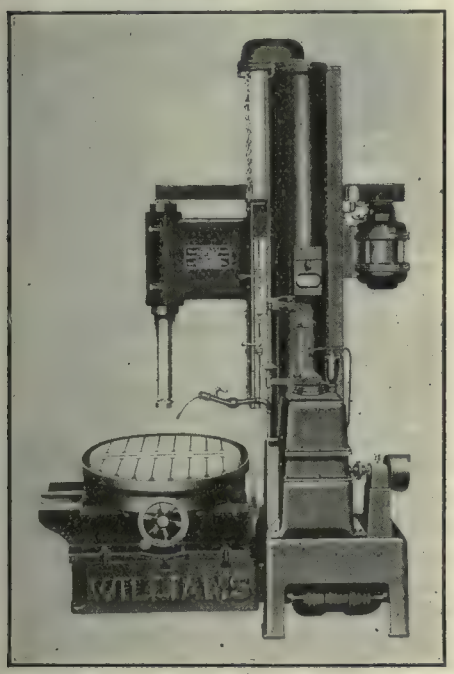
One thing which is needed is the opportunity for railway shop executives to visit manufacturing shops where work is done in different ways. There are plenty of shops doing work of a somewhat similar nature in which new ideas can frequently be obtained. Nearly every shop has some methods which can be successfully used by others, and it is by exchanging ideas and using those which are applicable, that we make real and rapid progress.

If railway shop executives are encouraged, even a little, by those higher in authority, they will put the railway shop on a more sound and efficient basis than ever before. The main encouragement needed is to give them the better shop equipment which they all want—and need. And it will help to pay dividends by reducing the time of the locomotive in the shop, for every day out of service counts heavily against the earning power of such a large investment unit. This is a factor which is not always considered.

Shop Equipment News

Williams Vertical Internal Grinder

The Williams vertical internal grinder, shown in the accompanying illustration, is, with the exception of the grinding head and the work table, very similar to the Williams vertical



WILLIAMS VERTICAL INTERNAL GRINDER

cylinder which was described on page 714, Vol. 59, of the *American Machinist*. The machine is now being marketed by the Hi-Way Service Co., Elkhart, Ind.

The grinding spindle and its driving motor are both mounted on the head, the motor driving the spindle through a belt at 7,000 r.p.m. The regular spindle is adapted to grind holes from 3½ to 20 in. in diam. The diameter of the spindle arbor is 3½ in., tapering to 3 in., and 15 in. in length. Arbors 18 or 24 in. long can also be furnished.

The work is mounted upon a revolving table, 24 in. in diam. The table has an in-and-out travel of 12 in. and is driven by a ¾-hp. 3-speed motor mounted at the left of the table. Starting, stopping and speed changes are controlled by a drum-type controller on the opposite side of the table.

The feed of the head is controlled in the same manner as the previously-described cylinder grinder, that is, by means of an Oilgear pump operating a hydraulic ram under the head. The range of feed is up to ⅝ in. per revolution of the work, and quick traverse to and from the work is also provided. A water pump is mounted on the stand with the oil pump and is driven by the same 1-hp. motor.

The floor space occupied by the machine is 49x42 in. and the height is 7 ft. 6 in. The weight of the machine, crated, is approximately 5,500 pounds.

Taft-Pierce Micrometer Plug Gage

The Taft-Pierce Mfg. Co., Woonsocket, R. I., has placed on the market an expanding plug gage designed to take the place of solid plugs and possessing the advantage of giving the user immediate information as to the exact amount of departure from standard diameter, parallelism or roundness of the holes to be gaged.

The gaging surface consists of four shoes bearing upon a conical plug at the center of the tool and held in place by dovetailed retaining blocks. The conical plug is susceptible to an endwise movement actuated by a micrometer screw, the thimble of which is graduated to read directly in ten-thousandths of an inch measured over the diameter represented by the outer surface of the shoes. The increments of measurement are thus the sum of two movements: the axial advance of the conical plug within the body of the tool by means of the micrometer screw, and the wedging action of the plug as the cone is drawn into the seat formed by the correspondingly inclined under surfaces of the shoes.

Adjustable limit stops operating in both directions are provided, and can be set and sealed to allow any desired amount of tolerance when using the tool as an inspection gage. The stop mechanism can be thrown out of action instantly when it is desired to determine the actual amount of error in a doubtful piece, and can be as quickly returned to position. The gage is easily taken down for the purpose of cleaning and readjusting by loosening two screws. The readjustment feature permits the gage to be reground, lapped and reset when the measuring surfaces have become worn from long usage.

All parts of the tool are hardened



TAFT-PIERCE MICROMETER PLUG GAGE

and ground and all working surfaces are carefully lapped. It is so designed as to balance easily in the hand and can be manipulated readily by the thumb and forefinger of the hand in which it is held, leaving the other hand free to handle the work.

It is made in 15 sizes ranging from ⅝ to 1½ in. Each gage has an individual range of slightly more than ⅛ in. in diameter so that it will overlap adjacent sizes.

Johansson Gage Blocks and Tools

The Ford Motor Co., Detroit, Mich., will continue to market the Johansson gage blocks and measuring tools. These instruments were formerly manufactured and sold in America by C. E. Johansson, Inc., Poughkeepsie, N. Y., which company was recently acquired by the Ford organization. The purchase also includes the sole American rights to the gages and the methods by which they are made. These gages are used as standards by many manufacturers and will still be available.

Beeman & Broughton High Speed Steel Furnace

The Beeman & Broughton Co., 458 Twenty-first St., Detroit, Mich., is now marketing an addition to its line of furnaces which consists of a gas-

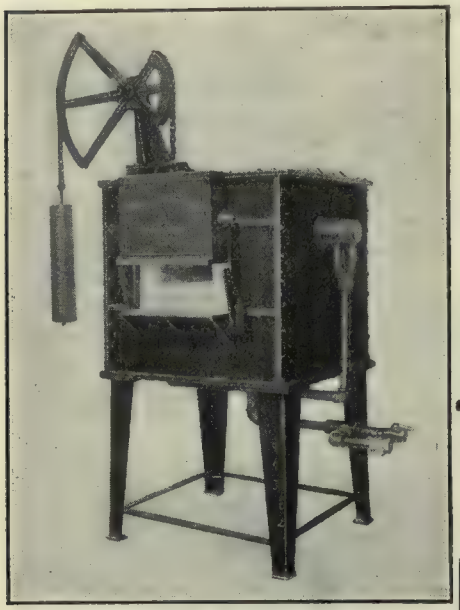


FIG. 1—BEEMAN & BROUGHTON HIGH SPEED STEEL FURNACE

fired furnace for heat-treating high speed steel. Fig. 1 shows an outside view of the furnace, the feature of which is the method used to apply the heat to the tools, claimed to impart exceptional cutting qualities and

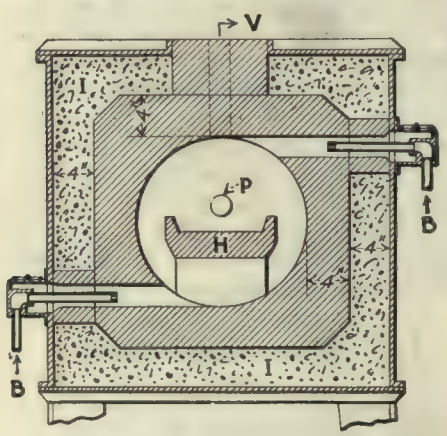


FIG. 2—CROSS-SECTION THROUGH BEEMAN & BROUGHTON FURNACE

leave the tool clean and free from flame erosion and warping.

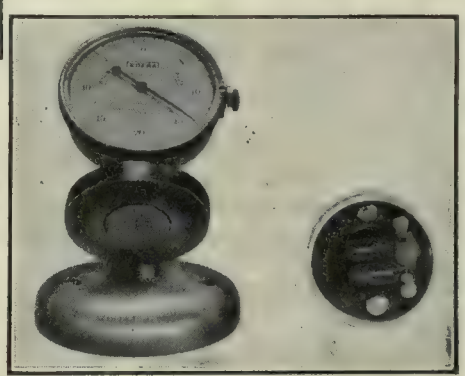
A cross-section of the furnace through the heating chamber is shown in Fig. 2 and it will be noted that the heating chamber is cylindrical. The flames from the burners *B* enter tangentially and rotate around the firebrick hearth *H* on which the tool is supported. The tool rests in the center of a swirling cylinder of flame which does not impinge on it, but heats it by radiation instead of by contact.

The opening for a pyrometer is at *P* and the vent openings are at *V*. The furnace is insulated by means of Sil-O-Cel and the firebrick lining is 4 in. thick. The outer casing and the legs are of cast iron.

Five standard sizes of the furnace are made, the largest of which has a 16x20-in. heating space on the hearth.

Federal Dial Gage for Radio Phones

The device shown in the accompanying illustration and now being marketed by the Federal Products Corp., Providence, R. I., is for the purpose of determining the distance between the ends of the electromagnets of a radio phone receiver and the edge of the shell upon which the diaphragm rests, thus showing at a glance the space, or air-gap, between



FEDERAL DIAL GAGE FOR RADIO PHONES

magnets and diaphragm. A phone with its diaphragm removed is also shown at the right of the gage.

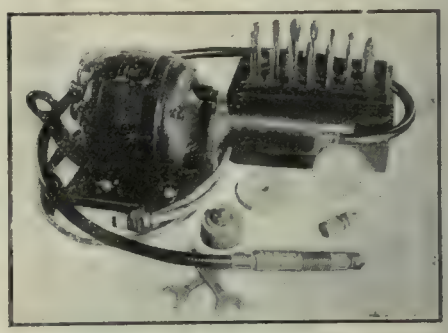
The device consists of a cast-iron base, made heavy enough to insure stability, and a standard Federal dial gage, to the measuring spindle of which is attached the smaller of the two disks of hardened and ground steel. The outer disk is stationary relative to the gage.

The gaging is done by placing the shell of the phone against the larger disk. The smaller one, bearing against the ends of the magnets, will then cause the pointer to show the distance between the two planes. Because of the large diameter of the disks as compared with the parts to be gaged the inspector cannot obtain a false reading, as no movement of the pointer will occur until the part is properly in contact with both disks.

Hergi Patternmaker's "Pal"

The Hergi Mfg. Co., 250 Fifth St., Bridgeport, Conn., has recently placed on the market a combination tool set especially designed for the use of patternmakers. The set consists of a ¼-hp. motor, a No. 5 Hergi flexible shaft, ball-bearing hand piece and tools.

The motor is mounted on a cast-



HERGI PATTERNMAKER'S "PAL"

iron base that is provided with an eye so that it may be suspended from a hook, and in this position the center of gravity is so disposed that the motor will hang with the rotor shaft in a vertical position. The base also permits the outfit to be placed on the bench, floor, or other location convenient to the work in hand. The motor can be supplied for any commercial current and voltage, fitted with an attachment cord and plug.

The tools consist of a set of 14 high-speed steel burs both file and mill cut; one ¾x3-in. grinding wheel; one 1x2-in. sanding drum; one No. 5 Hergi grinding spindle and necessary wrenches.

"Beltex Gripstick" Bar Belt Dressing

A bar belt dressing, called "Beltex Gripstick," is now being marketed by the Chicago Belting Co., 125 North Green St., Chicago, Ill. This dressing is furnished in 1-lb. sticks, 10½ in. long.

To apply the dressing the stick is held against the pulley side of the belt. This application is said to clean the belt of dirt and oil and make it soft and pliable. The dressing penetrates the belt and tends to eliminate the conditions which make slippage possible, that is, dryness of body and hard, glazed surface.

It is claimed that the ingredients of the dressing actually increase the life of the belt, and have no injurious effects.

News Section

A. S. M. E. Completes Plans for Annual Meeting

Many talks and discussions of special interest to the machine tool industry have been scheduled for the annual meeting of the American Society of Mechanical Engineers which will be held Dec. 3 to Dec. 6 in New York City. Plans for the meeting this year are on a more elaborate basis than heretofore, and members are looking forward to sessions filled with value.

Of especial interest to the machine tool makers will be the general session to be held Tuesday morning. H. A. S. Horwarth of the Kingsbury Machine Works, Philadelphia, Pa., will present a graphical study of journal lubrication and there will be other problems discussed.

On Wednesday the economic phases of coal shortage will be discussed by F. G. Tryon of the United States Geographical Survey, Washington, D. C., in the fuel session, while in the ordnance session, Capt. H. W. Churchill, executive assistant in the New York district ordnance office, will speak on "Some Production Problems in the War Department's Preparedness Plan."

Perhaps the greatest interest will be shown in the machine shop session to be held on Thursday morning when three speakers of unusual ability will be heard. D. P. Cook of the Boston Pressed Metal Co., Worcester, Mass., will speak on "Some Principles and Examples of Metal Development." W. W. Galbreath, president and John R. Winter, general superintendent of the Youngstown Pressed Steel Co., Warren, Ohio, will present their theories on the development of modern stamping practice outlining the history of pressed metal and showing how great its contribution has been to industry.

Other Features

There will also be a progress report on the present status and future problems of the art of cutting metals presented at this session.

In the afternoon at the management session, R. T. Kent, consulting management engineer of Montclair, N. J., W. L. Churchill, of the Industrial Engineering Service, of New York City, and E. H. McKitterick of Lockwood, Green & Co., Boston, Mass., will present a symposium on the relation of mechanical engineering to management in the metal working, woodworking and textile industries.

Officers of the society are looking forward to the largest attendance in the history of the A.S.M.E.

Roads Will Continue Expenditures

The railroads will continue their intensive program of development next year, it was announced recently following a meeting of the American Railway Association in New York, attended by executives of ninety-four roads whose mileage totals 219,077 miles, or 95 per cent of that of Class 1 lines.

Statistics were made public which show that record-breaking expenditures for equipment and supplies were made in 1923. The total reached $1,059,440,000. In addition, there will be carried over into 1924 appropriations made this year for capital expenditures amounting to $243,804,000, or a grand total of $1,732,516,836 expended or authorized for capital improvements during 1922 and 1923.

In addition to the above, Class 1 railroads will in 1923 spend for fuel and supplies in currernt operation approximately $1,800,000,000.

Capital expenditures this year for increasing facilities, plus the expenditures for 1923 for fuel and materials and supplies used in current operation and maintenance, totaled $3,103,244,000. This did not include any direct expenditures by the railroads for labor, but went to the country's industries and represented, according to the association, one of the major causes contributing to the expansion of business and to the employment of industrial labor, which, in turn, was a primary factor in the increase in domestic demand for both products of industry and of the farm.

Many Machine Tools At Textile Show

The International Textile Exhibition and National Power Show held in Mechanics Hall, Boston, during the week of Oct. 29-Nov. 3, besides being an interesting display of the endless variety of textile products and the machinery contributing immediately thereto, serves to emphasize the inter-relation existing between this great industry and many others that, while of lesser magnitude, may justifiably be considered of equal importance.

Since the day when power was first applied to the preparation of materials and to the weaving them into fabrics, the growth of the industry has been dependent upon machinery, and to no other line of activity is due more credit for its continued expansion than to the designing and building of machine tools.

As an exhibition of the marvellously complex and intricate machinery involved in the production of textile fabrics the show was of surpassing interest not only to everyone directly associated with the industry itself, but to all whose minds are trained to think and reason along mechanical lines. To the observer whose business it is to design, construct or handle machine tools it is at once a revelation of what has already been accomplished and an incentive to further effort.

Evidence of the growing interest of machine tool builders was displayed by the numbers of such tools on the floor; tools that can have no possible connection with the production of textiles except that they were themselves directly concerned in the construction of textile producing machinery. The field for special tools and the special adaptation of standard tools was but the second largest in the country—perhaps in the world, and well worthy to be considered by our foremost designers and engineers.

Steam Still Important

Though the steam engine as a generator of power has been relegated to the background by electric motors that derive their energy from far distant sources, steam is a very important factor in the production of textiles; and the display of steam handling, regulating and distributing devices was very complete. Though many of the larger machines are driven by independent motors mounted upon or within the frame, power transmission devices were even more than ever in evidence. The silent chain has taken its place as a transmitter of power as quietly and unobtrusively as it does its work.

Taken as a whole, the show was quite as much an exposition of the part played in the industry by the machines that produce machinery as it was of the machinery that produces only textiles. The importance of the machine tool is being more and more recognized in the cloth making industries and improvement is perhaps more noticeable in this line than in many others.

Auto Output Gains in October

Automobile production for October was 360,924 passenger cars and motor trucks, according to factory shipment reports submitted at the Directors' meeting of the National Automobile Chamber of Commerce. It represented an increase of 11 per cent over the September output and makes a total production for the factories in the United States of 3,388,785 cars for the ten months since Jan. 1, 1923. The sales market for cars was reported better than September in most of the larger cities, such as New York, Cleveland, Chicago, Pittsburgh, St. Louis and Seattle. The demand for the next two months is expected to be better than for the same period a year ago.

Five cities in the country showed decreased accident records for October as compared with that month a year ago. They are Boston, Chicago, St. Louis, Seattle and Fargo.

Industrials and Railroads Buying in the Chicago District

There has been an increase in industrial buying in the Chicago district during the first week of November. Industrials have purchased punches, bull dozers, rolls and shears. As usual some dealers report an improvement in business and others state that there has been no change. As a whole there appears to have been some increase. The Indiana, Harbor Belt R.R. is making inquiry for a dozen machine tools including lathes, drills and punches. The Illinois Central R.R. has purchased a couple of lathes, and an upright motor-driven drill press. The Chicago, Burlington & Quincy R.R. has ordered 6 32-in. shapers from Manning, Maxwell & Moore and is reported to have purchased the lathes which were included in its recent inquiry. The Chicago, Rock Island & Pacific R.R. has not made purchases on the list of light machine tools which it made inquiry on several weeks ago. The New York Central is inquiring for machine tools for Elkhart, Ind. and Collinwood, Ohio. Several auctions of used machine tools have been held during the past week. The Northern Pacific Ry. has purchased a 200-ton locomotive crane from the Whiting Corp. The New York, New Haven & Hartford R.R. has ordered a small hand crane from the Whiting Corp. The New York Central has entered the market for seven 18-in. lathes, two punching and shearing machines, one 2,500-lb. steam hammer, one radial drill, and one 40-in. band saw.

Producers of steel are in a comfortable position so far as November is concerned, but December is still in doubt in some lines. There has been an increase in buying during the last few weeks, but the sales are not sufficient to insure the present rate of activity for any length of time. Much depends upon railroad buying, according to members of the trade, and unless the carriers go through with the expected buying program a curtailment of operations is certain. So far the railroads have indicated they would enter the market soon but no sizable orders have been placed.

Cleveland Expects Busy Winter

Actual orders so far are lacking in the Cleveland district, but there are inquiries to furnish encouragement. Of particular interest at the moment is an inquiry emanating from Japan, or its representatives in this country, for some 400 pieces of varied equipment. The large number of inquiries from railroad sources is likewise welcomed.

In keeping with this also must be reckoned the automotive industry, that part of it located in Cleveland as well as those interests located elsewhere, which already appears to be anticipating its 1924 requirements for additional equipment. Changes in motor car construction will account for this equipment interests.

Sales Before New Year

This inquiry movement, however, must be tempered for the machinery trade itself for the present, however, since such inquiries are not considered official until they actually come out of the purchasing departments. Yet the larger machine tool factors are confident that this business, a fair portion of it at any rate, will be coming forward before Jan. 1.

That this belief is well founded, may be proved by the fact that the Bourne-Fuller Co., one of the larger independent steel interests, is receiving orders for considerable quantities of semi-finished steel products from railroad interests.

From Youngstown comes the report that car manufacturers likewise are receiving goodly inquiries for rolling stock. The Standard Tank Car Co., has closed a substantial order, and is shipping cars daily to one rail interest, still heavier shipments to a large automotive factor, and making several smaller shipments to oil concerns.

In the matter of locomotives, orders are coming forward more slowly, in the opinion of officials of the Lima Locomotive Works Co., but inquiries have been received, and are expected to be backed by bookings, based upon the road and car work that has already been let. Though it may be waiting upon this new business, there is sufficient business on hand at the Lima to keep it running to capacity to March 1.

Probability that expansion of the Diesel engine production here will be seen at an early date, is indicated in the move by a committee of the Winton Co. to interest stockholders in that company in the purchase of the engine division of the concern. The committee undertaking this work included Alexander Winton, Thomas Henderson and George H. Brown. Until recently it was expected that the engine division would be taken over by other interests. Of interest to industry generally and Winton stockholders particularly is the committee's statement that it believes the Diesel engine outlook today is what the automobile business itself was a decade and a half ago. The committee will await the stockholders' decision for a few days before presenting their proposition elsewhere.

Indiana Business Slows Up

However optimistic the leading men in the industry may be in Indiana, the fact remains that users of machine tools and machinery have become exceedingly cautious in their orders. This does not apply to all lines, but for the most part the trade is finding sales a little more difficult. The furniture trade which has been a big buyer of woodworking tools and special machinery has curtailed expansion. This does not mean a cessation of production for most of the plants are working to capacity, but executives say there is not the same activity in the market there was two months ago. This leads them to believe next month will see plants pretty well caught up with their orders. Such plants as are at Shelbyville, Ind., just South of Indianapolis are maintaining their production schedules, but nearly all unite in admitting the situation is not as promising as it was.

Another slump has come from the automobile industry. Not only is this industry affected, but the accessory plants as well. Business with these factories was better this Fall than it has been for years and this was reflected on the tooling demands. During the last two weeks, however, plants in this section have slowed up their production and the tool industry has suffered thereby. The fact that the Haynes plant at Kokomo, Ind., was sued for receiver did not serve to put any further courage in the hearts of the local trade. Officials of the Haynes plant say as soon as they refinance, all debts will be paid, but this plant being one of the oldest in the country, the action came as a complete surprise to the local trade.

Demand from the brick industry in the western part of the state has been curtailed somewhat. Most of these plants are working better than had been expected this Fall, but they have curtailed machinery purchases. Some machinery is being sold in the coal fields, but the demand is not what it was last year. Weather conditions that have made logging operations possible until late, has helped the saw business, according to officials of the E. C. Atkins & Co. All machinery connected with the lumber industry, they say, is moving actively.

Slight Improvement in the South

Regarded as a whole, there appears to have been some slight improvement in machine tool sales in the Southern territory during the first several days of November, as compared with the same period in October, though there is still room for a great deal of improvement. A falling off in the sales to the smaller machine shops, which have been the principal buyers for some months, has been recently noted, and a slight increase in the sales to larger industries, principally in the textile and lumber fields.

As was the case two weeks ago, however, reports of the distributors in the Atlanta territory show a tendency to be "spotty," and it is difficult, therefore, to present any figures that might show the tendency of the business the past two weeks. It seems certain, however, that the month of October brought about a decline in total sales as compared with September, though proved fairly satisfactory as compared with the same month a year ago.

For the same reason, it is difficult to express definitely what the future portends, for the distributors seem disinclined to make any definite predictions, due to the fact that whereas the outlook seemed very bright some two months ago, sales have not been up to the mark that the trade had predicted it would be.

Yet, industrially the South has continued to show further improvement

during the latter half of October, and with the 1923 cotton crop now quoted at the Southern spot markets at nearly 32 cents per pound, machine tool business certainly should experience a period of increased activity. On this score virtually all of the distributors seem in agreement, but do not care to have themselves quoted as making the statement definitely.

But a general survey of the outlook for the next eight or ten months presents a very favorable picture, and the trade should enter 1924 with business on a much more satisfactory basis than was the case at the beginning of 1923, in spite of the fact that machine tool sales during the early part of this year were exceptionally good.

New England Gets Auto Orders

The Summer quietness in the automobile industry, reflected in contributing industries, is well over, in the opinion of sales managers and works managers of plants of the allied industries in New England. "We have orders for 90 to 120 days ahead from our regular customers," said the sales manager of one of these companies, and basing his conclusion that the usual quiet season is over he cites the fact that these big buyers are now ordering more heavily. The inquiries are also more firm and indicate a better interest. Substantially the same conclusions were drawn by others.

Opinion was expressed by four factory representatives that the labor supply now is better than it has been for some time. No difficulty is experienced in obtaining the mechanics necessary. Few changes are now being made by workmen. There has been no change in wage schedules of the workmen in the factories whose representatives were interviewed, and there was a unanimity of belief that there would be none.

Immediately following the Japanese earthquake a number of manufacturers in the Hartford district received orders for export and a conclusion drawn was that they were the direct result of the disaster. An analysis of the orders since has led to a change in the inference drawn and that is that the orders were purely for stock and that orders as a direct result of the earthquake have not yet been received and consequently this business is still held in anticipation.

Philadelphia Sales Are Steady

Leading industrial establishments in Philadelphia have sufficient business in hand and in prospect to keep their plants in operation for four or five months. This was hailed as a hopeful outlook for this season of the year, when most businesses apply the economic rule of curtailment to make a satisfactory end-of-the-year showing to their bankers.

The plants from which the hopeful signs come are the Electric Storage Battery Co., the Baldwin Locomotive Works, and J. G. Brill & Co., car builders. The business situation generally presents a strengthening outlook.

Detroit Auto Output Continues to Aid Machine Tool Business

As production figures from the automobile plants of Detroit and vicinity continue to set marks that are considerably in excess of anything ever experienced at this season in previous years, Detroit business in general, especially in the metal working fields, is finding itself in an enviable position as contrasted with other large centers.

Machine tool manufacturers report a steadiness in the market that augurs well for the industry in this section. A decline in the industry is expected during the inventory season that is approaching in most of the large firms of the city, but the slump will be only temporary, it is believed by those in a position to know.

In support of this belief, the recent business forecast of the Merchants National Bank of Detroit is given attention. In part the forecast said:

"A development of great significance during the past month has been the changing perspective of business men. Swift and striking changes in the economic picture since 1914 have led most business men to think of good times only in terms of racing prices and great waves of profits. They are now adjusting themselves to the view that the coming months are likely to bring neither a boom nor a deep depression. Rather they expect a fair volume of trade at reasonable prices, with the competition among sellers and not among buyers.

"The industrial skyline is pronouncedly irregular. The most favorable factors include some improvement in the steel trade, better agricultural condition, phenomenal freight traffic, sound credit conditions, increasing exports, a good rate of building activity and continued large employment with good purchasing power."

Building contractors say they have sufficient work to keep them going comfortably for two or three months, and considering the industrial and other projects which are known to be going ahead, it is the consensus of opinion that there will be no seasonal slump this Winter. Contracts let for the past week were of good volume.

Railroads report an increase of from 20 to 41 per cent in outbound shipments from Detroit and received freight shipments averaging 21-25 per cent more than in October.

The machine tool industry continued to look with hope for a satisfactory situation after the year's end.

The William Cramp and Sons Ship & Engine Building Co. has been awarded a contract for building and installing three 9,850-hp. turbines for the Kentucky Hydro-Electric Co. The Cramp company also is installing in the Niagara Falls Power Co.'s plant a 70,000-hp. turbine. Another contract is for a turbine for the St. Croix Paper Co.'s plant in Maine. The Philadelphia office also announced the San Francisco plant of the Cramp company is building three 33,000-hp. turbines for the Pacific Gas & Electric Co.

The volume of employment in manufacturing establishments throughout Pennsylvania, New Jersey and Delaware is greater now than a month ago, it is found by the Federal Reserve Bank. Notable gains were made among the metal manufacturing industries. The third quarter of 1923 showed a large sale of automobiles, and inquiries point to a satisfactory situation.

The action of railway executives at their recent meeting in New York in announcing large expenditures will be carried over into 1924 was regarded as a most hopeful indication. The close of the year has, as usual, found the railroads curtailing purchases to actual necessities.

The general business situation is satisfactory, with retail sales far in advance of this period a year ago.

Ford Trucks Shipped to Japan

First shipments of 1,000 Ford one-ton truck chassis for the city of Tokio, Japan, have been made by the Ford Motor Co. This is taken as an evidence that Ford trucks will play an important part in the reconstruction of the devastated sections of Japan and in furnishing transportation for the thousands of inhabitants in the affected regions.

New York Maintains Steady Trade

The steady trend of business in the machine tool line in New York City is one of the encouraging features to be noted this week. Dealers were unanimous in stating that, while the volume could be improved considerably, business was good and most important to them it is steady with all indications being that it will remain so for the next few months or well into the Spring of next year.

Railroad buying rumored for the last part of November had begun to materialize earlier than expected and before the tenth of the month sales were reported. Many lists are out at this time from the roads. The New York Central, the Delaware, Lackawanna & Western the Lehigh Valley, the Baltimore & Ohio, the Rock Island, and the Central Railroad of Georgia all have inquired for tools within the past two weeks and some of them have also purchased in the New York district.

Industrial buying seemed to be improved recently and reports from New York City and some parts of New York State would indicate that manufacturers are renewing machine tools and machinery for the Winter and for the expected heavy business of next Spring. Good sized sales were reported from Elmira, Syracuse, Schenectady and Troy.

Makers of parts for automobiles have been in the market during the past week for several different tools. Immediate delivery was asked for in most cases and dealers are of the opinion that the future buying of these concerns will be on a larger scale than during the past ten months of the year.

Used tools were in fair demand during the week. Small shops bought some lathes and presses and dealers state that this part of the industry expects a good portion of the business.

Railroads Show Good Gains

One hundred and ninety-four Class 1 railroads, representing a total mileage of 235,812 miles, earned 4.46 per cent on their tentative valuation during September, compared with the 5.75 per cent fixed as a fair return by the Interstate Commerce Commission. The tentative valuation set up by the commission includes additions and betterments up to Jan. 1, 1923, and is for rate-making purposes.

The same carriers in September last year earned a net operating income of $58,677,600, which was at the annual rate of 2.90 per cent. In August, 1923, their net operating income was $98,343,200, or at the rate of 4.94 per cent. September net operating income totaled $92,238,400.

Further tabulations by the Bureau of Railway Economics, made public by the American Railway Association, show that in the Eastern district the rate earned in September was 3.93 per cent; in the Southern district, 5.20 per cent, and in the Western district, 4.80 per cent.

In comparing the earnings of the roads for September, account must be taken of the shopmen's strike which continued for that month and two preceding months in 1922, at which time the coal miners' strike was also in progress.

Some Roads Lose

Twenty-two Class 1 roads operated at a loss in September, according to reports filed with the Interstate Commerce Commission. Eleven of these roads were in the Eastern district, two in the Southern and nine in the Western. In August, sixteen of these roads reported operating deficits.

Operating revenues of the Class 1 roads in September totaled $545,502,700, an increase of $44,620,000, or 9 per cent over the same month last year, while operating expenses amounted to $415,983,000, an increase of $7,070,600, or about 2 per cent, over September last year.

For the first nine months this year net operating income of the 194 railroads represented an annual rate of return of 5.27 per cent on their tentative valuation, amounting to $718,949,000, compared with $529,470, or about 3.96 per cent, for the same period of 1922.

Class 1 carriers in the Eastern district, according to complete reports, had a net operating income in September of $37,380,000, which was at the annual rate of 3.93 per cent on their tentative valuation.

Southern Plants Are Well Employed

A questionnaire to determine accurately on just what basis the foundries and machine shops of the South are operating was sent out during the latter part of October to members of the Southern Metal Trades Association and replies received to date indicate that production is on a fairly satisfactory basis. The questions asked included annual and monthly capacity of each foundry and each machine shop operated by members, total production in October, percentage of capacity and number of employees.

In the foundry trades some reports were low, but as a whole production seemed to be around 75 per cent of total capacity, with two or three of the larger plants operating at 100 per cent. In the machine shops reports showed operations on about the same basis, and especially satisfactory as compared with the same month last year.

All the machine shops were operating, however, and though one or two of the smaller plants were only at about 25 to 30 per cent of capacity, as a whole conditions were satisfactory, though somewhat less so than during the early part of the year. The outlook, according to the replies received, seems to be very good, with owners of both foundries and machine shops looking for marked activity during 1924.

Buell with Diamond Co. Thirty-Five Years

On Nov. 2, William C. Buell, vice-president and secretary of the Diamond Machine Co., Providence, R. I., celebrated the thirty-fifth anniversary of his start with the company. Mr. Buell's long experience on the road has built up for him an unusually wide acquaintance and his loyalty and consideration of others have made for him almost as many warm friends. After so many years of hard work for his company he is beginning to devote a little more time to his family and to his farm where he grows wonderful dahlias and gladioli.

Business Good in West Says Egan

Clifford P. Egan, president of the J. A. Fay & Egan Co., Cincinnati, Ohio, on his return from an extensive Western tour is very optimistic in the outlook for future business and a continuance of prosperity.

Mr. Egan said: "With the Japanese government removing the duty on piece lumber, many of the tidewater mills have withdrawn from the domestic market while the Japanese market looks so big."

Inquiries are received by his company in good volume and indications point to a moderate revival in building activities as the sash and door manufacturers have a good volume of orders on their books and are looking to increase their production with more modern equipment.

Gear Grinding Machine Co. Wins Suit

The award of approximately $54,000 to the Gear Grinding Machine Co., Detroit, from the Studebaker Corp., has been confirmed by the Federal Court in that district. The Studebaker Corp. must account to the Gear Grinding Machine Co. for 322,483 shafts at fifteen cents each and interest since manufacture.

The case was brought by the gear grinding machine company who claimed an infringement of patents and the decision in its favor was sustained by the United States Court of Appeals and referred back to the Federal district court for an accounting.

Cincinnati Holds Recent Gains

Production of machine tools in Cincinnati is holding up to a fair standard at the present time with some improvement evident over the conditions that prevailed several weeks ago. While it is not expected that there will be any startling developments in business activities during the rest of the year, most of the firms that experienced a decrease in the volume of their orders recently have recovered sufficiently to report that their production has again become more nearly normal. There has been somewhat of a falling off in the buying being done by automobile manufacturers and indications point to a continuation of this condition throughout the remainder of 1923. It will be rather unusual if orders from the automotive industry show much of an increase until after the first of the year.

The larger manufacturers in this district state that business during the month of October and through the early days of November has been fairly good. The main thing that is brought home to the manufacturers is that it is necessary to get out and dig for every bit of business that comes in. Those firms that are showing aggressive activity in their sales department and are working hard every minute are producing results which, although they may not be above the average, are good enough to insure a fair volume of factory production.

An encouraging feature of the present situation is the fact that practically every plant in the city is considerably ahead of its 1922 production figures. This year has shown a decided improvement over last, and even the slump that hit the industry in October did not change the records which credit the industry in Cincinnati with a decided improvement over last year.

Demand for Lathes

Lathes are selling fairly well, and the present standard of business in this line is expected to continue the rest of the year. It is understood that the Ford Motor Car Co. has some inquiries out. The Pennsylvania Railroad Co. is expected to place some orders soon, according to reliable reports. There has been spasmodic buying of upright and radial drills and the market in this line has been rather dull with little hope for a change to better conditions for several months. Conveying machinery houses state that their shops are full of orders at present and, judging by the orders now on hand and the number of inquiries being received daily, good business will continue until after the first of the year. One pleasing feature of the conveying machinery situation is that orders are not confined to any one section of the country, but are being placed generally.

Woodworking machinery concerns are enjoying a very good season. One of the largest plants is running at capacity and is working shifts three nights a week in order to get out machinery at the specified time for delivery. The outlook in this field is particularly good. The production of Cincinnati foundries is not as large as it was a month ago. Orders have not been so plentiful and, consequently, production has been curtailed to some extent.

Business Items

The Crofoot Gear Works, formerly of Cambridge, Mass., but now located in Chicago, Ill., has been purchased by Bradford Foote who has sold his interest in the Foote Brothers Gear & Machine Co., Chicago.

The Pioneer High Speed Machine Knife & Tool Co., Cleveland, Ohio, has been formed. A. W. Erickson, formerly superintendent of the Wapakoneta Machine Co., Wapakoneta, Ohio, is president.

The plant and the shops of the Quitman Machine Co., Quitman, Ga., destroyed this month by fire, are to be re-established at an early date, it has been announced by officials of the company at Quitman, Ga. Three other buildings were destroyed in the fire, loss exceeding $100,000, but largely covered by insurance.

The general offices of Edgar T. Ward's Sons Co. have been moved to 400 Frelinghuysen Ave., Newark, N. J., from Philadelphia, Pa.

Piecemeal sale of equipment and supplies of the Stroh Casting Co., Detroit, for approximately $35,000, was confirmed recently by Judge Ormond F. Hunt in the Wayne County Circuit Court.

The Fisher Body Corp. will construct a plant costing approximately $650,000, in Tarrytown, N. Y., officials of the corporation have announced. The plant will be erected on the Chevrolet Motor Co. property.

Elgin Motors, Inc., is the new name of the Elgin Motor Car Corp., formerly of Argo, Ill., now located at 323 West Fifteenth St., Indianapolis, Ind.

The Lincoln Products Corp., Newark, N. J., has taken over the sales rights for northern New Jersey for the Crescent electric industrial trucks and tractors. The trucks and tractors are made by the Crescent Truck Co., Lebanon, Pa.

The *Far Eastern Review*, a monthly American engineering paper published at Shanghai, China, has opened a branch office at 50 Church St., New York City.

The Sawbrook Steel Castings Co. has been organized at Cincinnati, Ohio, for the manufacture of steel castings from electric steel material. A new plant will be erected and the capitalization at the present time is put at $200,000. The officers are: E. S. Sawtelle, president; A. E. Anderson, vice-president, and Edward L. Brooks, secretary-treasurer.

The Schubert-Christy Construction & Machinery Co., Railway Exchange Bldg., St. Louis, Mo., has been organized by Frank H. Schubert, district manager of the Wheeler Condenser & Engineering Co., and Wm. G. Christy, formerly with the St. Louis Boat & Engineering Co. The company will represent manufacturers of power plant equipment and will render general design and construction engineering service.

William F. Wendt Dies in Buffalo

William F. Wendt, aged 65 years, died recently at his home in Buffalo. Mr. Wendt was the founder and the former president of the Buffalo Forge Co. He was prominent in many lines of endeavor having been president of the



George L. Squier Manufacturing Co., the Buffalo Steam Pump Co., the W. F. Wendt Publishing Co. and other companies. He retired in 1916 as president of the Buffalo Forge Co. and two years ago as president of the W. F. Wendt Publishing Co.

Mr. Wendt was prominently connected with Republican politics in Buffalo although he never held office himself.

His brother, Henry Wendt, is the present president of the Buffalo Forge Co.

Obituary

CLARENCE C. SMITH, a design engineer of the Western Electric Co., New York City, was drowned recently near New York City.

WILLIAM M. THOMAS, ballistic engineer at the Union Metallic Cartridge Co., Bridgeport, Conn., for fifty-four years, died of pneumonia Nov. 7, at his home in Stratford, Conn. He was ill nine days. Mr. Thomas was 75 years of age. He leaves his wife, two sons and two daughters.

EDWIN R. BALL, for the past twenty years general manager of mining operations for the Tennessee Coal, Iron & Railroad Co., and recognized as one of the leading iron mining experts in the South, died recently at his home in Birmingham, Ala. Mr. Ball was 65 years of age.

AMOS P. MACK, president of Mack & Co., Rochester, N. Y., died suddenly at his home in that city. Mr. Mack was well known among western New York machinery men.

Personals

JAMES J. DALE has resigned as vice-president and director of the Consolidated Machine Tool Corp. of America, Rochester, N. Y.

E. P. BLANCHARD, advertising and sales manager of the Bullard Machine Tool Co., will give the salesmanship course at the Union Y. M. C. A. educational classes in Bridgeport, Conn., during the Winter.

EDWARD M. WOODWARD, JR., has been elected president and treasurer of the Woodward & Powell Planer Co., Worcester, Mass., succeeding his father, the late Edward Woodward.

L. L. THWING, who for the past two years has been an appraisal engineer with the Income Tax Unit, has resigned and will open an office in Cleveland as a consultant in amortization cases.

W. T. COLLIER, for the past thirty years connected with the Standard Machine Screw Co., Elyria, Ohio, has entered upon his duties as general manager and vice-president of the Hartford Machine Screw Co. in Hartford, Conn. He was treasurer of the Western plant. Mr. Collier succeeds FREDERICK S. THOMPSON, who plans to take a year's rest. Mr. Thompson came to Hartford three years ago and for twelve years prior was with the Niles-Bement-Pond Co. at the Plainfield, N. J., plant.

JOHN W. ROBINSON has been named secretary and vice-president of the Woodward & Powell Planer Co., Worcester, Mass.

COL. A. W. ERDMAN, manager of the small tools department at the Pratt & Whitney Co., Hartford, Conn., has been granted a six months' leave of absence on account of ill health and leaves shortly for a complete rest. C. M. POND is temporarily filling the position.

GEORGE C. STEIL, who has been the factory representative for the Whitney Manufacturing Co. in eastern Massachusetts and Rhode Island, has been made a distributor for that company and has his office at No. 740 Commonwealth Avenue, Boston.

W. H. HENDERSON, of New Bern, N. C., and O. W. LANE and others, have organized and incorporated there the New Bern Machine Shop & Foundry Co., according to a recent announcement.

COL. W. G. SHEEHAN, president of the Society of Industrial Engineers, was in Washington last week conferring with War Department officials in connection with plans for industrial mobilization.

A. S. BISGOOD, for many years with the Purinton & Smith Co., Hartford, Conn., and also with Machinery Dealers, Inc., New Haven, Conn., has gone into business for himself with offices at 286 Courtland Ave., Bridgeport, Conn. Mr. Bisgood will handle both new and used machines in the New England and Eastern territory.

The Industrial Review

Bright future in the machine tool line if railroads and auto builders continue expending program—Electrical field busy—The high cost of building

ACCORDING to the best authorities in the machine tool industry, it is more encouraging to look toward the bright future of tomorrow than to consider the situation of today. The monthly totals for October in all parts of the country showed that business was better than it was in September. But sales during the last week of that month and the first week in November were plainly disappointing and by some of the manufacturers characterized as worse than that.

Against this dark blue background, loom up promises and hopes for the very near future that are, to say the least, encouraging. Inquiries are plentiful, railroads are rumored customers for the last part of the month, Henry Ford has made a brave announcement of daily production of 10,000 cars by Spring, the United States Steel Corp. has increased its quarterly dividend and declared an extra dividend, general building conditions are better now than for a long time past and programs of expansions are heard of more often than at any time since last April. But actual buying, nevertheless, is quiet and promises after all are poor substitutes for performances.

Automobile production generally is in fine shape, although some of the builders are not as busy as they would like to be. Closed body models are being sought in all quarters and factories making parts for closed cars are working at a good rate.

Railroad buying during the past two weeks has been for necissities in the form of single tools with the exception of a few Eastern roads that have made good on lists that have been out. Locomotive shops and car building plants have also bought freely during the past fortnight.

Textile manufacturers in the New England states have bought nothing for some time and nothing is expected from this quarter until Spring. Southern textile manufacturers, however, are in the market for machines from time to time.

Electrical Business

Appliance selling holds the center of the field in the electrical trade this week. In all parts of the country demand is strengthening, and manufacturers are reporting a heavy call for the full line of electrical comfort and labor-saving appliances that are suitable for Christmas gifts. Jobbers are devoting a large share of their attention to this holiday trade. The prevalent feeling seems to be that sales this year are going to set a new record for the electrical industry.

The general tone of business in the East is better this week. Boston, Philadelphia and Atlanta experienced a stronger general demand, though in the New York district porcelain, conduit, wire and wiring devices generally were slack and the market was characterized as "spotty."

In the Middle West general business was steadier although sales in either the Chicago or the St. Louis area were not large. There was a slight reduction in the price of wire and pole-line hardware reported in St. Louis. Conduit and wire were selling better in Chicago than the week before. Business on the Pacific Coast continues in good volume with prices steady. Orders from Japan to the lumber and other industries continue to influence considerable buying of electrical material. Throughout the country sales of radio material are steadily increasing.

Electric Railways Prosper

A substantial argument indicating the return of prosperity to the electric railways can be found in the United States Census figures for 1922. In that year more than 12½ billion pay passengers were carried by electric railways in the United States. This figure represents an increase of 12 per cent over the previous census of 1917. Further, this is an increase of 2.5 per cent per year while population has increased less than 1 per cent. The operating revenues of the electric railways have increased 47 per cent over 1917 and now are close to a billion dollars annually. In addition, it is estimated that $250,000,000 in new capital is needed for improvements and betterments for the current year. These facts establish the electric railways as a necessary business with increasing traffic, increasing revenues and increasing facilities. Emphasis was laid on these points recently by a representative of the electric railway industry in presenting a brief review of the status of the railway before the Investment Bankers' Association.

> **In the machine tool industry prospects are bright if the present is dull and indications are that the next six months will bring forth a good volume of sales; the electrical manufacturers are busy with the Christmas business that started earlier than usual; street car business shows big improvements as compared with the past; bus makers report excellent returns for the year; mining is more than holding its own in all fields of activity; and the building figures show substantial increases in all parts of the country.**

Another favorable factor has been the introduction of means of more economical operation. This included the one-man car of which 10,000 are now in operation as compared with fewer than 1,000 in 1917. The use of the automatic and remotely controlled sub-station equipment as a factor in reducing power costs and the use of power saving devices are resulting in material reduction in the total cost of power. In the maintenance and repair departments the use of electric and metal composition welding processes has effected great savings.

Building Many Buses

Manufacturers of buses report that the present volume of sales is holding close to the level of the first six months of 1923. The White Motor Co. states that the business done by it during July was the best in the history of the firm for the same month. August sales showed some slackening throughout the manufacturing field, as is normally the case at this season of the year. Outlook for the final quarter of the year indicates that business will continue at a rate close to that of the first six months.

Mine Production Good

Production in both coal mines and others continues at a satisfactory rate for this time of the year. Improvements in the Western copper and iron mines have been going along with more activity than in other years and the indications are that equipment buying will continue as long as production keeps up.

Coal mining during the past fortnight has stayed at a steady level which is unusual considering that the sales of bituminous have been slight and anthracite needs are mostly taken care of or anticipated.

High Cost of Building

A fact that may not be generally recognized but deserves serious consideraton is that, although the value of contracts awarded in the first ten months of this year is $330,000,000 greater than in the same period of 1922, the actual physical volume of construction is only 1½ per cent above last year. *Engineering News-Record's* Volume Index Number for the ten months of 1923 is 132 against 130 for the same period of 1922 and also for the whole of 1922. This is due entirely to high cost. The Cost Index is 214 for the ten months of 1923 and 173 for 1922.

The sharp rise in industrial building in October is attributable to the $20,000,000 power plant at Kearney, N. J., for the Public Service Corp.

Carnegie Corp. Donates to Technical Study

An appropriation of $108,000 for the study of engineering education was made on Oct. 31 by the Carnegie Corp. of New York, the study to be conducted by a director responsible to a committee of the Society for the Promotion of Engineering Education. As the *American Machinist* goes to press news comes from the committee that W. E. Wickenden, assistant vice-president of the American Telephone & Telegraph Co., has accepted appointment as director.

The resolution adopted by the Carnegie Corp. sets aside for the purpose $24,000 during the present fiscal year and $12,000 during the fiscal year 1924, with the understanding that if, in the judgment of the executive committee, substantial progress shall have been made in this study by Jan. 1, 1925, the balance of the $108,000 will be made available to the society as follows: $24,000 additional during the fiscal year 1924, $48,000 during the fiscal year 1925.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THIS is written from Houston after a week spent in traveling over the state of Texas.

The optimism manifested here is not surprising for cotton has advanced nearly four cents a pound within the last ten days and the state crop, estimated at 4,300,000 bales, will sell for at least six hundred million dollars even after allowing for the deterioration in quality due to the heavy rainfall.

Adding to cotton the other crops grown here the agricultural production of Texas this year will probably be worth about a billion dollars. If the values of the cattle, hogs, sheep, oil, coal and manufactured products of the state were included the total would be much larger. The purchasing power of the community is therefore great and while the cattle men and the oil men are complaining of the low prices, the bankers admit that most frozen loans have been thawed out and that their resources are now more liquid than they have been for some years.

A few of the more conservative are in fact fearful that the prevailing prosperity may lead to a revival of speculation in land which is the favorite investment here. As yet, however, there is no indication that such fears are justified and business throughout the Southwest appears to rest upon a very sound foundation.

The large expenditure for roads and the spread of co-operative marketing are the two things by which the observant traveler in the South will be most impressed. The good road mileage of the United States is already equal to its railroad mileage and it is being rapidly increased. The cost of the roads now being built will probably average about $25,000 a mile. This is about what our present railroads cost when they were constructed and we are therefore confronting a development which is quite as important in its economic significance as was the era of railroad building that ended about thirty years ago. It may be that the road building is being overdone, but this is questionable and while it lasts it is certain to provide work for many men and keep a lot of money in circulation.

The co-operative marketing movement is hardly less important for it is not only economically sound but is has been of great educational value in that it had led farmers to study commercial conditions and endeavor to adjust their production accordingly. For this reason an overproduction of cotton is unlikely in the future and while some increase in acreage next year may be expected it will probably be smaller than many anticipate.

Of last week's elections or their import as well as political conditions abroad, most business men and farmers seem comparatively oblivious. They are faithfully reported by the newspapers but they have been but little discussed for with cotton at 34 cents there is no consciousness of the economic disorder in Europe and there is but little interest in the November election day here because its popular verdict had been predetermined by the primaries held months ago.

Nor can any business significance be attached to the results of the elections in other parts of the country, though

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As for the Bavarian revolt and the other alarming developments in Europe, they are but the logical outcome of the course which France has pursued and as such have been foreseen by all thoughtful men for many months. Therefore, though German disintegration has gotten under way more rapidly than most people expected, its effects on this side the Atlantic have been to some extent discounted. Its worst result, so far as concerns the rest of the world, is that all hope of an effectual reparations conference is dashed, for with Germany on the verge of civil war and further French intervention probable the economists will have to retire to obscurity once more. The natural outcome will be a further decline in the foreign exchanges, particularly the franc, concerning which an able banker said last week that "at the first sign that the French peasants are hesitating to trust their savings to the government there is no telling where it will drop."

There is not much change in the domestic business situation. The stock market was very firm all last week, and its stimulating influence was widely felt, although confidence that it has passed bottom is by no means general. Close observers say the advance has not induced "the public" to buy stocks, which is another way of saying that prices have not gone low enough to compete with the other securities which have been offered in such huge volume and so well absorbed. That is all the significance which need be attributed to the stock market at present.

Trade indicia show a continued heavy movement of goods. There are a few notable laggards, including steel, in which production has slowed down further and price shading is reported. Some kinds of textiles are moving "slowly" also. But it must be remembered that the word "slowly" is used in comparison with the greatest volume of trade this country has ever known and that it is in no way related to the word "depression." The ground on which active business rests is still unshaken. Corn has sold at the highest price of the season despite an increase in the estimated yield and the fear that marketing the new crop would cause a dip. Wheat has been steady. Livestock prices have held up well in the face of heavy receipts. The California fruit growers and the sugar beet raisers are facing an unusually prosperous season. In conjunction with the high cotton prices it is evident that there is daily less cause for worry about the farmer's purchasing power.

October's statistics of building permits, showing an increase in leading cities of 19 per cent over September, bear out predictions that this mainspring of business is wound up to run all Winter. There is still nothing to cause concern in the money markets. If profits were more certain few business men could find legitimate ground for complaint, but most of them know that the gentle drop in prices of last Summer has had much to do with the maintenance of Fall trade and not many would want to exchange the exorbitant profits of a "boom" and the consequent collapse for the smaller but less variable gains of steady distribution.

And above all the tax collector, the uninvited and unwelcome guest at the business banquet, may be a little less exacting in the not distant future, for Washington reports indicate that the Administration will support a policy of tax reduction for 1924. It may or may not be accepted by the farm bloc group who hold the balance of power, but the fiscal condition of the Treasury will permit it and the sentiment in its favor will be enormous. It is hard to conceive of anything else which could so encourage and stimulate business.

The Future of the Merchant Marine

Necessity and ultimate realization of American ships unquestioned—Government's obligation in removing income tax from American business representatives abroad

By HERBERT HOOVER

IT IS simply a truism to say that we must have an American Merchant Overseas Marine. Entirely apart from the fine sentiment and national pride of a great trading nation in keeping its flag upon the seas, we must have our own ships for the protection of our foreign trade; we must have ships if we would expand our exports on sound lines and we must have them as an auxiliary to our national defense.

It seems worth repeating at times that our international trade is one of the very foundations of our standards of living; that our whole fabric of living and comfort is dependent upon the import of commodities which we do not and cannot ourselves produce—tin, rubber, coffee, sugar, and a score of others; further, in the main the amount of these commodities we can import will depend upon the volume we export. Moreover, we need a constant expansion of our export markets to give stability to our internal production by a wider range of customers.

If we are to have secure export markets, we must have some sound proportion of American controlled shipping to assure us against combinations in rates which would prejudice our goods in competitive markets. Nor have our merchants been without the experience of finding that the transport of our goods in foreign bottoms has been taken advantage of by our competitors to learn the details of our trade connections.

The Importance of Shipping Rates

The facility of the world in creating combinations in restraint of trade has been growing by leaps and bounds since the war and while we, as a nation, endeavor to curb these activities within our borders, there has naturally been no curbing of these activities abroad when they affect American interests.

Today, there are many commodities upon which we are dependent by import from foreign lands in which there are combinations in control of price in those foreign lands. Combinations in control of sea rates are the commonest thing in the world shipping fabric. Many of our raw material exports, such as wheat, are sold in the world market in competition with those of other countries, and the price level in these cases is the result of competitive streams that flow into these world markets. In wheat the farmer's return is fundamentally the price which he receives at Liverpool less the cost of transportation and handling. Therefore, any increase in shipping rates is in fact a deduction from the price to the farmer. It is just as important to him to be guaranteed reasonable rates of sea transport as of land freight. The real security is an American-owned Merchant Marine. In the long view the expansion of our foreign trade must and will take place in the export of larger proportions of manufactured goods. The primary requisite for such expansion is the assurance of regularity in transportation. Not only do we need regularity of sailings week by week, in order that the manufacturer may be assured in his problems of delivery, but our merchants and manufacturers require to know that when they have established their goods in foreign lands then regular transportation will be assured to them over years to come. They cannot be dependent upon hazards of foreign ship owners, allied as these owners are with foreign merchants and competitors.

Preparedness Against Foreign Wars

We must have especially regular and positive transportation under our flag on those great trade routes where our commerce can and will expand. Nor can America be dependent for her movement of overseas goods upon the make and break of peace and war in different parts of the world. We have had one gigantic national experience with this already. We must have ships under our own flag if we are to have security in our vital supplies and exports when other nations go to war with each other. As an auxiliary of our national defense we must have preparedness in transport for soldiers and supplies; we must have a training ground for our sailors, or our Navy itself would be helplessly confined to our own coasts.

In a broad sense the American people are endeavoring to establish a Merchant Marine that will adequately protect and promote our commerce. The ideal is regular, ferry-like service of boats of the cargo liner type with some passenger capacity traversing the great trade routes of the world and carrying at least 50 per cent of our foreign trade. Today, outside of oil, we are carrying less than 20 per cent. Some day we will attain such a merchant marine. Our national necessities, the capacity of our people for organization, for mechanical development and enterprise will some day bring it about. In the meantime we have much divided opinion in public mind, in the shipping world and in Congress, as to method. And our shipping world is suffering from great handicaps.

American Management Abroad

It is not my purpose to review all these handicaps that are so familiar to you, but rather to present to you one single phase that has not been so generally considered that is capable of remedy. That is the relationship that American merchants abroad must bear to the success of an American Merchant Marine. We will never have a real American Merchant Marine until we have a much larger complement of merchants of our own nationality conducting our commerce in foreign ports. Our raw materials are largely sold at our shores to foreign merchants. They dictate the shipping. Again most of our purchases of raw materials are for delivery at our shores. The foreign merchant again controls the shipping. If we except oil, most of our manufactured goods for export are dealt with by foreign merchants. How real all this is, is shown by the fact that except oil only about 12 per cent of our imports and exports were managed by American merchants abroad.

The situation is just as insecure for our exports as for our shipping. If we would make sure of the continuous flow of goods we must have the American on the ground distributing to the foreign retailer, securing business by his services as well as his price. Many an American merchant has seen his established trade disappear because he depended upon a foreign merchant not to show patriotism to his own country. This situation has been contributed to by the tendency of some of our manufacturers to regard export as a happy hunting ground in times of domestic depression, to be abandoned in times of domestic demand. We cannot have a Merchant Marine without an army of American merchants in foreign ports. This is the foundation of our British competitors.

No stable consumption of goods can be built upon on such a fabric. And other things being equal, the merchant ships his goods under his own flag, even giving a preference to that flag. Our competitors certainly do so. The lack of growth in our merchant personnel abroad is, I believe, to a large degree the fault of our Government for reasons I will detail later.

Despite our expanding export and import trade, the number of our merchants abroad has decreased in late years and yet if we would have a merchant marine they must be increased. The taxation policies of our Government have been to a considerable degree responsible for this situation.

The Heavy Tax Burden

We are asking our people to expatriate themselves in order to sell American goods and manage American ships. Our own Government demands in income and corporation taxes up to 58 per cent of the profits of our merchants resident abroad. They also pay taxes to the Government where they reside. Thus we demand that they pay double taxes. We are the only nation that does such a thing. With tax burdens even greater than ours, our competitors in the world today have freed their merchants resident abroad from this double taxation. For instance, an American merchant firm in London today must pay British taxes amounting directly or indirectly up to 50 per cent of his income. The American Government comes along and claims the same sum or even more. In countries not participants in the war, such as the Argentine, the British merchant pays no taxes to his home Government, whereas our merchant must pay his taxes in full.

It is, therefore, felt by many as more

An address delivered at the American Marine Congress, New York City, Nov. 8.

economic for Americans to stay at home and sell their goods in the Argentine through a German or a British merchant. Scores of our merchant firms, totally discouraged, have thrown up the sponge.

Few Engineers Now

Before the war, there were at least 1,000 American engineers employed at substantial salaries in the territories of our former allies. These men went abroad to install American methods, American machinery and equipment in the production of raw materials, and in transportation. These salaried workers now find themselves subject to two gigantic income taxes and thus their foreign mission is unprofitable. I doubt whether there are 100 of them left in foreign territories today. A vast amount of American machinery and equipment that followed in their wake has dried up.

There is one phase of this matter of vital importance to our farmers. Over 80 per cent of our agricultural exports go to Europe. Before the war European merchants bought stocks of wheat and grain during our Fall marketing season and thus assisted in financing the crop. They carried stocks in European warehouses thus relieving our congestion. Today, shortage of finance and credit leads them to buy from day to day and thrusts the burden of carrying the world's seasonal reserves either upon our own farmers or upon our merchants. If our merchant firms were established in Europe, it would be possible for them to give delivery at that end and to establish short credits to their customers—all of which would relieve our farmers. But American merchants are not likely to established in Europe and to pay two income taxes which might absorb up to 75 per cent of their income.

Another case of pertinent order is that on the China Coast. Inasmuch as China has no dependable corporation law, much Chinese capital is invested in foreign corporations under the management of, or in partnership with, Europeans. As foreign governments exact no home taxation from such corporations or their stockholders the Chinese naturally prefer them. We attempted to remedy this by Congressional authority to establish special American corporations under Federal authority but the restrictions are such that the act has failed its purpose. Three large American managed businesses have gone over to control of our competitors at a real loss to our foreign trade and the great discouragement of our merchants. Similar questions are arising in the Philippines.

Must Have Americans Abroad

I wish to repeat that if we are to secure the establishment of a merchant marine we must secure dispersion of the American merchant and our Government today is one of the most destructive influences in the whole matter. I do not wish to argue the theory that Americans who are engaged abroad in reproductive work should not bear their share of the national burden. I would only point out that other nations have found it is uneconomic to impose this burden upon them, and that we are left in a prejudiced position. Nor am I pleading the cause of the American expatriot, who prefers foreign civilization as a luxury, who is bringing no returns to his country by way of his savings or by way of his expansion of American trade.

These two groups are quite distinct. They can be distinguished in tax measures so as to apply the relief only to incomes earned abroad. One is tied passionately to his country's interests and the expansion of its welfare; America to him is the home he serves in managing her trade. He will yet return with his savings to add to the national wealth, whereas the other is but a pensioner on our national resources. And yet as a nation we penalize the one who brings us service and credit whereas we should lighten his burden as much as possible.

Notes on Washington Activities

By Paul Wooton

WITH the idea of unifying the specifications for machine screws, bolts and nuts, a special committee has been organized under the Federal Specification Board. The intention is to make possible the use by all Government agencies of the same nomenclature concerning the types of fits, tolerances and methods of gaging. Commander Miles A. Libbey, representing the Navy Department, is chairman of the committee. H. W. Bearce, representing the National Screw Thread Commission, is to be secretary of the committee. The other members are: Capt. J. M. Ward, representing the War Department; Capt. John T. West, representing the General Supply Committee; W. A. E. Doying, representing the Panama Canal. The first meeting of the committee is to be held Dec. 4.

In this connection, it may be mentioned that the work of the Federal Specifications Board is progressing rapidly. Ninety standards are ready for promulgation. Industry is being consulted in each case so that the new specifications may conform to the best commercial practice.

Circulation has been given a statement to the effect that the Board is eliminating the metric system from its specifications. This is being done only in those instances where it is not customary to furnish materials in metric units. The idea is to provide specifications in the system which is used currently for the particular material involved. Dr. G. K. Burgess, the director of the Bureau of Standards, is chairman of the Board.

The Stove Bolt Controversy

The National Screw Thread Commission has not given up hope that a national standard for stove bolts will be brought about. While it is apparent that the Commission is not impressed with the action of the Cleveland manufacturers in setting up the so-called Western standard, it is believed some means will be found to adopt a national standard under which machine screws and stove bolts can be completely interchangeable, despite the effort of the Cleveland manufacturers to consider the matter closed.

The Screw Thread Commission has been requested by New England manufacturers of stove bolts not to give its approval to any standard that is not consistent with the Commission's standard threads. New England manufacturers are circulating the following as a part of a statement to their customers: "The practice of makers of stove bolts heretofore has varied in respect to head, thread and actual diameter. The desirability of a common standard being recognized generally, effort has been made to establish such a standard through the co-operation of makers, users, Government authorities and scientific societies, but no standard has been adopted as yet by manufacturers generally or has been approved by the Government authorities or the scientific societies."

Specification Dictionary

Work is being crowded by the Department of Commerce on its dictionary of specifications. Sub-committees have been named to work along the lines of a classified system. The dictionary is the first step. In its final form it will be an encyclopedia of specifications.

Col. Peck's Committee

The work of the committee on Plain Limit Gages for General Engineering Work of the American Society of Mechanical Engineers is to be pushed vigorously this Winter, Col. E. C. Peck, the chairman of the committee announces. It is planned to hold the first meeting of the committee in New York, Dec. 4, when the annual meeting of the American Society of Mechanical Engineers is in session, thereby gaining by the co-operation that is sure to be obtained from that engineering association.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Screw and bolt making machinery and tools. Prague, Czechoslovakia. Purchase. Reference No. 8074.

Woodworking machinery and building construction machinery. Varese, Italy. Agency. Reference No. 8024.

Drilling machines and drills. Cape Province, South Africa. Purchase. Reference No. 8036.

Hack saw blades and other tools. Melbourne, Australia. Purchase. Reference No. 8040.

Forthcoming Meetings

National Founders' Association. Twenty-seventh annual convention. Hotel Astor, New York City, Nov. 21 and 22. J. M. Taylor, secretary, 29 S. LaSalle St., Chicago.

American Society of Mechanical Engineers. Annual meeting, Dec. 3 to 6, in New York City. Calvin W. Rice, 29 W. 39th St., New York City, secretary.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8. Headquarters, Grand Central Palace, New York City.

Society of Automotive Engineers. Annual meeting, Jan. 22 to 25, at the General Motors Building, Detroit, Mich. Coker F. Clarkson, 29 W. 39th St., secretary.

Foreign Trade Council. Eleventh annual convention at Boston, June 4, 5 and 6. O. K. Davis, India House, Hanover Square, New York City, secretary.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Some improvement in pig-iron inquiries. Bottom of market probably reached, so far as price of pig iron is concerned. Prices tending downward in light rails, forging billets, cold finished bars, black and galvanized steel sheets. Structurals firm at $2.50 base; soft steel bars, $2.40 per 100 lb., Pittsburgh. Tin plate firm. Accumulation of small orders keeping mills at 85 to 90 per cent of capacity.

Advances—Tin firm at present level; advanced 1⅛c. per lb. in week. Copper demand improving; price of electrolytic rose ⅛c. per lb. in New York. Lead market strong; up 5c. per 100 lb. since last week. Asiatic antimony scarce; ¾c. per lb. higher in New York.

Declines—Bar iron, $3.10@3.15 per 100 lb. at mill, against $3.25 one week ago. Aluminum ingots, 25c. compared with 25½c. per lb. formerly. Old copper slightly cheaper in Cleveland. Zinc market quiet. No other declines reported.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.05
Northern Basic	24.00
Southern Ohio No. 2	24.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	28.00
BIRMINGHAM	
No. 2 Foundry	22.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.25
Virginia No. 2	28.17
Basic	24.00
Grey Forge	24.00
CHICAGO	
No. 2 Foundry local	24.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	27.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.77
Basic	25.77
Bessemer	26.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.75
Cleveland	4.75
Cincinnati	....
New York	5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.00
No. 12	3.10	4.64	3.80	4.05
No. 14	3.20	4.69	3.85	4.10
No. 16	3.40	4.79	3.95	4.20
Black				
Nos. 17 and 21	3.70	4.95	4.45	4.70
Nos. 22 and 24	3.75	5.00	4.50	4.70
Nos. 25 and 26	3.80	5.05	4.55	4.75
No. 28	3.85	5.15	4.65	4.85
Galvanized				
Nos. 10 and 11	4.00	5.15	4.70	4.85
Nos. 12 and 14	4.10	5.25	4.80	4.95
Nos. 17 and 21	4.40	5.55	5.10	5.24
Nos. 22 and 24	4.55	5.70	5.25	5.40
No. 26	4.70	5.85	5.50	5.55
No. 28	5.00	6.15	5.80	5.85

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded.	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0,17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold drawn shafting or screw	4.65	3.90	4.55
Cold drawn flats, squares	5.15	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.10@3.15 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 5/32, 8.35c.; ⅛, 7.85c.; 3/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			13.50
Tin, 5-ton lots, New York			44.50
Lead (up to carlots), St. Louis	6.45@6.50	New York	7.17½
Zinc (up to carlots), St. Louis	6.37½	New York	6.80

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.00	27.00	26.50
Antimony (Chinese), ton spot	10.37½	10.50	10.50
Copper sheets, base	20.25	20.50	23.00
Copper wire, base	15.00	18.25	16.25
Copper bars, base	19.25	21.50	19.50
Copper tubing, base	23.00	26.50	23.00
Brass sheets, base	17.00	21.25	18.75
Brass tubing, base	21.50	26.25	20.50
Brass rods, base	14.75	17.25	15.75
Brass wire, base	17.50	21.25	.....
Zinc sheets (casks)	10.25	10.45	.....
Solder (½ and ½), (case lots)	29.50	29.00	28.50
Babbitt metal (83% tin)	52.00	52.00	45@48
Babbitt metal (35% tin)	25.00	17.50	20@25
Nickel (ingot and shot)	29.00	.....	.....
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00

Shop Materials and Supplies

METALS—Continued

Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.75	11.25	11.25
Copper, heavy, and wire	10.75	10.75	10.50
Copper, light, and bottoms	9.50	8.75	9.50
Lead, heavy	5.75	5.25	5.75
Lead, tea	4.75	4.00	4.75
Brass, heavy, yellow	7.00	....	7.00
Brass, heavy, red	8.75	9.25	8.75
Brass, light	6.25	5.00	6.00
No. 1 yellow brass turnings	7.00	5.75	6.50
Zinc	3.75	2.75	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$25.10	$22.85	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.40	18.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	13.00	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.14
Cotton waste, colored, per lb.	.08@.13	.12	.10½
Wiping cloths, 13¼x13¼, per lb	11.00	36.00 per M	.16
Wiping cloths, 13¼x20½, per lb	....	52.00 per M	.16
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.98	1.05	1.14
Lard cutting oil (50 gal. bbl.) per gal	.55	.50	.67½
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.297	.35	.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30–10%	30–10%	30–10%
Heavy grade	20–5–2½	30%	20–5–2½%
Rubber and duck:			
First grade	50–10–5%	50–10%	40–10%
Second grade	60–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20
Fire clay, per 100 lb. bag	....	.65	.60
Coke, prompt furnace, Connellsville	per net ton		3.50@4.00
Coke, prompt foundry, Connellsville	per net ton		5.00@5.50
White lead, dry or in oil	100 lb. kegs	New York, 14.00	
Red lead, dry	100 lb. kegs	New York, 14.00	
Red lead, in oil	100 lb. kegs	New York, 15.50	

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0354	$0.0354	$0.0304
Cold finished shafting	per lb.	0.0465	0.0465	0.039
Brass rods	per lb.	0.1475	0.1525	0.17
Solder (⅛ and ½)	per lb.	0.295	0.295	0.275
Cotton waste	per lb.	.10@.13	.10@.13	.09@.11½
Washers, cast iron (½ in.)	per 100 lb.	6.50	6.50	6.00
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.02
Lard cutting oil	per gal.	0.55	0.55	0.60
Machine oil	per gal.	0.297	0.297	0.33
Belting, leather, medium	off list	30–10%	30–10%	30–10%
Machine bolts up to 1x30 in.	off list	40–10%	40–10%	40%

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40–10%	60%	45–5%
1⅛ and 1¼x3 in. up to 12 in.	15%	50–5%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	25–10%	$3.50 net	.....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30–10%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65–5%
Lag screws, coach screws	40–10%	.....	60–5%
Square and hex. head cap screws	60%	70%	70–10%
Carriage bolts, up to 1 in.x30 in.	30–10%	50%	40–5%
Bolt ends, with hot pressed nuts	40–10%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 9/16 and smaller	60%	.....	.....
Semi-finished nuts, ⅝ and larger	55%	70%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	0.50	3.50	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	0.50	3.50	2.50
Nuts, cold punched, sq., per 100 lb. Off list	0.50	3.50	2.50
Nuts, cold punched, hex., per 100 lb. Off list	0.50	3.50	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	50–10%	60%	60%
Rivets, tinned	50–10%	60%	4½c. net
Button heads ⅞-in., ¾-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3.60	$3.75
Cone heads, ditto (net)	5.60	3.80	3.85
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

New and Enlarged Shops

Machine Tools Wanted

Ala., Albany—Decatur Cornice & Roofing Co., Inc., H. R. Davis, Secy.—No. 17 E punch, new Doty, 16 in. throat, capacity ¾ in. through ⅝, direct motor drive; No. 17 E shear, new Doty, 16 in. throat, capacity 2 in. round with shearing attachments for rounds, squares, flats and angles, direct motor drive; two W. F. & J. Barnes Co. No. 5 drill presses, one 20 in. and one 26 in. swing; power hacksaw for 24 in. blades, swivel vise for bevel cutting; Reliance or Landis bolt and pipe threading machine, capacity ½ to 2½ in. bolts, ⅜ to 2½ in. pipe; quick acting light power punch; 16 in. turning lathe, 5 ft. travel; light high speed drill, friction drive from band, no gears; pipe bending machine up to 2½ in. pipe; one hand operated crane, 50 ft. span, with 1 to 6 ton electric hoist, lift 22 to 25 ft., both bridge member and trolley to be hand operated; one single carriage, ten ton capacity and one 2 to 5 ton carirages, 2 to 5 ton hoists, electrically operated, 50 ft. span, lift 25 ft. crane, 220 volt, 3 phase, 60 cycle, a.c., operated on open runway.

Conn., Hartford—J. A. Pilgard, 1026 Main St.—complete equipment and tools for machine shop of new garage.

Conn., Stamford—H. H. Noack, Forest St.—machinery and equipment, including lathe, planer, drills, bench tools, shafting, pulleys and belting, for proposed garage.

Fla., Bradentown—Bradentown Sales Co.—lathe, drill press and bench tools for automobile repairs.

Ill., Chicago—Chicago, Rock Island & Pacific R.R., La Salle St. Sta., F. D. Reed, Genl. Purch. Agt.—motor driven 24 in. heavy duty lathe, 7½ in. hole through spindle.

Ill., Chicago—Illinois Central R.R., 135 East 11th Pl., J. J. Bennett, Purch. Agt.—motor driven upright drill, 36 in. table, to drill 2½ in. holes.

Ia., Odebolt—E. D. Peck & Son—20 in. drill press, air compressor, chain hoist and gasoline service pumps for garage.

Kan., Galena—J. Hoffman—lathe, about 20 in. swing, for blacksmith and machine shop (used).

Kan., Galena—Jaqueth & Loucks—lathe for garage.

Kan., Galena—C. N. Outt, West Side Garage—lathe and drill press.

Kan., Galena — Stone & Penson, F. T. Stone, Purch. Agt.—lathe for sheet metal work.

Kan., Wichita—Moore Bros. Electric Co., 215-217 West Douglas St.—lathe and milling machine.

Me., Portland—E. W. Jones, Exchange St.—lathe, planer, upright drill, hacksaw, pipe cutters and threaders, shears, drills, reamers, miscellaneous small tools, pulleys, belting and shafting for proposed $50,000 garage.

Me., Portland — Portland Terminal Co., Union Sta., T. B. Wheeler, Ch. Engr.—machinery and equipment for new $1,500,000 locomotive repair shop.

Md., Baltimore — G. Esselmann, 3313 Greenmount Ave.—automobile repair machinery, lathe, drill press and bench tools.

Mass., Boston—W. J. Connell Co., 574 Commonwealth Ave.—small garage tools, shafting, pulleys, belting, upright drill, shears, punches, hacksaw, reamers, pipe and bolt dies, etc., for proposed garage.

Mass., Worcester—Curtis & Marble Machine Co., 100 Fremont St.—large and small machine tools, including lathes, planer, shaper, drills, reamers, shears, etc., for $20,000 addition to shop.

Mich., Detroit—Buhl Sons, foot of Adair St.—automobile repair equipment for proposed $55,000 garage.

Miss., Utica—J. B. Arnold Motor Co.—lathe and drill press.

Mo., Webb City—T. H. Stepp, Daugherty and Walker Sts.—drill press and lathe (used).

N. Y., Barneveld—T. Haskell—vise, tools, press, emery wheel and equipment for garage repair shop.

N. Y., Buffalo—H. C. Amidon, Central Y. M. C. A.—equipment for garage repair shop.

N. Y., Buffalo—L. Doebert, 352 Pratt St.—tools, vise, presses and equipment for new garage.

N. Y., Buffalo—J. Fourrier, 200 Dewitt St.—garage repair shop equipment.

N. Y., Buffalo—M. Grossman, 15 Mortimer St.—equipment for garage and repair shop.

N. Y., Buffalo—J. King, 1185 Niagara St.—equipment for garage repair shop.

N. Y., Buffalo—G. Kranchfeld, Spring and Sycamore Sts.—equipment for garage repair shop.

N. Y., Corning—Hood Fdry., Front St., A. G. Hood, Purch. Agt.—lathe, emery wheel, stand, belting, grinding machine and equipment for machine shop; also machinery and tools for carpenter shop.

N. Y., Geneva—O'Malley Motor Co., 347 Exchange St., R. O'Malley, Purch. Agt.—complete equipment, including tools, lathe, emery wheel and presses for proposed $100,000 garage, to replace that which was destroyed by fire.

N. Y., Jamestown—East 2nd St. Garage, P. Ogren, Purch. Agt.—drill press, tools and equipment for garage and repair shop.

N. Y., Mayville—Service Garage, S. W. Houx, Purch. Agt.—garage tools and equipment, including bench tools, press and emery wheel.

N. Y., Niagara Falls—United States Light & Heat Co., Highland Ave. (manufacturer of motors, batteries, etc.)—machine shop tools, machinery and equipment, to replace that which was destroyed by fire.

N. Y., Richmond Hill (Jamaica P. O.)—Auto Table Co., Inc., 120th St. and Jamaica Ave.—punch, shear and angle cutting combined for handling iron up to ½ in. thick; one 8 ft. press.

N. Y., Schenectady—Westinghouse Co., 56 Weaver St. (manufacturer of thrashing machines)—hangers, pulleys, special machinery, gear cutting, grinding and automatic drilling machines, also presses for new plant at Shortsville.

N. Y., Seneca Falls—F. Maier, 193 Fall St.—complete machinery and equipment for the manufacture of Star lathes.

N. Y., Sheriden—Sheriden Garage—small lathe, tools and machine shop equipment.

N. Y., Syracuse — Borgenson Tool Co., Water and Grape Sts.—machine tools, including special, slotting, cutting off, chucking, automatic milling and screw machines.

N. Y., Syracuse—Diefendorf Gear Corp., 324 Pearl St., W. H. Diefendorf, Pres.—machine tools, automatic milling, drilling, boring, gear cutting, grinding, etc., to enlarge capacity.

N. Y., Syracuse—H. A. Smith Mchy. Co., Water and Grape Sts.—complete machinery and equipment, including automatic drilling and screw milling tools and lathes.

N. Y., Utica—J. Cox, 408 Cooper St.—complete equipment, drill press and small lathe for garage and repair shop.

O., Akron — Farmers Sanitary Strainer Co., F. B. Young, Pres. — machine shop equipment, including drill press and grinder.

O., Akron—Summit Tractor Co., 202 East Mill St., H. D. Korte, Mgr.—general machine tools, including small lathe, automatic drilling machine and grinder.

O., Bridgeport—Hill Machine Shops—complete equipment, tools and lathes for proposed machine shop.

O., Columbiana—H. Dill—pipe threading and cutting machine, tools and equipment for plumbing shop.

O., Columbus — Columbus Steam Pump Wks., 83 West Broad St., R. Pulling, Pres.—automatic punch machine, grinder, etc.

O., Delta—Markey & Belprez (brass foundry and machine shop), E. V. Markey, Pres.—small lathe, drill press and foundry equipment.

O., Youngstown—Youngstown Boiler & Tank Co., 1054 Mahoning St.—drill presses, cranes, hoisting machinery and drilling machines.

Pa., Altoona—H. H. and H. M. Fleck, 1409 13th Ave.—tools, press, emery wheel and equipment for proposed garage.

Pa., Altoona—William Penn Auto Co., 2208 Union Ave., R. P. Miller, Purch. Agt.—drill press, vise, small lathe and repair tools.

Pa., Coraopolis—Advance Welding Co., S. Crute, Purch. Agt.—welding outfits, machinery and tools for welding and repair plant.

Pa., Edwardsville (Kingston P. O.)—R. Lloyd, Durkas Bldg., (battery repair shop)—tools, press, charging and general repair equipment.

Pa., Erie — H. P. Westcott, Pittsburgh Ave.—machinery and tools for proposed $35,000 machine shop.

Pa., Johnsonburg—Johnsonburg Machine Co. (manufacturer of iron, steel and brass parts), R. E. Dempsey, Purch. Agt.—special machinery, machine shop tools and equipment.

Pa., Kingston (Wilkes-Barre P. O.)—Davenport Garage & Service Sta., C. M. Whitesell, Purch. Agt.—tools, emery wheel, presses and battery station equipment.

Pa., Miners Mills (Wilkes-Barre P. O.)—S. Jacobs—tools, equipment and emery wheel for new garage.

Pa., Pittsburgh — Beechwood Garage, Beechwood Blvd., S. Neuman, owner—tools and repair equipment.

Pa., Pittston—Motorin Garage, Tompkins St., W. J. Gillespie, Purch. Agt.—complete equipment, including small lathe and repair tools, for proposed garage.

Pa., Scranton—Paige Motor Co., Anderson Bldg., Adams St.—equipment, garage repair tools, press, etc.

Pa., Somerset—A. B. C. Motor Co.—tools, press and equipment for new garage.

Pa., Titusville—City Hall Garage Co., W. C. Jones, Purch. Agt.—tools, presses and equipment for garage.

Pa., Wilkes-Barre — M. Desiderio, Lawrence St.—10 to 12 in. lathe, press, tools and machine shop equipment.

Pa., Wilkes-Barre—J. Silverblatt, 94 Bennett St.—equipment, press, tools and emery wheel for garage and repair shop.

Tex., Fort Worth — J. J. Longever, 290 West 11th St.—electric drill press.

Va., Norfolk — Norfolk Southern R.R., L. M. Jones, Purch. Agt.—24 in. lathe and 6 ft. radial drill.

Wis., Appleton — Appleton Pattern Wks. Co., c/o B. F. Wachholtz, Mgr.—special machinery and equipment for wood and metal patterns and templates.

Wis., Milwaukee—Adjustable Rack Co., c/o F. A. Brown, 2801 Center St. (manufacturer of shoe racks)—boring machine and drill press.

Ont., Welland — Gram Bros. — complete equipment for proposed $40,000 garage.

Que., Hull—Hull Steel Fdrys. Co. (manufacturer of railroad equipment), A. H. Coplan, Pres.—machinery, equipment, furnaces, power hammers, etc., for proposed $1,000,000 steel mill at Ogdensburg, N. Y.

Que., Longueuil—Cote & Montcalm, 2 St. Charles St.—tools and equipment for garage and repair shop.

Que., Montreal — Anctil & Burnell, 50 Workman St.—small lathe and tools for automobile repair shop.

Que., Montreal—Cylinder Grinding & Auto Part Co., Ltd., 146 Mountain St.—hacksaw, threading machine, etc.

Que., Montreal—Duplessis, Bezier & Valiquet, 27 St. Alexander St.—tools, lathe, drill, etc., for automobile repairs.

Que., Montreal—Emery Steel Co., Ltd., c/o H. S. Ross, 90 St. James St.—equipment for foundry and machine shop.

Que., Montreal—A. Fleurant, 142 Murray St.—drill press, emery wheel and stand for blacksmith shop.

Que., Montreal—J. A. Houle, 765 Laurier Ave.—drill press and lathe for automobile repairs.

Que., Montreal—Jarry & Frere, 2914 St. Lawrence St.—lathe, press and bench tools for garage.

Que., Montreal—E. Lamarche, 106 Baldwin St.—equipment for garage.

Que., Montreal—M. Mongeau, 321 Aylwin St.—equipment for garage and repair shop.

Que., Montreal—Montreal Auto Repairs, 1446 St. Lawrence Blvd.—tools, press and equipment for automobile repair shop.

Que., Montreal—Natl. Welding Co., 563 St. Timothee St.—shears, upright drill, etc., for automobile repair shop.

Que., Montreal—Paiement & Frere, 439 Joliette St.—drill press and lathe for garage.

Que., Montreal—J. Therrien, 576 Ontario St., E.—reamer and small hand tools for machine shop.

Que., Montreal—L. Tremblay, 7 Brebeuf St.—press, tools and equipment for garage.

Que., Montreal—Savaria & Lettre, 1581 St. James St.—lathe, planer, etc., for automobile repairs.

Que., Montreal, East—A. Lavigne, 33 Derocher St.—equipment and tools for repair shop and garage.

Que., Pointe aux Trembles—A. Bilodeau, 5493 Notre Dame St.—emery wheel, drill press, tools, etc., for automobile repair shop.

Que., Quebec—R. Gauvin, 1 D'Aiguillon St.—garage and repair equipment.

Que., Quebec—G. Legace, 66 Charest St. —tools, press, etc., for garage.

Machinery Wanted

Calif., Los Angeles—Amer. Crushed Rock Co., Amer. Bank Bldg.—rock crushing plant for Claremont. Estimated cost $100,000.

Fla., Lakeland—N. P. Cauthen—lathe for turning broom handles.

Ga., Atlanta—R. B. Blackburn, Atlantic Trust Bldg.—machinery for the manufacture of tags for cotton bales.

Ill., Chicago—Duplex Printing Press Co., 536 Rush St., C. S. Brown, Purch. Agt.—8 page duplex press.

Ill., Chicago—Florsheim Shoe Co., 3927 Belmont St.—complete machinery and equipment for proposed $700,000 addition to plant.

Ill., Chicago—Harvard Press, 1213 West Van Buren St., M. Mehincoe, Purch. Agt.—12 x 18 in. Miller job press and a 10 x 15 in. Gordon press.

Ill., Chicago — Vulcan Co., 4036 West Lake St. (contractors)—metal grinder, surfacer and planer for woodwork.

Ill., Marissa — R. W. Randolph — job printing press for electric power, belting, hangers and pulleys (used).

Ind., Indianapolis — Indianapolis Wood Products Co., 204 Lombard Bldg.—bandsaw and slotting machine.

Ind., Spencer—The Journal — Babcock press.

Ia., Sigourney—F. C. Parke—10 x 15 in. Chandler & Price job printing press.

Ia., Stratford—Courier Publishing Co.—9 x 13 in. Gordon job printing press.

Kan., Galena—Electric Shoe Shop, 403 Main St.—shoe stitcher and finisher (used).

Kan., Galena—W. L. Hardman—dustless shoe finisher and stitcher.

Kan., Galena—A. L. Morford, 207 Main St.—Miller feeder, job press and paper cutter (used).

Kan., Galena—R. B. Tennis, 506 Main St. —electric shoe finisher, also combination shoe and harness stitcher.

Md., Baltimore—Porcelain Enamel & Mfg. Co., 8th Ave. and O'Donnell St.—special machinery and equipment for proposed $400,000 addition to plant.

Mass., Boston—Berwick Cake Co., 2220 Washington St., C. T. Main, 220 Devonshire St., Purch. Agt.—machinery and equipment, including ovens, conveying machinery, etc., for proposed $150,000 bakery.

Mass., Boston — The city, Public Bldg. Dept., F. J. Kneeland, Chn.—machinery, including wood and metal working machines, benches, shafting, belting and pulleys, for manual training department of proposed $500,000 grammar school.

Mass., Boston—Fuller-Thurber Co., 414 Albany St. (planing mill)—pulleys, shafting, belting and possibly machinery.

Mass., Campello (Brockton P. O.)—Howard Press, Inc.—15 x 21 in. Golding job press (used).

Mass., Fall River—City Bldg. Dept.—machinery, including wood and metal working tools, tables, benches, shafting, pulleys and belting, for manual training department of proposed junior high school.

Mass., Fall River—Union Cottor Mfg. Co. —looms, shafting, pulleys, etc., for addition to mill.

Mass., Hinsdale—Hinsdale Woolen Mills, address manager—picking, carding and warping machines.

Mass., Lowell—International Cotton Mills, Marginal St.—looms, shafting, pulleys, etc.

Mass., Newburyport—Essex Cotton Mills, address manager—shafting, belting, pulleys, etc., possibly a few looms.

Mass., Southbridge — Hamilton Woolen Mills, address purchasing agent—machinery for proposed 3 story, 50 x 150 ft. addition.

Mass., West Roxbury (Boston P. O.)—L. S. Crosby, 61 Dent St.—medium size power hammer for machine shop (used).

Mass., Worcester—Osgood, Bradley Car Co., 351 Mountain St., address purchasing department—forge equipment for new $40,000 shop.

Mich., Detroit—Consolidated Bakeries Co., c/o R. R. Pereira, Archt., 333 State St.—bread baking and handling machinery for proposed $75,000 baking plant.

Mich., Redford—W. Gitchel, R. F. D. 3—medium or large paper cutter (used).

Mich., Sault Ste. Marie—Soo Handle & Enameling Co.—wood turning machinery and complete outfit for enameling on metal, to replace that which was destroyed by fire.

Minn., Duluth—Cutler-Magner, 1115 Fidelity Bldg.—machinery for proposed $400,000 salt refinery and warehouse.

Miss., Jackson—Enochs Lumber Mfg. Co. (sash and door factory)—complete machinery for proposed plant, to replace that which was destroyed by fire.

Mo., Cameron — B. B. Witt (newspaper and job printer)—model 1 linotype machine.

Mo., Carterville—Byers, 407 West Main St.—tinner's brake (used).

Mo., St. Louis—Chester Knitting Mills, Vanderventer and Laclede Sts.—machinery and equipment for plant for the manufacture of hosiery at Gadsden, Ala.

Mo., St. Louis—Puritan Co., 6111 Harlan Pl.—job printing press.

Mo., Webb City—J. Carbon, 4th and Oakland Sts.—electric finisher, stitcher, belting, pulleys and hangers for shoe repair shop.

Mo., Webb City — K. M. Ross, 310 North Hall St. (leather shop)—stitcher, finisher, belting, hangers and pulleys (used).

N. Y., Akron—Donex Co.—machinery for the manufacture of tennis rackets and lawn furniture, to replace that which was destroyed by fire.

N. Y., Binghamton—Hullman Furniture Co., 221-225 Washington St., I. J. Hullman, Purch. Agt.—machinery and equipment for the manufacture of wood furniture, including bench tools and lathes.

N. Y., Brownville—Brownville Board Co. (manufacturer of wall board)—machinery for pulp mill to replace fire loss.

N. Y., Buffalo—P. J. Cahill, 128 Chester St.—bakery equipment.

N. Y., Buffalo—R. H. Childs, 345 Niagara St.—candy making equipment.

N. Y., Buffalo—K. Falter, 2281 Genesee St.—bakery equipment.

N. Y., Buffalo—G. E. Farthing, 86 Ellicott St.—printing office equipment for proposed plant at 260 Oak St.

N. Y., Buffalo—A. J. Feyl, 1274 Genesee St.—candy manufacturing equipment for factory at 42 Harriett St.

N. Y., Buffalo—K. Henzl, Bailey St. and Littell Ave.—carpenter shop equipment.

N. Y., Buffalo— J. E. Kieffer, 1299 Hertel Ave.—equipment for bakery.

N. Y., Buffalo—A. Koch, 720 West Ave.—bakery equipment.

N. Y., Buffalo—Luther Bros., 52 Warwick Ave., C. Luther, Purch. Agt.—carpenter shop equipment.

N. Y., Buffalo—F. Ponczkowski, 2 Empire St.—equipment for the manufacture of sausage.

N. Y., Buffalo—G. J. Stavros, 291 Ellicott St.—candy manufacturing equipment for factory at 852 Tonawanda St.

N. Y., Buffalo—A. Szlagowski, 152 Milburn St.—grinders, cutters and equipment for addition to sausage factory.

N. Y., Burt—Henner Evaporating Plant, Creek Rd., H. Henner, Webster, Purch. Agt. —complete machinery and equipment for fruit evaporating plant.

N. Y., Dunkirk—Roamer Axe & Tool Co., J. C. Roamer, Purch. Agt.—machinery and equipment for the manufacture of axes and tools.

N. Y., Green Island (Troy P. O.)—J. A. Manning Paper Co., W. L. Eldred, Purch. Agt.—six beaters.

N. Y., Holley—R. Sarmsworth—refrigeration equipment for cold storage plant, to replace that which was destroyed by fire.

N. Y., Lowville—Power Gas & Oil Co., A. N. Virkler, Purch. Agt.—pumps and equipment for gasoline stations.

N. Y., Niagara Falls — Cataract Ice Cream Co., Niagara St.—machinery and equipment for addition to plant.

N. Y., Norwich—M. Devine—machinery and equipment for the manufacture of cigars, to replace that which was destroyed by fire.

N. Y., Peekskill—Union Stove Wks.—complete machinery and equipment for proposed $500,000 plant, to replace that which was destroyed by fire.

N. Y., Potsdam—St. Lawrence Condensed Milk Corp., R. B. Page, Pres.—machinery, equipment, hangers and pulleys for milk plant ,to replace that which was destroyed by fire.

N. Y., Rhinebeck—Rhinebeck Gazette—model 14 linotype machine.

N. Y., Seneca Falls — Seneca Rug Co. Inc., 12 Swaby St., F. Marcella, Purch. Agt. —complete machinery and equipment for proposed $60,000 factory.

N. Y., Utica—Utica Knitting Co., Erie St.—machinery for proposed factory for the manufacture of steel boxes.

N. Y., Watertown — Watertown Radio Service Co., 112 Park St., J. Purser, Purch. Agt.—machinery for small plant for the manufacture of radio and electrical apparatus.

N. C., Littleton — E. E. Wollett—fast feed planer and other planing mill machinery.

N. C., Rutherfordton—Taylor Lumber Co., J. L. Taylor, owner—complete outfit for general mill work.

N. D., Parshall—Plainsman—2 page cylinder newspaper press.

O., Bridgeport—Scott Lumber Co.—complete machinery for proposed planing mill, to replace that which was destroyed by fire.

O., Columbus—Henderson Tire & Rubber Co., Goodale St. along tracks of Hocking Valley R.R., C. O. Henderson, Pres.—five tire making machines and one tubing machine.

O., Corning—Consolidated Clay Products Co.—clay working machinery and equipment, to replace that which was destroyed by fire.

O., Dayton — Aero Sign Service Co. McDaniel Ave., W. P. Hartsock, Purch. Agt.—machinery and equipment for the manufacture of electric signs.

O., Dover—Sugarcreek Brick Co., H. A. Rinker, Genl. Mgr.—general brick making equipment.

O., Lima — Lima Glass Co., Pearl and Union Sts.—machinery and equipment for proposed $50,000 glass plant.

O., Lima—Parks & Klay Co., South Pine and St. Johns Sts., S. G. Parks, Purch. Agt. —gasoline pumps and service station equipment for proposed expansion program.

O., Toledo—W. Zeunen, 507 Front St.—electric welding outfit and equipment for welding shop.

O., Warren — East Ohio Mfg. Co., B. Shover, Oliver Bldg., Pittsburgh, Purch. Agt.—one 25 ton, 3 motor, industrial crane.

Okla., Rush Springs — Rush Springs Record—No. 8 or 14 linotype machine.

Ore., Portland — Triangle Milling Co., Tillamook St.—milling, cleaning, conveying machinery, belting, etc.

Pa., Allentown—Pennsylvania Independent Oil Co., P. L. Price, Purch. Agt.—equipment and pumps for proposed branch service stations.

Pa., Columbia Cross Roads—C. E. Peckham—complete sawmill machinery and equipment, to replace that which was destroyed by fire.

Pa., Dawson—Corrado Coal Co., Fort Hill—coal handling equipment, tipple machinery, etc.

Pa., Homestead—Acme Steel Constr. Co., G. L. Redpath, 107 3rd Ave., Purch. Agt.—machinery and equipment for the manufacture of iron, steel and metal products.

Pa., Montgomery — United Buyers Mfg. Co.—machinery for the manufacture of small wheel toys at Williamsport.

Pa., Pittsburgh—Anchor Drawn Steel Co., 1101 Farmers Bank Bldg.—cranes.

Pa., Pittsburgh — A. M. Byers Co., 235 Water St. (iron pipe)—one electric gantry crane for South Side Wks.

Pa., Pittsburgh — Carnegie Steel Co., Carnegie Bldg.—two 75 ton and three 10 ton cranes; also one hand operated crane for McCutcheons Wells, Reedsdale St., N. S.

Pa., Pittsburgh—Crucible Steel Co., Oliver Bldg.—cranes for expansion of Park works.

Pa., Pittsburgh—Eagle Soda Water Co., 3206 Niagara St.—charging machinery and equipment for addition to plant.

Pa., Pittsburgh—Jones & Laughlin Steel Corp., 3rd and Ross Sts., A. Ochsenhirt, Purch. Agt — one locomotive type dock crane, 75 ft. boom, for Memphis, Tenn.

Pa., Pittsburgh — Pennsylvania R.R., Union Arcade, W. G. Phelps, Purch. Agt.—one 20 ton locomotive crane for Sharpsburg.

Pa., Youngsville — H. Trask (manufacturer of furniture)—woodworking machinery, including lathes, stickers, saws, belting, hangers and pulleys.

S. C., Hardeeville—H. B. Rivenbark, P. O. Box 27—machinery for the manufacture of hosiery.

Tenn., Chattanooga—Chattanooga Roofing & Fdry. Co., Masonry Ave. along tracks of Nashville, Chattanooga & St. Louis Ry. —brass foundry equipment.

Tenn., Columbia—Non-Acid Phosphate Co.—equipment, etc., for the reduction of phosphate rock.

Tenn., Nashville—The city—refrigeration plant for market house.

Tenn., Nashville—Equipment Sales Co., Independent Life Bldg. — jaw crusher, medium size.

Tex., Dekalb—Crump Motor Co.—electric drill.

Tex., DeKalb—Jolly Printing Co.—24 x 36 in. folder.

Tex., Kaufman—J. Keith (cabinet maker) —8 in. jointer and Universal woodworker.

Tex., Lubbock—The Printer, Box 966—10 x 15 in. job printing press.

Tex., Marlin—E. Undersmith, 302 Fortune St.—two job printing presses.

Tex., Mission—S. W. McClure—newspaper press, belting, pulleys, hangers and shafting.

Tex., Whitney—O. D. Harris (machine shop)—trip hammer, Universal woodworker and belt sander.

Va., Front Royal—Major Constructing Co.—brick making machinery (used preferred).

Va., Richmond—The city, E. W. Trafford, Dir. Public Utilities—motor driven portable belt conveyor.

Wis., Arpin—J. Ganzley—churn, separator, etc., for proposed $40,000 creamery, to replace that which was destroyed by fire.

Wis., Beaver Dam—G. E. Welson—vegetable canning machinery, including sorters, viners, conveying, cooking, belting, shafting and hangers.

Wis., Beloit—E. R. Branigan, 398 Eclipse Ave.—ice making machinery for proposed $40,000 ice plant.

Wis., Beloit—W. A. Rossow, 4th St.—equipment for proposed $40,000 laundry.

Wis., Birchwood—Clover Valley Cheese Co.—separators and vats.

Wis., Birchwood — Weigor Hardwood Products Co.—planer, matcher and bandsaw.

Wis., Fond du Lac—H. & H. Cafeteria Co., 105 South Main St., E. C. Halverson, Mgr.—ice machine and refrigeration machinery, brine type.

Wis., La Crosse — The city, c/o C. C. Congdon, Engr., City Hall—level, transit and blue printing machine for engineering department (new).

Wis., Madison—Chicago & Northwestern Ry., 201 South Blair St., B. R. Kulp, Division Engr.—electric hoist for switching yards.

Wis., Madison—N. Olsen, 1928 Railroad St.—bench tools, small woodworking machinery, band and circular saws.

Wis., Madison—G. Ripp & Son, 20 South Bassett St.—8 in. molder, turning lathe, jointer and dry kiln equipment.

Wis., Marathon — Marathon Concrete Wks., C. Kersten, Purch. Agt. — tamping machines, also moulding machine.

Wis., Mayville—Feilbach Mfg. Co., A. O. Feilbach, Mgr.—equipment and tools for the manufacture of metal specialties.

Wis., Milwaukee—Advance Boiler & Tank Co., 3015 Walnut St., E. J. Lepinsky, Purch. Agt.—one boiler maker's flanging machine.

Wis., Milwaukee — Christophel Concrete Products Co., Greene Bay and Cedarburg Rds., J. Christophel, Purch. Agt.—tamping machine, multiple tampers.

Wis., Milwaukee—E. F. Goss, 935 Clinton St. (foundry)—one 20 to 25 ton electric traveling crane.

Wis., Milwaukee—A. Lohberger, 1250 25th St.—power cake mixer, dough trough and sifter for bakery.

Wis., Milwaukee—Pittsburgh Plate Glass Co., 205 Lake St., L. Patton, Purch. Agt.—one traveling crane, about 5 ton.

Wis., Milwaukee—P. J. Ries, 809 35th St. (printer)—20 to 24 in. paper cutting machine.

Wis., Racine—Belle City Malleable Iron Co., Kewaunee St., C. S. Anderson, Mgr.—annealing equipment for proposed $45,000 addition.

Wis., Rice Lake—Battery Box Mfg. Co., 209 Knapp St., M. A. Paulson, Purch. Agt.—dove-tailing machine and matcher.

Wis., Sheldon — Bd. Educ., T. Bennett, Clk.—woodworking equipment, bench tools, etc., for manual training department in new school.

Wis., Shullsburg—Northern Mines Co.—mechanical shovel loader and conveying machinery.

Wis., Stetsonville — Stetsonville Welding Co., Box 1—oxyacetylene welding equipment, either cylinder or generator.

Wis., Wales — R. Lathe — equipment, forges, anvils, etc., for new blacksmith shop.

Alta, Edmonton—Alberta Refineries, Ltd., W. B. Stewart, Dir.—refinery and producing equipment for new oil plant.

B. C., Port Alberni—Yellow Fir Lumber Co., Ltd.—sawmill equipment for plant at Great Central Lake.

Ont., Acton—Acton Machine Co., F. S. Blow, Mgr.—metal working machinery for the manufacture of specialties and general repairs.

Ont., Port Colborne—Marine Welding & Boiler Co., J. Sherk, Mgr.—equipment for proposed additions to plant.

Ont., Ridgetown—Canada Wood Products Co.—machinery and equipment for the manufacture of wood specialties.

Ont., Schumacher—McIntyre Porcupine Mines, Ltd., R. J. Innes, Mgr.—mining plant to carry work to 5,000 or 6,000 ft., also additional unit to present 1,000 ton mill.

Ont., Tilbury—Southern Ontario Gas & Oil Co.—equipment for handling gas and oil.

Ont., Toronto — Chapmans Ltd., 330 Gerard St., E.—ice manufacturing machinery and equipment for proposed $75,000 plant.

Ont., Walkerville — Villeneuve Lumber Co., Ltd.—planing mill equipment.

Que., Amos—Dubuisson Mining Co., Ltd., W. Norris, Purch. Agt.—complete development equipment.

Que., Bout de l'Isle—D. Delorme—emery stand and wheel for blacksmith shop.

Que., Montmagny—Canadian Heating Apparatus Fdry., Ltd.—C. A. Paquet, Dir.—complete foundry equipment.

Que., Montreal—Courtaulds Ltd., C. R. Tetley, 314 Beaver Hall Hill, Purch. Agt.—about $750,000 worth of machinery for proposed silk plant at Cornwall, Ont.

Que., Montreal — J. Sauveur, 632 St. Lawrence Blvd.—complete equipment for blacksmith shop.

Que., Prefontaine—Seaman, Kent & Co., Ltd.—complete sawmill machinery to replace $200,000 fire loss.

Que., Quebec—P. Auclaire, Notre Dame de Lourdes St. (sash and door factory)—sander.

Que., Quebec — C. Jefferson, 12 Cartier Ave.—compressor and garage tools.

Que., Quebec — O. Lachance, 128 Lalibertie St.—emery wheel, stand, tire shrinker, etc., for blacksmith shop.

Que., Quebec—P. Lapointe, 3 St. Francis St.—bench tools, tire shrinker, etc., for blacksmith shop.

Metal Working Shops

Calif., Fresno—C. H. Cobb, c/o Trewhitt-Shields, Rowell Bldg., Contrs., awarded the contract for the construction of a garage on Forthcamp St. Estimated cost $52,000.

Calif., Los Angeles—The Southern Pacific Ry. Co., 5th St. and Central Ave., will soon receive bids for the construction of an 80 x 500 ft. locomotive erecting shop to contain about twenty-four engine pits, equipped with 200 ton and two 15 ton traveling cranes, on Alhambra Ave. Cost will exceed $300,000. G. W. Boschke, Ch. Engr. Noted July 19.

Calif., San Francisco—The Meyers Safety Switch Co., 575 Howard St., awarded the contract for the construction of a 1 story factory on Tehama St. near 5th St. Estimated cost $7,940.

Calif., Sausalito—C. Mason, El Monte Lane, awarded the contract for the construction of a 2 story garage on Water St. Estimated cost $50,000. Noted Nov. 8.

Conn., Bristol—Truden & Platt, Inc., 67 Prospect St., awarded the contract for the construction of a 1 story, 60 x 70 ft. garage and office building. Estimated cost $40,000. Noted Oct. 25.

Ill., Chicago—V. A. Hackel, 6827 Creiger Ave., awarded the contract for the construction of a 1 story, 150 x 190 ft. garage at 7221-39 Exchange Ave. Estimated cost $65,000.

Ill., Chicago—**D. S. Klafter**, Archt., 64 West Randolph St., is receiving bids for the construction of a 1 story, 100 x 120 ft. garage at 3401-11 Cottage Grove Ave. for W. B. Frankenstein, c/o Architect. Estimated cost $75,000.

Ill., Madison—The Amer. Car & Fdry. Co., Jeffersonville, Ind., plans to build a foundry, here. Estimated cost $85,000.

Ill., Quincy—The Michaelman Steel Co. awarded the contract for the construction of a 3 and 4 story steel foundry and warehouse. Estimated cost $100,000.

Me., Portland — E. W. Jones, Exchange St., is having plans prepared for the construction of a 1 story, 100 x 180 ft. garage on Forest Ave. Estimated cost $50,000. Webster & Libby, Exchange St., Archts.

Md., Baltimore — G. Esselman, 3225 Greenmount Ave., is having plans prepared and will soon receive bids for the construction of a 2 story, 75 x 110 ft. garage at 3313-31 Greenmount Ave. Estimated cost $40,000. Private plans.

Md., Baltimore — Maryland Penitentiary, c/o C. B. Sweezy, Warden, Eager and Forrest Sts., is having plans prepared for the construction of a 1 story, 100 x 230 ft. foundry. Estimated cost $100,000. H. Massart, 328 North Charles St., Engr. T. W. Pietsch, Amer. Bldg., Archt.

Mass., Boston—The W. J. Connell Co., 574 Commonwealth Ave., awarded the contract for the construction of a 1 story, 50 x 105 ft. garage on Brookline and Burlington Aves. Cost will exceed $40,000.

Mich., Detroit—Buhl Sons, foot of Adair St., awarded the contract for the construction of a 1 story, 132 x 180 ft. garage on Wright and River Sts. Estimated cost $55,000.

Mich., Detroit—The Capitol Brass Co., 2306 Franklin St., will soon award the contract for the construction of a 3 story, 60 x 150 ft. brass factory. Estimated cost $100,000. Raseman & Freier, 1302 Penobscot Bldg., Detroit, Archts.

Mich., Detroit—C. H. Koeber, 200 McLean Ave., is having plans prepared for the construction of a 1 story, 100 x 200 ft. garage on Woodward Ave. and Stevens St. Estimated cost $50,000. S. E. Remey, 1140 Griswold St., Detroit, Archt.

Mich., Detroit—The Michigan Stamping Co., 11631 Mack Ave., awarded the contract for the construction of a 1 and 2 story, 50 x 100 ft. addition to its sheet metal stamping plant on Hart Ave. Estimated cost $75,000. Noted Oct. 25.

Minn., St. Paul—The Ford Motor Co., Highland Park (Detroit P. O.), Mich., awarded the contract for the construction of a 1 story, 606 x 1,726 ft., assembly plant, here. Noted Oct. 18.

Mo., St. Louis—The Green Fdry. Co., 3003 North Bway., awarded the contract for the construction of a 1 and 2 story, 215 x 530 ft. car wheel foundry on Kingshighway. Estimated cost $100,000.

N. J., Paterson—The Alexander Hamilton Garage Co., Inc., awarded the contract for the construction of a 4 story garage, to contain 100,000 sq.ft. of floor space.

N. Y., Geneva—The O'Malley Motor Co., 347 Exchange St., plans to rebuild its garage, to replace the one which was destroyed by fire. Estimated cost $100,000.

N. Y., Ogdensburg—The Hull Steel Fdrys. Co., Hull, Que., manufacturer of railroad equipment, is having plans prepared for the construction of a steel mill, including a 100 x 600 ft. main building, pattern department, machine shop, etc., here. Estimated cost $1,000,000. A. H. Coplan, Pres. Private plans.

N. Y., Peekskill—The Union Stove Wks. plans to rebuild its plant, to replace the one which was destroyed by fire. Estimated cost $500,000.

O., Cincinnati—H. Belmer Co., 1051 Overlook Ave.—hoisting and conveying equipment for proposed $60,000 warehouse.

O., Cleveland—The Cleveland Cutter & Reamer Co., 1619 Merwin Ave., awarded the contract for the construction of a 1 story, 40 x 100 ft. factory, at 7406 Madison Ave. Estimated cost $40,000. M. Dormer, Pres.

O., Cleveland—The Park Battery Co., 277 East 156th St., awarded the contract for the construction of a 2 story, 79 x 152 ft. garage and factory. Estimated cost $75,000.

O., Cleveland—B. Ris (metals), c/o A. N. Ferguson, Archt., 12821 Phillips Ave., awarded the contract for the construction of a 2 story, 40 x 156 ft. factory at 3035 St. Clair Ave. Estimated cost $60,000. Noted Oct. 25.

O., Cleveland—The White Motor Co., 824 East 79th St., awarded the contract for the construction of a 1 story, 100 x 100 ft. factory. Estimated cost $60,000. Noted Oct. 25.

Wis., Milwaukee—The Modern Auto Repair Co., 2431 State St., awarded the contract for the construction of a 1 story, 112 x 125 ft. addition to its garage. Estimated cost $55,000. Noted July 12.

Wis., North Milwaukee—The North Milwaukee Fdry. Co., Commerce Ave., awarded the contract for the construction of a 1 story, 65 x 100 ft. addition to its foundry. Estimated cost $40,000. Noted Oct. 4.

Ont., Welland—Gram Bros. plan to build a 2 story garage and service station on East Main and Burgar Sts. Estimated cost $40,000.

Que., Outremont—The J. O. Villeneuve Co., St. James St., plans to build a 90 x 167 ft. garage on Bernard and De L'Eppee Sts. Estimated cost $150,000.

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Machining Locomotive Parts In the Frisco Shops

By HOWARD CAMPBELL
Western Editor, *American Machinist*

Machining engine parts in a well-equipped shop—Advantages of modern machinery—Reducing hand labor to a minimum—Shop methods

WHILE railroad shops are, as a rule, not as efficient as they should be, there are a few which, in the matter of methods and equipment, stand out as examples to all the rest. Among these few are the "west" shops of the St. Louis & San Francisco Railway, otherwise known as the Frisco Lines, at Springfield, Mo. The economy of good equipment has been recognized here, and laborious, costly methods have been discarded for those of more recent origin. A number of new machines have been added in the past year, making the equipment practically complete and placing this shop in the front rank of shops handling work of the size and class usually encountered in railroad shops.



There are some jobs in the repairing of locomotives which, while common to practically all shops, are handled in a variety of ways. Among these is the boring of cylinders. In the Frisco shops the operation is performed on a horizontal boring machine, built by the Locomotive Finished Material Co., Atchison, Kan. The cylinder is bolted to the table of the machine as shown and the tool is clamped in a head which is attached to the machine spindle. The tool is of ¾x1½-in. high speed steel, this steel being used for all tools throughout the shop. The cylinder is for 30-in. stroke and is 29 in. in diameter and the tool head is large enough to afford sufficient support for the tool. At a cutting speed of

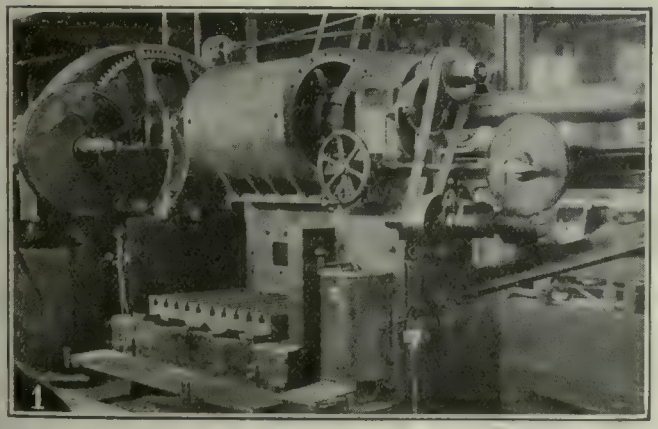




FIG. 1—TURNING AND BORING CYLINDERS. FIG. 2—PLANING RADIUS ON CYLINDERS.
FIG. 3—PLANING FRONT DECK PLATES

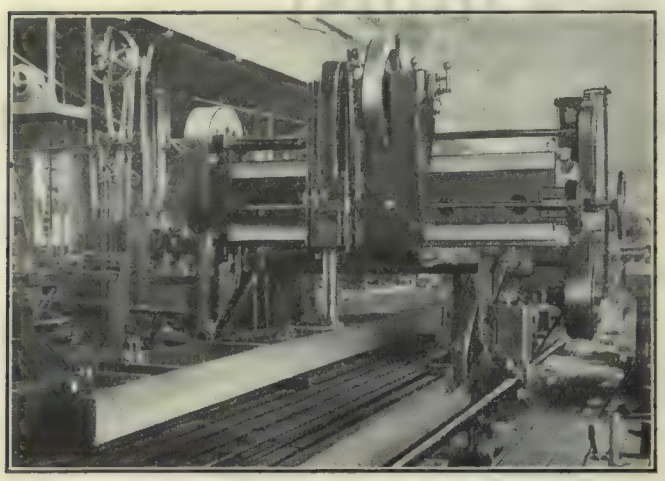


FIG. 4—SLOTTING SIDE FRAMES

40 ft. per min. and a feed of $\frac{1}{16}$ in. per revolution, a cut up to $\frac{1}{2}$ in. in depth can be taken without difficulty. Two cuts are taken through a cylinder so as to insure that it will be perfectly round and within a limit of $\frac{1}{64}$ in. of the specific size, the finish cut removing approximately $\frac{3}{32}$ in. of stock at a feed of $\frac{1}{2}$ in. per revolution. The only gage used is a caliper, and a cylinder can be finished in approximately eight hours.

Another operation that has been speeded up by the use of modern equipment is that of planing the radius on the cylinder. The operation was once done by chipping with air hammers and chisels and took one man six hours to complete the job. With the machine shown in Fig. 2, two cylinders, set in tandem, can be finished, floor to floor, in five hours. The machine is a Putnam planer with an 8x14-ft. table. The tool is a section of 1x2-in. high speed steel. The head *A*, in which the tool is held, is fed down until the point of the tool is at the proper distance from the center of the swivel to produce the correct radius, and is attached to the other head *B* by means of the bar *C*, as shown. Then the head *A* is locked in position and the head *B* is fed across the rail of the machine, swinging head *A* as it does so and producing the desired radius on the work. The stock varies from $\frac{1}{8}$ in. to $\frac{5}{8}$ in., all of which can be removed at one cut with the tool feeding $\frac{1}{16}$ in per cut. The table travels 40 ft. per min. on the cut and 60 ft. per min. on the return. A limit of $\frac{3}{32}$ in. is allowed.

Work that is too large for the planer described in the preceding paragraph, or that is too wide to pass between the uprights, is handled on the machine shown in Fig. 3. The machine is a Cincinnati open side planer with a 65-ft. bed and a 4½-ft. table, and the job shown in operation is that of planing a front deck plate. The tool used is 1x2-in., feeding across the work at a rate of $\frac{3}{32}$ in. per cut. The amount of stock on these pieces varies from $\frac{1}{8}$ in. to $\frac{1}{2}$ in., and just enough is taken off to clean up. The speed of the machine is 50 ft. per min. on the cut and 70 ft. per min. on the return. A plate can be finished on all sides in seven hours.

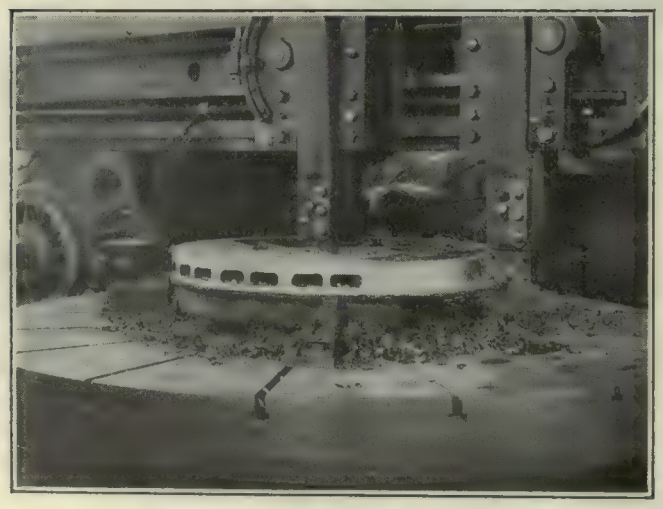


FIG. 5—TURNING MAIN DRIVING WHEEL

The operation of slotting a pair of side frames is shown in Fig. 4. The machine is a Niles-Bement-Pond frame-slotter, built especially for this job. The frames are forgings and are laid out to size before being placed on the slotter table. The tool, which is 1x2 in., travels at a speed of 40 ft. per minute and a feed of $\frac{1}{16}$ in. per cut, removing up to $\frac{5}{8}$ in. of stock. Two cuts are taken where the stock is heavy so that the cut will be straight and on the line. Two frames are machined at a time, one on top of the other as shown, forming a 10-in. thickness. Four frames are machined in 32 hours on this machine.

The operation of turning and boring a cast steel main driving wheel is shown in Fig. 5. The machine is a Cincinnati 12-ft. boring mill and is equipped with two heads, one of which is used for turning the wheel while the other is boring the hub. The wheel turns at a speed of 60 ft. per min. while the tool, which is 1½-in. square, takes a ¼-in. cut, feeding down $\frac{1}{16}$ in. per revolution. The wheel is 6 in. thick at the periphery and 9 in. thick through the hub. A limit of 0.005 in. is allowed and the only gage used is a caliper. Eight hours are required to finish a wheel.



FIG. 6—THE SLAB MILLER IN OPERATION

An Ingersoll milling machine, slab-milling a pair of side rods, is shown in Fig. 6. This is in line with the most advanced machine shop practice, the machine in use being especially designed for work of this class. The pieces are held in position by the use of clamps at the middle and both ends, supplemented with set screws at the sides. After one end has been milled, the middle clamp is removed while the table is being passed under the cutters and is then replaced. The same side of both rods is milled in one operation, then the rods are turned over and the other side is finished.

Two Ingersoll inserted tooth cutters are used, each 9x24 in. The cutters turn at 22 r.p.m. or 52 ft. per min., taking a cut of from $\frac{1}{4}$ in to $\frac{1}{2}$ in. while the table is feeding from 3 in. to 5½ in. per min., depending on the



FIG. 7—GRINDING A SLAB MILLING CUTTER

hardness of the metal and the depth of the cut. The work is laid out before coming to the milling machine, so that the machine is kept producing as much of the time as possible. A copious flow of cutting compound keeps the cutters cool. Two of these rods are finished in from six to eight hours, depending on the amount of stock, hardness, etc.

The illustration, Fig. 7, shows how one of the cutters spoken of in the preceding paragraph is set up for grinding. The cutter is held on a mandrel that is swung between the centers of a Cincinnati No. 3 grinder. A 1x12-in. Norton 3,860-K wheel is used, the point of contact between the wheel and the work being washed by a continuous flow of cutting compound. The rest for the cutter blade is stationary so that as the table passes the grinding wheel, the angle of the blade where it comes in contact with the wheel is always the same. As the blade is spiral, the cam-action of the blade riding on the rest forces the cutter to revolve slowly. The blade is kept in contact with the rest by means of a rope that is wound around the end of the mandrel as shown at *A*, then passed out over an arm on the front of the machine, and down, a weight being attached to the end to provide the necessary pull. As the cutters are used in pairs, they must be of the same diameter; consequently an extra amount of care is taken in the grinding. It usually takes about eight hours to grind a cutter of the size used for this kind of work.

Figure 8 shows the milling of the outside of the side rods at the ends. The rotary movement of the Ingersoll vertical milling machine allows the proper radius to be easily secured. The cutter is 5x12 in. with inserted teeth and cuts from $\frac{1}{2}$ to $1\frac{1}{4}$ in. from the forging, at 36 r.p.m. Both ends are milled by shifting the rods to both the bushing holes and the knuckle pin hole, in approximately 6 hours.

Another milling job—that of milling out the end of a side rod—is shown in Fig. 9. The operation is being done on an Ingersoll vertical milling machine, using a high speed steel cutter, $1\frac{3}{4}$ in. in diameter. An opening is first made with a drill, then the hole is finished to size on the machine. A cut can be taken that is equal to the diameter of the cutter, the cutter running at 120 r.p.m. and feeding at a rate of 1 in. per minute. Two cuts are required, the roughing cut taking three hours and the finishing cut one hour. There are no limits given, the operator working to a layout line.

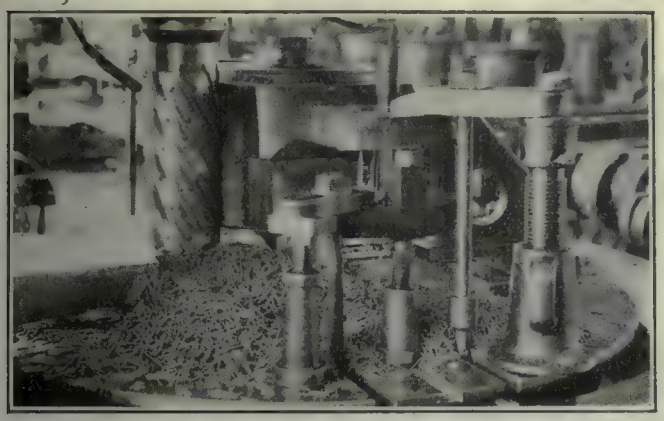


FIG. 8—PROFILING ENDS OF SIDE RODS

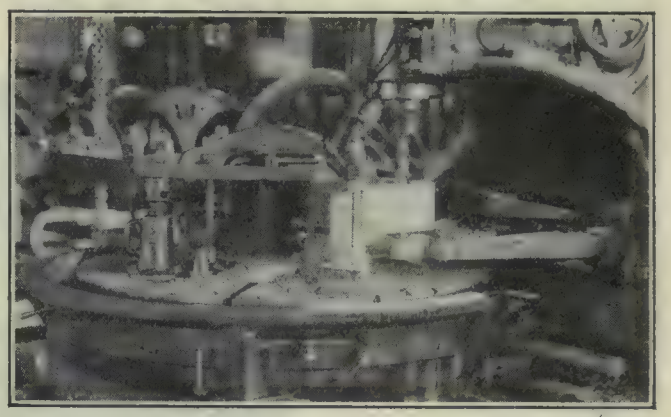


FIG. 9—MILLING OUT END OF SIDE ROD

The vertical milling machine is also used for milling out the jaws on the front or back sections of side rods. The same speed and feed as that used for the side rods is used, and two cuts are required to finish the piece.

The operation of boring and trepanning a pair of main rods is illustrated in Fig. 10. The machine is a Baker Bros. double spindle drill, working on two rods

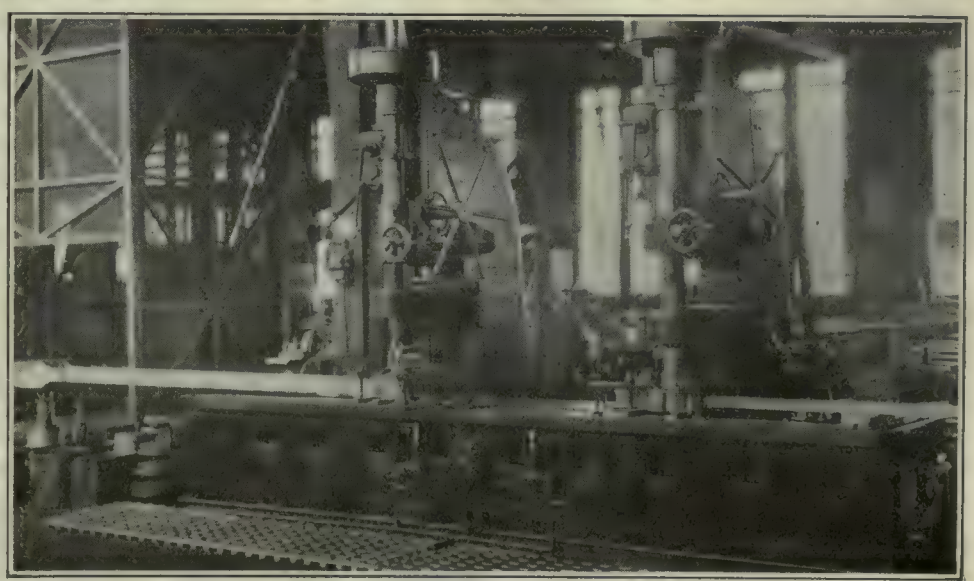


FIG. 10—BORING AND TREPANNING MAIN RODS



FIG. 11—TREPANNING TOOL

at the same time. As the rod ends are solid, the first operation is to drill a hole with the 2½-in. drill shown in the spindle at the left. The piece is then moved over to the other spindle and a trepanning tool is used which cuts out a block, leaving a hole of the size desired. The tool used on this particular job, shown in Fig. 11, is 8 in. in diameter. Four sizes of tools—8 in., 9 in., and 11 in.—are used for the different sizes of rods. The body of the tool is of machine steel, turned and bored so that a wall ⅝ in. thick is obtained, and sections are then cut out of the wall in four places, leaving four blades. The cutters are of ⅛-in. square high speed steel, each slotted at the rear side to fit a tongue on the blade of the tool, and each cutter is held in place by two cap screws, as shown. As each cutter has to be ground on the sides to conform to the circle that it is to cut, the width of the finished cutter is slightly more than ⅝ in. The speed of the tool is 12 r.p.m., feeding 0.012 in. per revolution. As the tool cuts through the piece, it cuts out a solid round block of steel similar to that shown on the table of the machine. The time required for the operation is 50 min., of which 35 min. is the actual cutting time.

A machine that will practically pay for itself within a reasonable length of time by producing better work at a lower cost, is a link grinder. A Newton link grinder in operation can be seen in Fig. 12. The links used on Frisco engines are usually made of cast steel, although the one shown here is a forging. The wheel, which is 1¾ in. in diameter (when new) and 4 in. long, revolves at a speed of 3,600 r.p.m. and takes a cut of approximately 0.005 in. or 0.006 in. The table travels at a speed of 40 ft. per min. Only enough stock is removed to clean up.

Everything possible is being done in this shop to eliminate hand labor. Two overhead cranes handle all the very large parts, and smaller parts are transported about the shop and lifted on and off machines with the aid of Elwell-Parker electric industrial trucks similar to the one shown in Fig. 13. The crane has a lifting capacity of 3,000 lb. and is very valuable in a shop of this class.

A number of air hoists like the one shown in the background, Fig. 13, are also installed at different machines throughout the shop, and the time they save in material handling plus the saving made on the loss of time and money due to accidents, puts them in the class of good investments.

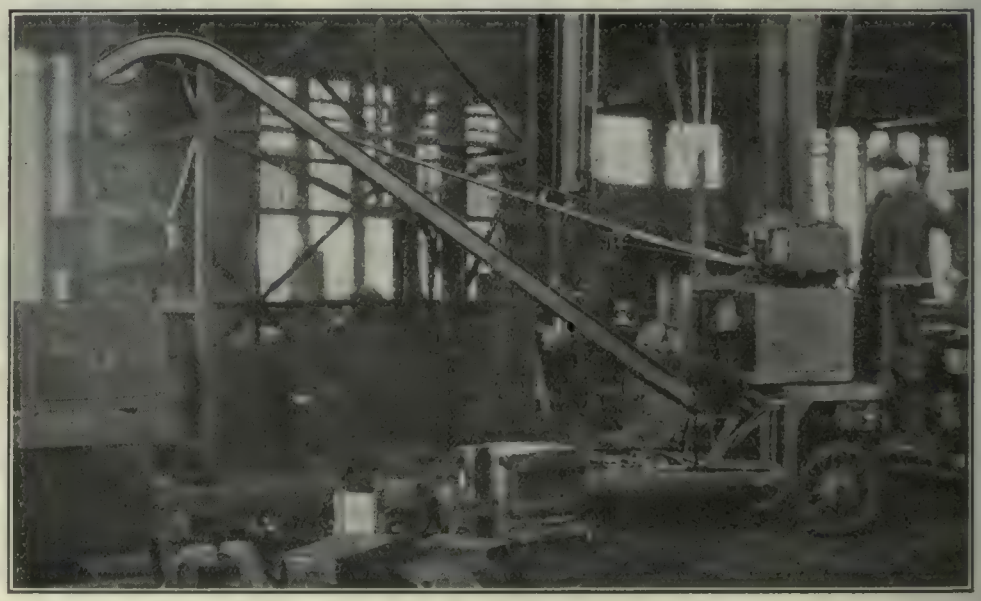


FIG. 13—SOLVING THE "COMMON LABOR" PROBLEM

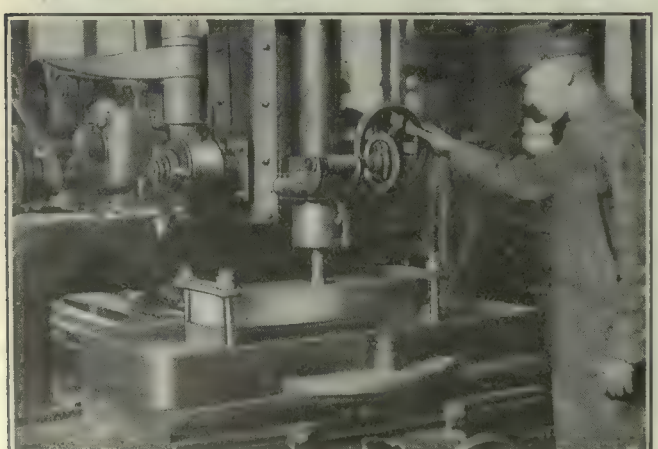


FIG. 12—THE LINK GRINDER IN OPERATION

Continuous Cleaning of Machine Parts

One of the notable changes in machine shop practice and equipment is the increasing use of washing machines for cleaning the dirt and grease from the work. While this is perhaps more frequently used after the parts are finished and just before they go to assembly, the washing machine is also finding its place between operations to an increasing extent.

In place of the old soda kettle which frequently became a nuisance and a menace and of the dangerous gasoline bath we now have the continuous steam washer, where the dirty work goes in at one end and comes out at the other—clean. And while it may perhaps be classed as a minor improvement, it shows one of the tendencies of the times in modern manufacturing methods.

What About Automobile Shops?

By A. L. DE LEEUW
Consulting Editor, *American Machinist*
AND
K. H. CONDIT
Editor, *American Machinist*

Fourth and final article in which points are summed up and suggestions offered—How new machines have been developed and how they may be in future

IN THE final article of a series like this one the reader naturally expects a summing up of any points that have been made in other articles of the series. He also expects those responsible for the articles to offer in it any remedies they may have for some of the things they have been so free in criticising. It shall be our endeavor to meet with these requirements in what follows.

If we may be permitted to generalize in our criticism of automobile shop practice as exemplified in the shops we visited, we would say that far advanced as the automotive industry is in its application of high production machine tools and all sorts of labor saving, handling and conveying machinery, there is still too much waste and expenditure of physical energy. We would repeat that this should be taken as a general conclusion only. Some of the shops have gone far beyond the others in adopting the latest equipment and applying the most modern methods of production. But there are others whose production is relatively large in which there is room for improvement.

Assembling conveyors, for instance, have had perhaps their most complete application in the automobile plants. It is a pleasure to anyone whether he understands shop practice or not to witness the operation of a modern automobile assembly line. When it comes to inter-machine conveyors, however, there are many places in most of the shops where they could be applied to better advantage than is now the case. There is entirely too much handling of parts and sub-assemblies before they reach the final stages. We do not recommend any particular type of inter-machine conveyor as local conditions must naturally govern the choice. What would work perfectly well in one shop might prove a dismal failure in another.

With better arrangements for getting the work from machine to machine a vast amount of physical energy now expended in lifting iron about could be conserved. As we remarked in the second article, the task of the operator in a modern production plant should be primarily to direct the functions of machinery rather than to do physical work that a machine could do very much better.

> IT is estimated by a competent authority that the installation of special automatic machine tools in one of the largest automobile plants has meant that one man can now produce the same output as could four men without them. When we consider that the plant in question is now just about as full of busy operators as is physically possible, we can get some idea of what the highly developed machine tool has meant to the industry.
>
> Everyone connected with the automobile industry, while proud of what has already been done in mass production, concedes readily that even more must be done in the immediate future. More production tools are to be developed but is the old way of doing it the best for all concerned?

Even where the inter-machine conveyor has reached its highest development in the automobile shops, we noticed that it was so arranged in several places that the greater part of the work done by some of the men along the line consisted of lifting fairly heavy parts some inches higher than their heads. There was no apparent reason why the conveyor could not have been run at a more convenient altitude. It was evidently a case of a place where sufficient attention had not been paid to details.

A considerable saving of human effort and time as well could be obtained by a wider use of magazine feeds on various types of machines. As compared to the practice in other high production machine shops, automobile shop practice does not seem to have advanced very far in this one particular. We are glad to say that we observed in most of the shops visited, growing interest in both of the subjects just mentioned. From information that was given us as to the plans for the future, we are inclined to believe that development in these two directions is to be a feature of automobile shop practice in the next few months.

In the other articles of this series we have dwelt on loss due to enforced idleness of both operators and machines. There are many operations that can be considerably shortened by further applications of rotating work tables and swinging fixtures. An excellent example of what can be done in reducing idle machine time was shown in one large machine in which the table was constructed in removable sections. As each section reached the far end of the machine, the finished piece was removed, the section swung around to the head end once more and a new piece mounted in position. With this arrangement there was no return stroke, all the motion being in one direction and one

might say that the work was practically placed on a conveyor and carried past the cutting elements of the machine.

A number of excellent station type machines for the larger pieces have been worked out and are in effective operation. We have nothing to criticise in these machines, but we do sense the need for machines to do the same type of work on pieces of smaller size. The lack of such machines was evidenced where the big machines were working on pieces decidedly below their capacity.

One thing that we noticed in connection with the handling of work on machines where a long table is loaded while the machine is at rest was that the operators had evidently not been very well instructed as to how to save time in loading and unloading the machine. They got into each other's way by being on the same side of the machine when they should have been on opposite sides, both working on the same piece, the first one to go under the cutting elements. As soon as this piece had been clamped down, the machine could have been started and the operators could have proceeded to clamp the other pieces in their fixtures while the machine was working instead of allowing it to remain at rest until all but the last piece was tightened down.

Another means of reducing idle machine time might be provided in the extra loading fixture for the type of machine in which the rotating table is loaded up with small similar parts. After the cutting operation has been completed it takes an appreciable time to unload the finished pieces and reload with new ones. This idle time can be reduced to a fraction by the use of a loading fixture which could be slid upon the table already loaded and removed when the operation is complete. In the meantime the operator can employ his time in loading the spare fixture.

The automobile industry has been fortunate in having a number of highly specialized tools developed for its particular use. Most of them have been eminently successful, although a few have been so complicated that they were constantly going down for minor repairs and dissipating the savings higher production made possible. Nevertheless, there is room for other special machines, and we cannot but believe that they will be forthcoming before long. Simplicity and ruggedness are the factors most in demand, many of the refinements and adjustments of the tools now in use being of practically no use in the high production shop.

How Are Tools to Be Developed?

There is one question that can be taken up briefly at this point and that is the matter of how these special tools are to be developed. So far as we can find out, the generally accepted custom in the past has been for the automobile manufacturer to let the machine tool builder or his agent, or both together, do the development work on an expensive single-purpose machine and then buy the machine if it happened to meet his requirements. It seems to us that this is not an entirely fair proposition, although it has its advantages from the automobile manufacturer's viewpoint.

One drawback of this method of developing new machinery is that the engineers of the machine tool builder can hardly be expected to produce quite as good results alone as they could if they consulted with and worked in co-operation with the engineers of the automobile manufacturer. There are certain elements in such a design that can only be developed by someone who has been closer to the job for which the machine is intended than the engineer of the machine tool building company. Consequently, the automobile manufacturer does not get quite as good a machine as he would have had his men taken some part in its development. The machine tool builder also suffers because of the possibility of dissatisfaction on the part of the purchaser.

Old Manufacturers Designed Own Tools

In the old days big manufacturers in the machinery field either developed their own special machines or else took their ideas to machine tool builders and asked them to develop them. The Lincoln type miller and the broad wheel grinder are instances of the first mentioned way of developing new machines.

Under present conditions, if the mechanical man of an automobile factory, let's say, should make a suggestion to a machine tool builder for a new machine, it may very well be that his ideas will not meet with favor in the higher regions where control of the expenditures resides. The builder who goes ahead under such conditions is quite likely to find out that the suggestion was made without the authority to purchase and then that the man who made the suggestion has been unable to sell his views, no matter how good they may be mechanically, to the financial man who has the say as to whether the machine shall be bought or not.

If the machine tool builder goes ahead under these conditions he is taking just as much of a chance as if he had originated the idea himself and had risked his money on the soundness of the idea and his ability to sell it.

A situation like the one we have described does not exist generally in other industries. The railroad, for example, that wants a special type of freight car to care for certain unusual classes of freight offered decides what kind of car it wants to meet these conditions and orders that car from a car builder. The car builder does not develop a new design which he thinks may meet such a condition and then try to sell it to the railroad people.

Even with the situation as we have painted it, a machine tool builder is not relieved from the responsibility of keeping his eyes open for opportunities. If he sees a very obvious need for a certain type of tool, it should be a part of his job to take steps to develop that tool. By the same token the automobile producer is not relieved from making his demands known to the man who can supply them. What is needed, apparently, is some means of getting the two principals together. Certainly the agents of the builder may be as far at sea as the mechanical men of the automobile companies when it comes to actual order-producing information as to what is wanted.

There are associations both of machine tool builders and of automobile manufacturers. Perhaps there is an opportunity here for them to co-operate to their mutual advantage.

There are about 25,000,000 car wheels used in railway traffic in the United States to carry 750,000,000,000 gross ton-miles per year. This means 8,000,000 tons of metal divided between chilled cast iron and steel wheels. The great majority of these are chilled.

Applying Production Methods to the Radio Head Set

By RAYMOND FRANCIS YATES

Use of special attachments and fixtures — Coil making procedure—Electrical testing—Mechanical accuracy required — Assembling in fixtures

THE popularity of radio came with such a rush that the manufacturers were caught completely unawares. The demands upon their factories were multiplied many times, and desperate efforts were made to get into production under the most trying conditions. This is a story of the success of one firm,



FIG. 1—ASSEMBLY PRESS FOR BOBBIN CORES

C. Brandes, Inc., which is now manufacturing from 2,500 to 3,000 head sets each day.

The radio head set presents a highly interesting production problem, since the mechanical construction has a great bearing upon the electrical efficiency, as well as the acoustic properties. This will be appreciated the more when it is said that, even with the most careful mechanical manufacture, it is difficult to find two receivers which will have exactly the same acoustic properties. Then again, we get some idea of the delicacy of a good head set when we understand that it requires but 0.00000000016 amp. to give an audible signal.

There is nothing unusual about the forming of the case, and after it is completed the edge of the case is swedged or pinched up to produce a shoulder to take the thread for the receiver cap. Since the material of the case is $\frac{1}{8}$-in. stock, it is necesary to produce this extra thickness. The thread is cut on the shoulder with an ordinary geometric diehead. It is necessary to carefully watch the adjustment of the diehead, for it is imperative that the receiver caps fit snugly, so that the diaphragm will be clamped perfectly over the pole pieces. Master gages are used at regular intervals to prevent too much scrapping.

The bobbin cores are blanked out from carefully selected special steel. Even a very small difference in the width of the bobbin or magnet core would cause an appreciable difference in a head set, and consequently it is necessary to test each core in a go and no-go gage. The accuracy must be within 0.0005 in. to pass inspection.

The bobbin heads are blanked out of a special grade of thin bakelite and these slip over the cores. The corners of the core are peaned over a trifle by a specially arranged foot press, illustrated in Fig. 1. It will be noticed that a semi-automatic attachment has been put in place. The bobbin tops are placed in a chute and the operator feeds the cores into the revolving dial with both hands.

Insulation is another important feature of successful receiver manufacture, and it is necessary to place a special grade of insulating tape over the bare steel core of the bobbins before they are passed along to the winding machines. Fig. 2 shows the operation of taping the steel core, and an automatic bobbin winding



FIG. 2—BOBBIN TAPING AND WINDING



FIG. 3—SOLDERING LEAD WIRES TO COIL

machine with spools of wire, guides and motor. The wire placed on the bobbins is almost as fine as a human hair, and is wound upon the bobbin at the rate of three thousand turns per min. When the proper amount of wire has been placed upon the bobbin, the machine automatically stops. In the meantime the girl operating the machine has prepared a second bobbin and the winding on it is immediately started.

The manufacturer of telephone receivers must be constantly on the alert for grounds or short circuits, since the least electrical defect is apt to cause a partial ground or leakage which will completely destroy the sensitivity of the receiver. Immediately after the bobbins are wound they are tested on a high voltage d.c. circuit to make sure that the winding is in no way grounded. A sensitive indicating instrument is connected in the circuit, and the action of its needle immediately gives the operator a warning.

After the ground test, a very careful resistance test is made, since it is necessary that the resistance of all bobbins be practically uniform. To measure the resistance of each one of these bobbins on a regular Wheatstone bridge would be a tedious task, which would interfere greatly with the progress of manufacture owing to the slowness of the method. Therefore, a direct reading ohmmeter sufficiently accurate for the purpose is used. Like a measuring gage, this ohmmeter is operated on the "go and no-go" principle. Two limit marks are placed on its scale and the indicating needle must fall between them. Variation in resistance must not amount to over 5 per cent, plus or minus.

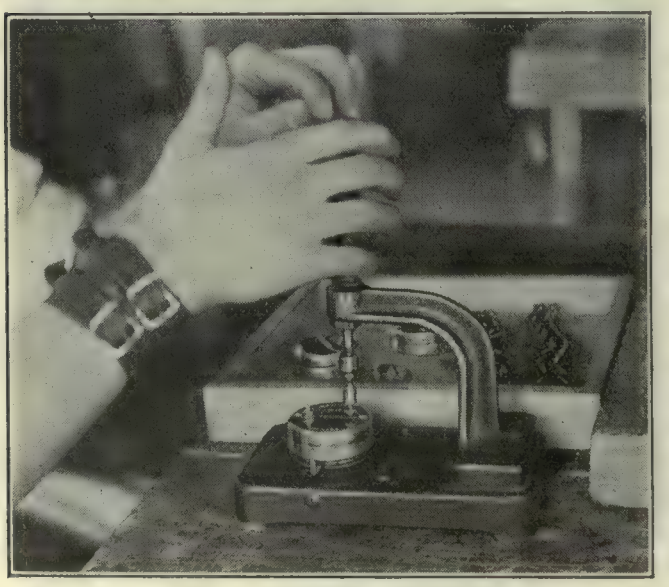


FIG. 4—ASSEMBLY FIXTURE

The next operation of importance is that of soldering on the lead-in wires. This operation is shown in Fig. 3. The molten solder is held in the receptacle at the center of the apparatus illustrated and the flux is in the tube into which the wires are being dipped. If the tiny wires used on the magnets were used to make the connections, they would be sure to break in time and render the receiver useless. To overcome this possibility a heavy lead-in wire is soldered to the fine wire.

The finished bobbins are placed in trays where they are allowed to remain for one month without being disturbed. This ageing process allows the moisture to dissipate thoroughly. At the end of the ageing process, the lead-in wires are clipped and skinned and the bobbins are again given a "ground" and an "open" test. This is to check up any changes that may have taken place during the ageing, and in these tests only the perfect bobbins are acceptable. Every bobbin that shows the faintest trace of ground is rejected.

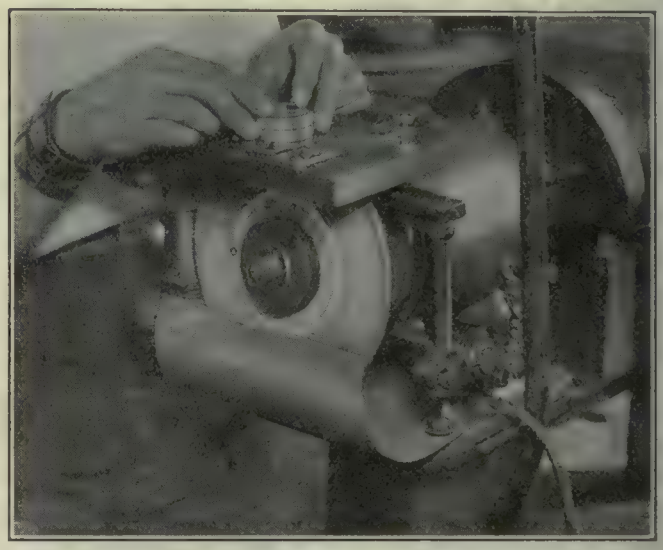


FIG. 5—GRINDING POLE FACES

An assembly fixture, used to assemble the binding posts in the case, is illustrated in Fig. 4. The various parts are assembled in proper position in the fixture and the nuts are tightened by means of the small socket wrench which is mounted in the fixture as shown. The remaining parts of the receiver are assembled in similar fixtures, and the assembly is completed by soldering the lead-in wires to the terminals.

In the completed receiver the pole faces must be exactly 0.002 in. from the diaphragm and this distance must be held between the pole faces and the edge of the case. The operation of grinding the pole faces is done on a surface grinder attachment placed on an ordinary motor-driven grinder as shown in Fig. 5. The distance from pole face to edge of case is measured by means of a depth gage. Should this distance be greater than 0.002 in., another operation is required to remove some metal from the edge of the case.

Analysis of Milled Gears

By ERNEST WILDHABER and EARLE BUCKINGHAM

Determination of error in using cutter of wrong number —Modification of cutting depth—Excess depth of cut for backlash—Eccentric tooth action and edge contact

ONE OF the most widely used methods of machining gear teeth is to mill them with a formed milling cutter. As is well known, this method utilizes a series of eight cutters which are adapted to produce gears with from twelve teeth to a rack, each cutter being utilized to produce a certain part of the series.

In principle, each cutter is correct for the smallest gear in its particular series, and the extent of the series for which each cutter is used depends upon the change in the theoretical form. As these forms change least with greater numbers of teeth, the range of the cutters greatly increases as the tooth numbers increase, as will be noted from the following tabulation:

Cutter	No. Teeth in Gear	Cutter	No. Teeth in Gear
No. 8	12 to 13	No. 4	26 to 34
No. 7	14 to 16	No. 3	35 to 54
No. 6	17 to 20	No. 2	55 to 134
No. 5	21 to 25	No. 1	135 to a rack

Theoretically, a cutter which is correct for a certain number of teeth is incorrect for any other number. Practically, however, this error is slight, and one purpose of this paper is to analyze the nature and amount of such errors.

Furthermore, it often happens that a gear with 23 teeth, for example, is required while the only cutter available is the No. 4 cutter instead of the No. 5 cutter. Another purpose of this paper is to show how this No. 4 cutter can be used with as good or better results by slightly modifying the depth of cut.

Again, it is often desirable to provide more backlash on the gears than is present when the gears are cut to the theoretical depth, and this is accomplished by sinking the cutters deeper into the blank. Theoretically, this operation displaces the profile and alters the action, and another object of this paper is to determine the amount of excess depth for each gear that will give the best results.

A study of the errors introduced, as noted above, will show that they can be reduced and compared to the errors in eccentric gears. The analysis itself is very involved, and requires much study to follow. It will be published some time in the near future, for the benefit of those who enjoy "mental gymnastics," but is omitted here for several reasons. In the first place, the time available is not sufficient to make a clear and complete exposition of the subject; in the second place, the majority of us are not so much interested in the derivation of the various equations as we are in the equations themselves, and their practical application; while in the third place, the inclusion of the involved derivation would tend to obscure the simplicity of the final results.

An analysis will show that if an eccentric gear driving a rack turns uniformly about its axis of rotation, the velocity of the rack will fluctuate according to a pure sine curve. This holds true for any amount of eccentricity.

If an eccentric gear driving a concentric gear turns uniformly about its axis of rotation, the velocity of the concentric gear will fluctuate almost according to a sine curve. When the amount of eccentricity is small (and we are dealing only with relatively small errors in this paper) the variation from the sine curve is so slight that it can be neglected.

If an eccentric gear drives another eccentric gear, the velocity of the driven gear will fluctuate according to two sine curves and, when the tooth numbers and amount of eccentricity are alike on both gears, they may fully compensate for each other. When the tooth numbers are the same but the amount of eccentricity is different, they can be made to partly compensate for each other. In other words, the resulting error will be the same as if one gear only was eccentric, with an error equal to the difference in eccentricity. When the tooth numbers are different, they cannot, as a rule, compensate for each other.

Purely eccentric gears, with small or large eccentricity give a varying but continuous action. Each succeeding tooth takes over the load from the preceding tooth smoothly and without impact. It is not such an action as in gears with spacing errors. Consequently, eccentricity of accurate involute gears does not introduce the action of spacing errors. This smoothness of action requires, of course, a sufficiently long arc of contact, which is also necessary for concentric gears, and the tooth load should be large enough to keep the teeth of the two gears in contact.

The continuity of action of eccentric involute gears can be taken advantage of in making variable motion gears. Eccentric gears of substantial eccentricity and equal tooth numbers make good variable motion gears, particularly if the tooth load during the whole cycle is large enough to keep the teeth in contact.

Error When Milling Too Deep

When a cutter is set to cut deeper than the theoretical depth, the involutes of the cutter no longer correspond to the center of rotation of the blank. The center of the involutes, or their base circle, of each tooth space, is then located beyond the actual center of the gear blank. This causes a somewhat different action of the gear because, instead of having one center

A paper presented at the Fall meeting of the American Gear Manufacturers Association, Lake Mohonk, N. Y., Oct. 25, 1923.

of eccentricity, each tooth space has its own center of eccentricity.

It is quite common in practice to cut too deep, thus introducing the required play or backlash into the gears in order to avoid jamming. The effect of this practice is to give a variable and slower motion to the driven gear. Thus, it has a similar effect to a spacing error, for such a pinion will move its rack too slow. The following tooth also gets into contact too early and with a blow. This premature contact might be called edge contact, inasmuch as the tip edge of the rack does not contact tangentially with the flank of the pinion tooth, but is somewhat tilted. The pressure is thus transmitted through the edge, as long as the tip edge of the rack and the flank of the pinion tooth stand up. Wear takes place rapidly at these spots. Such an edge contact is dangerous and should be avoided, because the rack tends to gouge into the flank of the pinion tooth.

The same relation as for a rack drive holds substantially true for gear drives, where one gear, which is cut too deep, meshes with a correctly cut gear. If the driver is cut too deep the driven gear has the tendency to fall back, and the driver acts as if its normal pitch were too short, every tooth starting with edge contact. On the other hand, if the driven gear is cut too deep, while the teeth of the driver are cut to the correct depth, the driven gear has the tendency to advance. The contact also starts with a blow, which is reduced however, as compared with the previous case, because of the momentum of the moving parts. Moreover, there is no edge contact, since the contact does not start at the bottom of the active face of the driving tooth and the tip of the driven tooth. It starts somewhat above the bottom of the active profile of the driving tooth and below the tip of the driven tooth. This condition is evidently much more favorable than the previous one.

The influence of deeper cutting is dependent upon the number of teeth in the particular gears. Pinions with small tooth numbers are much more sensitive than gears with large tooth numbers. The amount of falling back or advancing of the driven gear is inversely proportional to the number of teeth in the gear which has been cut to a given excess depth. Or, in other words, if in different drives, one gear is always cut to an excess depth which is proportional to its tooth number, then all these drives will contain the same error.

The foregoing refers to cutting one gear of a drive too deep, while its mating gear is cut to correct depth, and using cutters corresponding exactly to the number of teeth in the gears.

By cutting both gears of a drive deeper, the error is partly, or even entirely, compensated for. If two gears are cut with cutters that correspond to their exact tooth numbers, respectively, but are cut to an excess depth proportional to their respective tooth numbers, the errors will then just compensate for each other.

Action of Gears Cut with Formed Cutters Corresponding to Different Tooth Numbers

Cutting gears with different cutters than those which correspond to their exact tooth numbers has two effects. First, it produces a certain drop in the velocity of the driven gear from the first contact to the end of contact. Second, it tends to shift the period of contact ahead, that is, the contact will start at or near the bottom of the active profile on the driver, but will end before it reaches the top of the driving tooth.

In such gears only one tooth can be in contact at a time. In other words, the duration of contact of any one tooth lasts for one tooth interval and no longer. If the tooth profiles are long enough to provide this mesh, this drawback is not very important but, in cases where the tooth profiles are not long enough to provide a sufficiently long action, edge contact will occur. The tip of one tooth will contact with the flank of its mating tooth somewhat at an angle, the tip edge contacting without assistance from the tooth profile.

Such edge contact is dangerous and detrimental. If the mesh starts with edge contact, the flank of the driver tends to be gouged away, and the gears ruined. Edge contact can be restricted by modification of the tooth profiles, but cannot be avoided in all cases.

We have it in our power, however, to make a considerable improvement in the action of these gears by causing one error, such as results from using a range cutter, to compensate to a large extent for another, such as cutting the teeth deeper. In this way we can force the contact toward the middle of the mesh, and always avoid edge contact. At the same time we can always introduce the desired amount of backlash safely.

Hitherto it has been customary to always cut a gear with a cutter corresponding to a smaller tooth number, if no exact tooth number cutter was available. Many drives, however, can be greatly improved by using on one gear a cutter which corresponds to a larger tooth number than the gear, while the other gear is cut in the usual way.

Several simple equations must be solved to obtain this result, in which the following symbols are used:

n = Number of teeth in driving gear
n' = Exact tooth number of cutter for driving gear
d = Difference in tooth number $(n - n')$
N = Number of teeth in driven gear
N' = Exact tooth number of cutter for driven gear
D = Difference in tooth number $(N - N')$
D' = Drop in velocity ratio during mesh
A = Pressure angle
b = Excess depth to cut teeth for compensation
B = Excess depth to give desired backlash
B' = Total excess depth

$$D' = \left(\frac{D}{N \times N'} + \frac{d}{n \times n'}\right) \qquad (1)$$

When n' or N' is larger than n or N, respectively, the values of d or D will be negative. If the cutters are so selected, one of larger tooth number and the other of smaller, that equation 1 becomes equal to zero, true uniform motion gears will be realized. The value of this equation should be kept as small as possible, and positive. Negative values should be avoided. Preferably, the smaller gear is milled with the cutter which corresponds to a larger tooth number, and if desired, additional backlash may be introduced.

The following equations are based on gears of 1 diametral pitch. For different diametral pitches, we divide the results by the required diametral pitch.

$$b = \frac{\pi}{4} \tan A n' \left(\frac{D}{N \times N'} - \frac{d}{n \times n'}\right) \qquad (2)$$

If the value of b is negative, this would indicate that the pinion should be cut that amount shallower than standard.

Equation 2 becomes the following, when $A = 14\frac{1}{2}$ deg:

$$b = 0.20312 n' \left(\frac{D}{N \times N'} - \frac{d}{n \times n'}\right)$$

For simplification, the factor 0.20312 may be reduced to 0.20, which will give sufficiently accurate results, whence

$$b = 0.2n' \left(\frac{D}{N \times N'} - \frac{d}{n \times n'} \right) \qquad (3)$$

$$B = \frac{\text{Desired backlash}}{2 \times \tan A}$$

For a 14½-deg. pressure angle, this equation reduces to

$$B = 1.93336 \times \text{Desired backlash}$$

For simplification, the factor 1.93336 will be called 2, which will give sufficiently accurate results, whence

$$B = 2 \times \text{Desired backlash} \qquad (4)$$

The total excess depths to cut the gears, making the allowance for backlash, and compensating for the cutters used, are given in the following equations:

$$\text{(For driving gear)} \quad B' = B - (B - b)\frac{N'}{N' + n'} \qquad (5)$$

$$\text{(For driven gear)} \quad B' = (B - b)\frac{N'}{N' + n'} \qquad (6)$$

The above equations for the excess depth may be used as long as both excess depths are positive; b itself may be positive or negative.

We will illustrate the use of the foregoing equations with a few definite examples, and the first example will be the following:

16-tooth pinion, 29-tooth gear, 6 d.p., 0.010 in. backlash.

The 16-tooth pinion will be cut with a No. 6 cutter (17 teeth) and the 29-tooth gear with a No. 4 cutter (26 teeth). The backlash, corresponding to 1 d.p. equals $6 \times 0.010 = 0.060$ in. Thus we have the following numerical values:

$$\begin{aligned} n &= 16 \\ n' &= 17 \\ d &= -1 \\ N &= 29 \\ N' &= 26 \\ D &= 3 \\ A &= 14\tfrac{1}{2} \end{aligned}$$

Referring to equation 1,

$$D' = \frac{3}{29 \times 26} - \frac{1}{16 \times 17} = \frac{3}{754} - \frac{1}{272}$$
$$= 0.003979 - 0.003676 = 0.000303$$

This value is small and positive, and is therefore satisfactory. Referring to equation 3,

$$b = 3.4 \left(\frac{3}{29 \times 26} + \frac{1}{16 \times 17} \right) = 3.4 \times 0.007655$$
$$= 0.02603 \text{ in.}$$

Referring to equation 4,

$$B = 2 \times 0.060 = 0.120 \text{ in.}$$

Referring to equation 5, we have for the excess depth to cut the 16-tooth pinion,

$$B' = 0.120 - (0.120 - 0.02603)\frac{26}{26 + 17} = 0.120 -$$
$$(0.09397 \times 0.60465) = 0.06318 \text{ in.}$$

Reduced to 6 d.p., this excess depth becomes

$$\frac{B'}{6} = 0.0105 \text{ in.}$$

Referring to equation 6, we have for the excess depth to cut the 29-tooth gear,

$$B' = (0.120 - 0.02603)\frac{26}{26 + 17}$$
$$= 0.05682 \text{ in.}$$

Reduced to 6 d.p., this excess depth becomes

$$\frac{B'}{6} = 0.0095 \text{ in.}$$

In this same example, the 16-tooth pinion could be cut with a No. 7 cutter (14 teeth), and in this case we would have the following:

$$\begin{aligned} n' &= 14 \\ d &= 2 \end{aligned}$$

All other values would be unchanged, and referring to equation 1, we have

$$D' = \frac{3}{29 \times 26} + \frac{2}{16 \times 14} = \frac{3}{754} + \frac{1}{112}$$
$$= 0.003979 + 0.008928 = 0.012907$$

The value of D' is a measure of the variation in velocity during one pitch movement of the gears. This last value of D' is over forty times greater than the first one, and the first solution, therefore, will produce a much better running pair of gears than the second. This pair can be greatly improved, nevertheless, by the proper distribution of the excess depth of cut.

Referring to equation 3,

$$b = 2.8 \left(\frac{3}{29 \times 26} - \frac{2}{16 \times 14} \right)$$
$$= 2.8 \times (-0.004949) = -0.01386$$

Referring to equation 5, we have for the excess depth to cut the 16-tooth pinion,

$$B' = 0.120 - (0.120 + 0.01386)\frac{26}{26 + 14}$$
$$= 0.120 - (0.13386 \times 0.65) = 0.03300 \text{ in.}$$

Reduced to 6 d.p., this excess depth becomes 0.0055 in. Referring to equation 6, we have for the excess depth to cut the 29-tooth gear,

$$B' = (0.120 + 0.01386)\frac{26}{26 + 14} = 0.08700 \text{ in.}$$

Reduced to 6 d.p., this excess depth becomes 0.0145 in.

These examples should be sufficient to indicate the use of the foregoing equations. One word of caution, however, should be uttered. When the tooth number of the cutters are both smaller than the tooth numbers of the gears, edge contact seldom occurs, whether or not a correction is made for the depth of cut. On the other hand, if the tooth number of the cutter is larger than the tooth number of the gear, edge contact will occur unless the correction as outlined above is made for the depth of cut.

The foregoing analysis is an approximate one only. The approximations obtained, however, are extremely close, and sufficiently accurate for all practical results. It is an analysis of milled gears and, primarily, involute gears, for modifications of the involute have not been taken into account, and do not need to be. The modifications, intentional and otherwise, are relatively small quantities and do not require an extremely accurate determination. What is required, however, is a simple solution if it is to have any great practical value.

In addition to the determination of errors, the analysis also provides remedies. It develops a distribution of backlash which avoids errors ordinarily incurred through cutting deeper. It shows how the contact may be prevented from shifting too much, either towards the bottoms or to the tips of the teeth. It permits the use of compensating cutters, by making one error modify another.

One of the general and important gear problems is how to avoid safely edge contact at the beginning of mesh. It is particularly dangerous for the tip edge of the driven tooth to have contact with the flank of the driving tooth. When this danger exists in milled gears, for instance with low tooth numbers, through lack of accuracy in cutting, it may always be avoided by cutting the driven gear a trifle deeper.

Endurance Tests of Molybdenum Steels

THAT molybdenum is one of the most powerful and useful alloying elements in steel is stated by the Department of the Interior to have been conclusively demonstrated by experiments conducted by Dr. H. W. Gillett, chief alloy chemist, Department of the Interior, at the Ithaca, N. Y., field office of the Bureau of Mines. While the value of molybdenum as a steel alloy is only beginning to be appreciated and its commercial use is still relatively small, the Bureau of Mines considers that it is destined to become widely used, as it deserves to be. The United States has abundant supplies of molybdenum, which should be made to replace or supplement other metals used as steel alloying elements and which at present must be imported.

Fatigue Qualities Not Incomparable

The early claims of molybdenum as a specific against fatigue failure of steel, which alleged that molybdenum steels were vastly superior to other steels to resist vibration, have not been substantiated in the over-enthusiastic form in which they were made. The experiments of the Bureau of Mines show that, with one exception, molybdenum steels and other alloy steels containing nickel, chromium, vanadium, or a combination of these elements, have equal qualities of endurance, and that no one alloy steel stands out above the others on this score.

The exception is in favor of heat-treated molybdenum steels, for the presence of molybdenum makes the steel require a higher temperature in the drawing or tempering process after quenching, and this higher temperature causes fuller release of quenching stresses. The presence of quenching stresses tends to cause poorer performance under repeated vibration. This factor, however, is not very important, and has a noticeable effect only in very hard steels, for example, those of spring temper. For ordinary structural uses, no alloy steel is appreciably superior for use against vibration to any other when the steels are used in such sizes that they harden throughout on quenching. Molybdenum and certain combinations of nickel and chromium confer depth-hardening properties on steel, and hence they have advantages for use in parts of large cross-section.

Thus it is evident that, as regards endurance, molybdenum steels are the equals of any, and on some scores have slight advantages, but the advantages are slight instead of large. The choice of a composition of an alloy steel will therefore seldom depend on its fatigue properties.

Corroboration of Illinois Experiments

The endurance work of the Bureau of Mines has given results which in general fit in very well with the recent work of the Engineering Experiment Station of the University of Illinois, and which indicate that the conclusions of the Illinois investigation may be extended to apply to a large range of alloy steels.

But, beside corroborating and extending the Illinois results, the work of the Bureau has brought out a point which has not been covered completely by other investigators in this country or abroad, although it has been considered to some extent by most workers in this field. This point is the evil effect on endurance of non-metallic inclusions. Dirty steel gives far less uniform results on endurance tests than cleaner steel, and dirty steel is certainly unreliable and unsafe where repeated vibration must be endured.

These inclusions, or other similar imhomogeneities in the metal, are probably the cause of many failures in service. From the relationship worked out by the Illinois investigators and others, and corroborated by the Bureau of Mine tests, the endurance properties of any really clean steel may be quite safely predicted. But when the steel is not clean, it may give either the same results as a clean steel, or far poorer results, depending on whether the most severely stressed spot in a piece made from the dirty steel happens to be locally clean or locally dirty.

Investigating the Effect of Inclusions

The problem of the exact effect of different inclusions or inhomogeneities in steel and other alloys, and the larger problem of how to produce clean steel and alloys, are of vital importance, and involve many factors in the preparation of metallic products, ranging from the methods of elimination of impurities from the ores, down through the smelting of the metals and the melting of the alloys. Much scientific data needed for a proper understanding of the problem is lacking.

To obtain further information on the effect of inclusions, comparisons are being made of endurance tests on specimens cut both with and across the direction of rolling, since the latter, or transverse specimens, usually show the bad effect of inclusions and inhomogeneities most markedly. As soon as the endurance tests on the series of molybdenum, cerium and comparison steels are completed, tests will be made on a series of nickel-silicon steels previously made by the Bureau of Mines for the Navy, and on which tests made by the Navy on properties other than endurance are available. The Navy has supplied specimens cut both longitudinally and transversely, and the Bureau has prepared all these specimens for testing. This work should throw some light on the problem of inclusions. But work with inhomogeneities such as inclusions in steel is difficult because of the irregularity of distribution of the inclusions.

Endurance Tests Being Run Continuously

In order to study the effect of different kinds of inhomogeneities in different sorts of alloys, work on certain non-ferrous alloys has been begun.

Prior to the fiscal year of 1922-1923 a series of fifty molybdenum, cerium and other alloy steels was prepared for comparative purposes, and the necessary tests, other than endurance tests, were made. After these cooperative agreements ended, the Bureau of Mines continued the endurance tests in order to make the work complete. Endurance tests are time-consuming, and, save for a short period when the machines were out of commission due to a fire which damaged the laboratory of Sibley College, Cornell University, in which the endurance machines used in this work are located, two endurance machines have been run night and day throughout the present year. These machines will continue to run continuously for a few months longer to complete the program.

Cerium offers no promise of usefulness as an alloying element in steel. Its use tends towards the presence of non-metallic inclusions and toward troubles consequent upon this defect.

German Standards for Tolerances and Allowances in Machine Fits

BY OSCAR R. WIKANDER

LONGITUDNAL dimensions are treated in very much the same way as diameters in regard to fits and tolerances. The basic size is used as one limit of the tolerance field and either the unit bore or the unit shaft system can be used.

In case a number of longitudinal dimensions form a certain total, it is, of course, not permissible to prescribe tolerances for the dimension of each part and for the total as well. If tolerances are prescribed for the total, at least one of its component parts must not be dimensioned with tolerance limits.

It is, of course, desirable to use such variations for bores and shafts of standard parts, that they can be made in quantity production in specialized shops and used in combination with the unit bore or the unit shaft system. without discrimination. Standard parts, which are always used with the same fit, should be so dimensioned that:

1. All bore variations correspond to the desired fit in the unit shaft system.
2. All shaft variations correspond to the desired fit in the unit bore system.

The user can then always manufacture the mating parts according to his own gages, regardless of whether he is equipped for the unit bore or the unit shaft systems. In regard to standard parts to be used with different fits, it is impossible to dimension a bore so that it will give more than *one* fit in the unit shaft system or a shaft so that it will give more than *one* fit in the unit bore system.

Annular ball bearings and certain types of roller bearings, have a unique position among standard parts. The standardized dimensions of the current commercial sizes are the same, and the variations of their bores and outside dimensions are practically the same, in all countries. Their tolerances are closer than in any of the German standard grades of fits. The fits to be used for such bearings have not yet been standardized, though the recommendations of the various manufacturers agree fairly well.

For the measurement of shafts, snap gages are used for the entire range from 1 to 500 mm., while for the

DIN | **Drawings** — **Indication of Tolerances and Fits** | **DINORM 406** Sheet 5

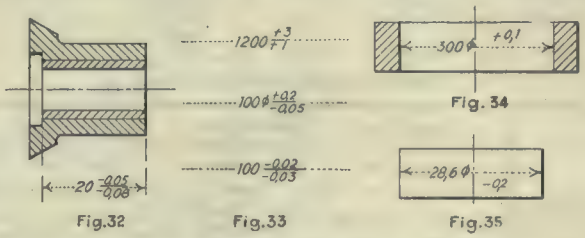


Fig. 32 Fig. 33 Fig. 34 Fig. 35

Tolerances are indicated by means of the basic size with the upper and lower variations (see Figs. 32 and 33).

If the basic size is equal to the minimum size (Example: bores, keyways), the latter and the tolerance are given (see Fig. 34).

If the basic size is equal to the maximum size (Example: shafts, keys), the latter and the tolerance are given (see Fig. 35).

The variation O is omitted (see Figs. 34 and 35).

The variations are given behind the dimension, in case of diameters behind the diameter sign, the upper variation always above and the lower variation always below the dimension line (see Fig. 33).

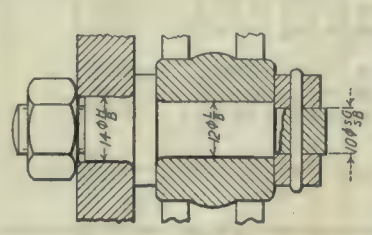


Fig. 36 Fig. 37

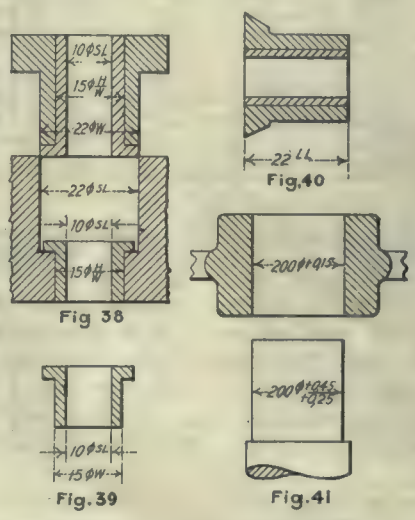


Fig. 38 Fig. 39 Fig. 40 Fig. 41

Fits are indicated:

1—By the abbreviations, according to DIN 776 (see Figs. 36 to 40), or

2—By the basic size and the variations for the two mating members (see Fig. 41).

The abbreviations or symbols are written to the right of the dimension, a little above the latter, or, in case of diameters, behind the diameter sign (see Figs. 36 to 40). Example: 22 ϕ *SL* means: 22 millimeter diameter, Schlichtlaufsitz.

If the dimensions for the bore and the shaft are indicated by one dimension only (see Figs. 36 and 38), the symbol for unit bore (see Fig. 36) or for unit shaft (see Fig. 37), is placed below the symbol for the fit. Example: 15 ϕ $\frac{H}{W}$ means: 15 mm. bore, Haftsitz, unit shaft, and 15 mm. outside diameter of the shaft, unit shaft.

The same indications of the fits can be used for flat fits as well (see Fig. 40).

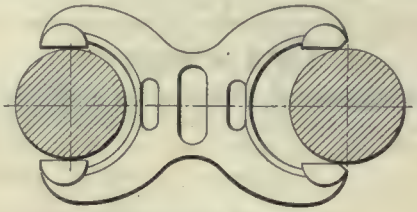
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DIN	Enger Laufsitz Fine Grade of Fit Unit Bore	DINORM 22

Symbol for Enger Laufsitz: *EL*

The "Enger Laufsitz" is used for mating parts, which should be able to move in relation to each other without noticeable looseness.

"Go" End
The gage should slip over the shaft by its own weight.



"No Go" End
The gage must not go over the shaft, but at the most hold on to it.

Dimensions in Millimeters

Range, Inches	New Gage Variations		Calculated Looseness Between Bore and Shaft for New Gages		Worm Gage "Go" End		Kind of Gage
	Upper "Go" End	Lower "No Go" End	Max.	Min.	Permissible Wear	Variation	
..... 1 to 3	—0.003	—0.008	0.016	0.003	0.0015	—0.0015	Snap Gages
Above 3 to 6	—0.004	—0.012	0.024	0.004	0.0020	—0.0020	
Above 6 to 10	—0.005	—0.015	0.030	0.005	0.0025	—0.0025	
Above 10 to 18	—0.006	—0.018	0.036	0.006	0.0030	—0.0030	
Above 18 to 30	—0.008	—0.022	0.044	0.008	0.0040	—0.0040	
Above 30 to 50	—0.009	—0.025	0.050	0.009	0.0045	—0.0045	
Above 50 to 80	—0.010	—0.030	0.060	0.010	0.0050	—0.0050	
Above 80 to 120	—0.011	—0.035	0.070	0.011	0.0060	—0.0050	
Above 120 to 180	—0.013	—0.040	0.080	0.013	0.0070	—0.0060	
Above 180 to 260	—0.015	—0.045	0.090	0.015	0.0080	—0.0070	
Above 260 to 360	—0.018	—0.050	0.100	0.018	0.0090	—0.0090	
Above 360 to 500	—0.020	—0.060	0.120	0.020	0.0100	—0.0100	
Tolerance Units	—0.5	1.5	3.	0.5	0.25	.....	

October 16, 1919

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measurement of bores, cylindrical plugs are used up to 100 mm. bore inclusive. Flat gages are used above 100 mm. up to 260 mm. inclusive, and pin gages with ball ends are used above 260 millimeters.

The permissible wear of shop gages, expressed in tolerance units (*PE*), has been standardized as follows:

Gage tolerance in *PE*	1	1.5	2	2.5	3	3.5	5.5	10
Permissible wear *PE*	0.25	0.35	0.4	0.5	0.6	0.6	0.6	1.5

All gages are measured at the standard temperature of 20 deg. C. or 68 deg. Fahrenheit.

Some time ago the Sectional Committee on Plain Gages, published its proposed standards of tolerances and allowances in machine fits (*American Machinist*, page 70, Vol. 57) and it may be of interest to compare the proposed American to the adopted German standards. Both are based on the same standard temperature of 20 deg. C. or 68 deg. F. Both have adopted the basic size as at least *one* tolerance limit for every class of fits. This arrangement has many advantages and it is probable that it will be internationally adopted.

The German standards are more complete than those of any other country in respect to the following several items:

1. They have *four* different grades of fits, each containing several classes of fits, while the American standards have only *one* grade.

2. They have two complete systems of fits, the unit bore and the unit shaft systems, while the proposed American standards limit themselves to the former.

In the German as well as the American standards, the tolerances of each class of fits are proportional to the cube root of the basic size, $\sqrt[3]{D}$, where D is the shaft or bore diameter in millimeters.

In the German standards all allowances, except those for press fits and shrink fits, are proportional to this same function, $\sqrt[3]{D}$, while in the American standards, the allowances for loose fits are proportional to $\sqrt[3]{D^2}$, and those for tight fits are proportional to D.

It is obvious that the German practice to use the same function of the diameter to express tolerances as well as fits, makes for a greater uniformity. Considering, however, that tolerances and fits are quantities of different nature, there may be good reasons for the American practice to let each vary according to the function of the diameter which appears most suitable.

The various German classes of fits do not exactly correspond to any of the proposed American ones and, in order to avoid confusion, we have not attempted to translate the German names for the various classes of fits.

The proposed American classes of fits correspond, however, very closely to the following German ones:

Proposed American Standards		Adopted German Standards	
Class of Fit	Symbol	Class of Fit	Symbol
Loose fit	I	Weiter schlichtlaufsitz	sWL
Free fit	II-A	Leichter laufsitz	LL
Medium fit	II-B	Laufsitz	L
Snug fit	III-A	Edelgleitsitz	eG
Wringing fit	III-B	Edelhaftsitz	eH
Tight fit	IV-A	Edelfestsitz	eF
Medium force fit	IV-B	Edelpressitz	eP
Heavy force fit	IV-C	Pressitz	P

In view of the facts that:

1. The proposed American standards have been carefully worked out by the leading experts of the United States;

2. They are equivalent, for all practical purposes, to certain of the German standards, which have been adopted upon the recommendation of the foremost German experts;

3. The American proposals check and confirm the results obtained by the German investigators;

4. The German standard fits and tolerances have stood the test of practical application for a few years and have met with the unqualified approval of the affected industries.

The following suggestions may be worthy of consideration:

1. That we accept as American standards, the exist-

ing adopted German equivalents of such machine tolerances, allowances and fits as have been proposed by the Plain Gages Committee of the American Society of Mechanical Engineers.

2. That said Committee be requested to investigate whether such adopted German standards as do not as yet have any equivalents among the proposed American standards, are of sufficient value or importance to be acceptable as anticipatory American standards.

3. That it also be investigated, whether it would not be practicable to use the German symbols for such tolerances, allowances and fits and to adopt the standardized German method of marking the drawings.

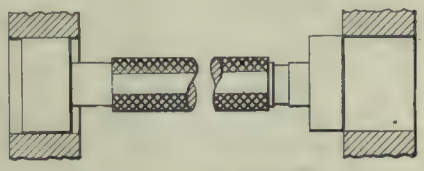
If the American and German standards for tolerances, allowances and fits were identical, and a uniform method of marking drawings were accepted, the engineering intercourse between said countries would be facilitated, and it appears probable that such an agreement would lay the foundation to international standardization in this young, but very important branch of mechanical engineering.

DIN	Haftsitz Fine Grade Fit Unit Shaft	DINORM 46

Symbol for "Haftsitz": *H.*

The "Haftsitz" is used for mating parts, which should hold on to each other, but which can be put together or taken apart without great effort. They must be locked in order to prevent turning or axial displacement in relation to each other.

"Go" End
The plug must enter without much effort.



"No Go" End
The plug must not enter the hole, but at the most hold on it.

Dimensions in Millimeters

Range, Inches	New Gage Variations: Upper "Go" End	New Gage Variations: Lower "No Go" End	Calculated Looseness Between Bore and Shaft for New Gages: Max.	Calculated Looseness Between Bore and Shaft for New Gages: Min.	Worm Gage "Go" End: Permissible Wear	Worm Gage "Go" End: Variation	Kind of Gage
1 to 3	+0.003	—0.005	0.008	0.005	0.0020	—0.0070	Plug Gage
Above 3 to 6	+0.004	—0.008	0.012	0.008	0.0030	—0.0110	
Above 6 to 10	+0.005	—0.010	0.015	0.010	0.0035	—0.0135	
Above 10 to 18	+0.006	—0.012	0.018	0.012	0.0040	—0.0160	
Above 18 to 30	+0.008	—0.015	0.023	0.015	0.0050	—0.0200	
Above 30 to 50	+0.009	—0.018	0.027	0.018	0.0060	—0.0240	
Above 50 to 80	+0.010	—0.020	0.030	0.020	0.0070	—0.0270	
Above 80 to 120	+0.011	—0.022	0.033	0.022	0.0080	—0.0300	Flat Gage
Above 120 to 180	+0.013	—0.025	0.038	0.025	0.0090	—0.0340	
Above 180 to 260	+0.015	—0.030	0.045	0.030	0.0100	—0.0400	
Above 260 to 360	+0.018	—0.035	0.053	0.035	0.0120	—0.0470	Ball Gage[1]
Above 360 to 500	+0.020	—0.040	0.060	0.040	0.0140	—0.0540	
Tolerance Units	+0.5	—1	1.5	1	0.35	—1.35	

[1]When Flat or Ball Gages are used, the resulting fits are sometimes slightly tighter than when plug gages are used.

If great uniformity in the manufacture is desired in case of a "Haftsitz," it is recommended to use "Edelhaftsitz," according to Dinorm 50.

October 16, 1919.

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Teach Your Boy a Trade—Discussion

By Fred J. Schlegel, Jr.

Having read several articles in the *American Machinist* since this subject has been under discussion, bemoaning the fact that more young men do not become apprentice machinists, I would like to offer my opinion. I served an apprenticeship at this honorable trade, during the time big wages were made in shops having war contracts, and am not working at it now.

One machine that I worked on is now operated by a man, being paid full machinist's wages, who never saw the inside of a machine shop before he secured a job in one as a machine hand during the war. Another man in the same shop, who has been specialized in a certain line of work, is now making 25 cents an hour more, on an average, than the average machinist's wages, and doing it easier than they can. He never served an apprenticeship. Can you blame a man who has been an apprentice and must work under these conditions for advising young fellows not to waste their time serving an apprenticeship?

Then look at the money that can be earned at bricklaying, plastering, carpentry, etc. None of these mechanics work any harder than the machinist, and theirs is a cleaner job. However, I know more than one young fellow who has had a clerical position and left it for one which meant he would have a dirty job but earn more money. It is not dirt that most are afraid of, it is money they want. Of course there are exceptions to this, but I think the greatest drawback is the lowness of wages paid machinists as compared to that received by skilled and even semi-skilled labor in other lines.

I feel that the time I spent as an apprentice was a large loss financially, for I believe I would be just as well off mechanically speaking, as I am now, had I taken a position as a handy man or machine hand in a machine shop, in the same way some are now breaking into the ranks of the machinists. At least most of them are being paid machinist's wages.

A machinist has an interesting line of work but you can't expect him to work for exercise all his life.

The Relation Between Inches and Millimeters

By H. W. Bearce
U. S. Bureau of Standards, Washington, D. C.

IN MANY discussions of the relation between inches and millimeters confusion has arisen as a result of failure to distinguish clearly between differences arising from the use of different fundamental definitions of the units, and those arising from the use of different standard temperatures for physical standards.

Since 1893, the legal relation between the metric and customary units of length in the United States has been that contained in the United States Law of 1866, and put into official use by the so-called Mendenhall Order of 1893. That relation is:

1 meter = 39.37 inches

In Great Britain the legal relation is that established by the Order in Council of 1898, namely:

1 meter = 39.370113 inches

It is apparent, therefore, that there is a slight difference in the relation of the inch and millimeter of the United States and that of the inch and millimeter of Great Britain. For the present purpose it is immaterial whether this difference is the result of the use of a different inch or a different millimeter in the two cases.

The above difference is very small and for most purposes may be entirely disregarded. It amounts to only about one part in 400,000 or 0.18 in. in a mile. This difference results from a difference in definition of the fundamental units, and is fixed and entirely independent of temperature or other physical considerations.

Co-operation of Nations Advisable

The United States and Great Britain can be brought together in this respect only by a change in the legal relation on the part of one or the other or both, and the adoption of a single basic relation.

The only difference referred to, namely, that arising from the use of different standard temperatures, is much more serious, especially from the standpoint of interchangeable manufacture. Strictly speaking it does not involve the relation between inches and millimeters, though often confused with it.

Material standards of length, in general, can have their correct nominal length only at a single temperature. In the United States industrial length-standards, such as gages, precision gage blocks, etc., are usually made to have their correct nominal length at a temperature of 68 deg. F. (20 deg. C.). In Great Britain they are usually made to be correct at 62 deg. F. (16⅔ deg. C.), while in Europe they are generally made to be correct at 20 deg. C. (68 deg. F.), except in France where 0 deg. C. (32 deg. F.) is widely used.

Gage Temperatures Should be Uniform

The result of this lack of agreement as to standard temperature is that accurately machined parts, when made to be correct at different temperatures, will not fit together properly even though of the same nominal dimensions. For example, a part measured with a gage or measuring machine, the standard temperature of which is 20 deg. C., will not fit when mated with a part measured in terms of a standard which is correct at 0 deg. C. This is obviously true whether the parts are measured in inches or in millimeters, or one in inches and the other in millimeters. If the two parts in question have the correct dimensions at the temperature at which they are expected to fit and function properly, then they will fit and function properly at that temperature. While if one is correct at one temperature and the other at another they will not fit and function properly regardless of the units of measurement employed.

This failure to fit is the result of expansion of the measuring instruments and of the materials measured, and can not be avoided except by making the parts of correct size at the same temperature. This can be done most conveniently by making all industrial standards, gages, etc., correct at the same temperature.

Attempts of European Standardizing Bodies

Within the past few years certain European standardizing bodies have attempted to establish a fictitious relation between inches and millimeters, such that machined parts when measured with tools graduated in terms of this relation, would fit interchangeably. Such an attempt serves only to complicate and confuse and can result only in failure.

The difficulties can be completely overcome by the adoption of two simple steps, as follows:

The adoption of a single fundamental relation between inches and millimeters.

The adoption of a single standard temperature at which industrial standards of length, and accurately machined parts shall have their correct nominal dimensions.

The most logical, convenient and generally acceptable relation between the units would undoubtedly be 1 in. = 25.4 millimeters.

The adoption of this relation would involve a slight change on the part of both the United States and Great Britain, but it is believed that the advantages to be derived from uniformity would more than compensate for the temporary inconvenience of the change.

The most widely acceptable standard temperature would undoubtedly be 20 deg. C. (68 deg. F.). This temperature is already widely used in Austria, Germany, Holland, Sweden, Switzerland and the United States. In Great Britain 62 deg. F. (16⅔ deg. C.), and in France 0 deg. C. (32 deg. F.) are generally accepted as the correct standard temperatures.

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Spiral Bevel Gears Which Can Be Hobbed —Discussion

By W. H. Rasche

The "important kinematical property" of the Archimedean spiral of which Nikola Trbojevich makes such good use in his interesting article, "Spiral Bevel Gears Which Can Be Hobbed," and which he thinks he was the first to notice, was discovered many years ago by Prof. F. N. Willson of Princeton University. See page 64 of "Theoretical and Practical Graphics," by Willson, the MacMillan Co., 1898.

Thus, again, is illustrated the fact that a becloistered scientific theorem which seems utterly irrevelant to practice today becomes of transcendent importance thereto tomorrow.



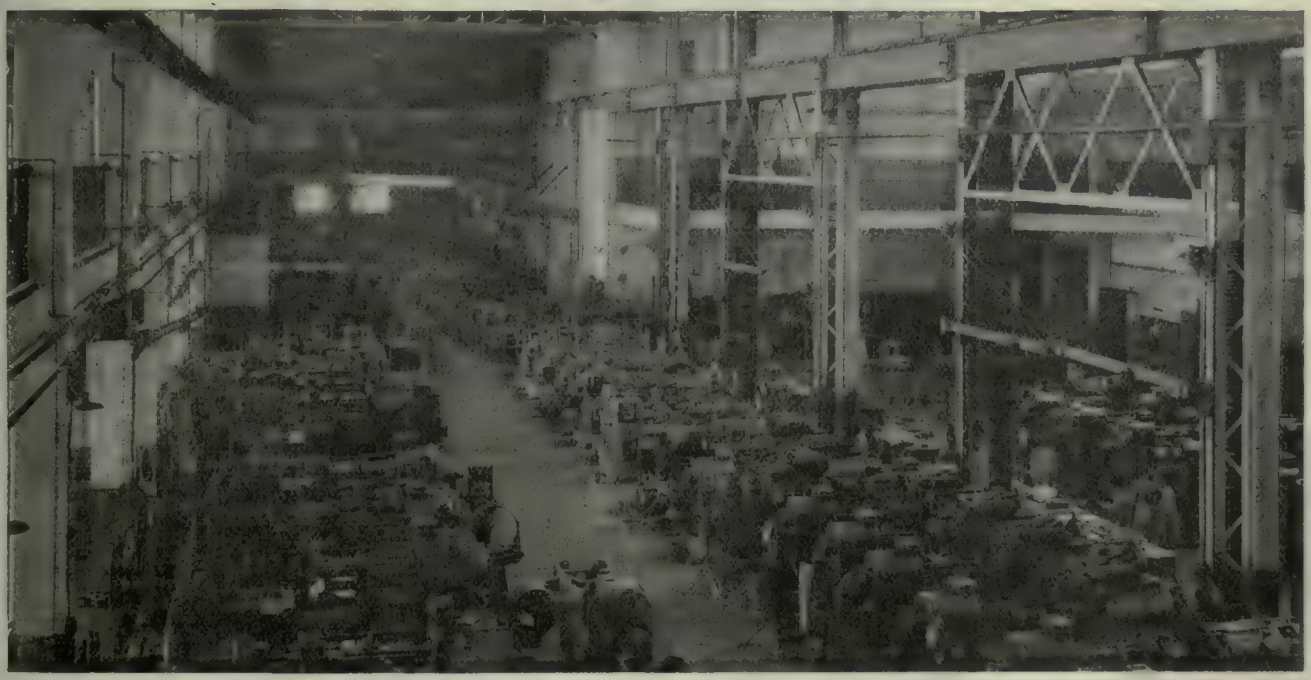
Where Machine Tools Are Made

The National Acme Company

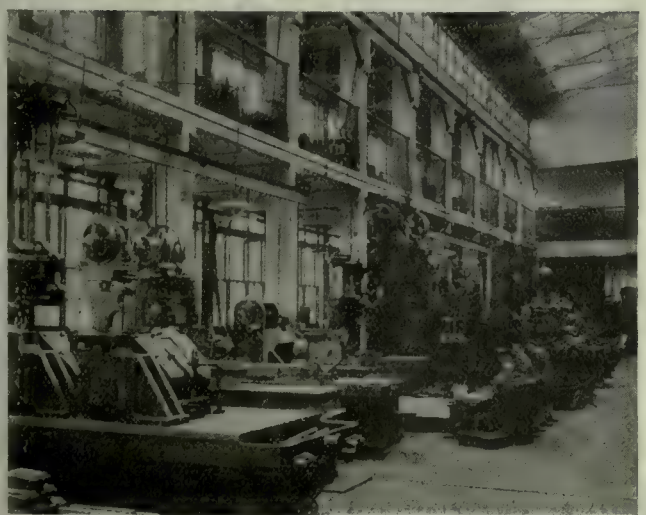
Stanton Ave. Plant, Cleveland

Founded 1897

Crane Room Where Large Acme Automatics Are Assembled



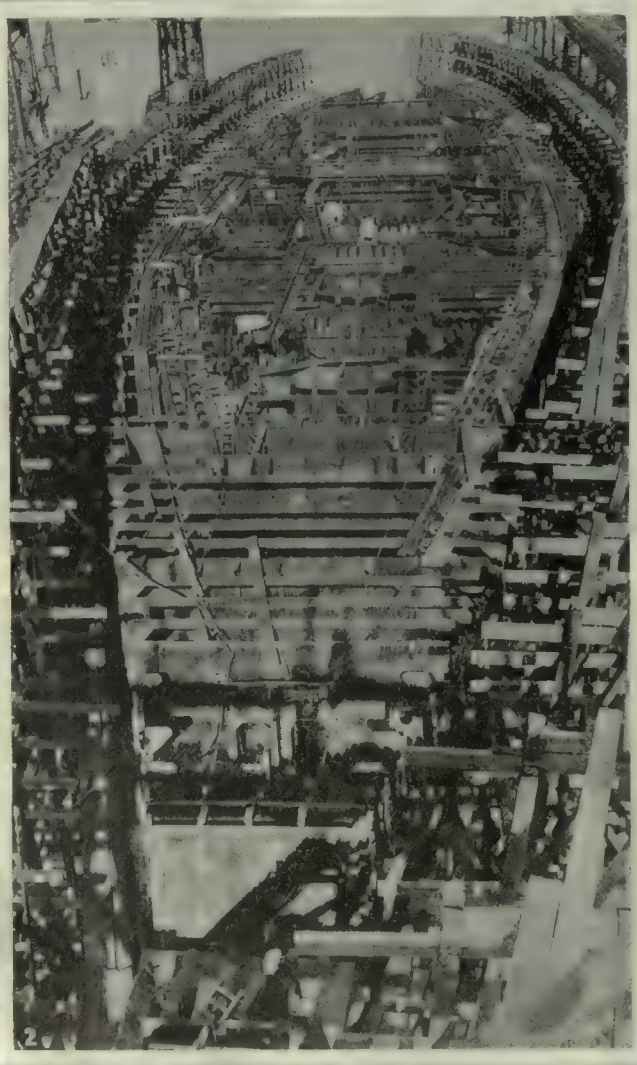
Where Large Castings Are Machined



A Battery of Multiple Drills



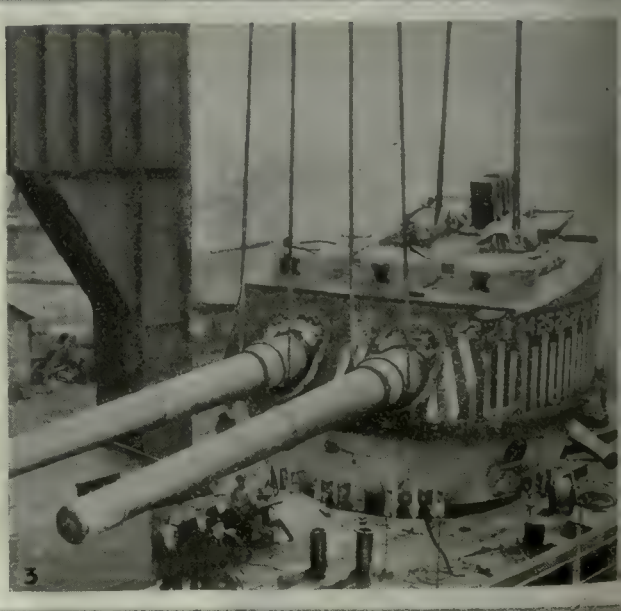




Carrying Out the Terms

The U.S. Navy Department is selling fo cruisers, some of which ha

1–After deck of the U.S.S. Michigan as dismantle and ready for sale as scrap.
2–The U.S.S. Montana, one of the ships being scrapped before completion.
3–How a 350-ton crane landed a turret carryi 8 inch guns.
4–Starting salvage work on a battleship.



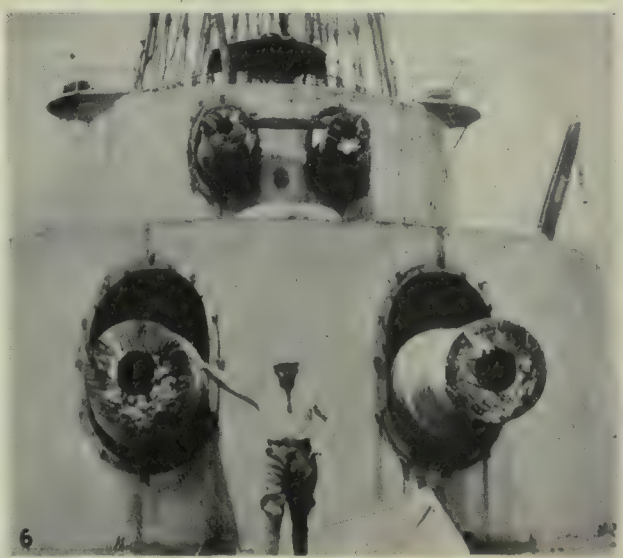




of the Disarmament Treaty

crap purposes battleships and battle not yet been completed

—After the superstructure has been removed.
—Guns that have been sawed off by a cutting torch.
—How a turret is cut up by means of a gas torch.
—The ever-handy cutting torch makes short work of armor plate.









PACKING FOR EXPORT

WORTHINGTON PUMP & MACHINERY CORPORATION

1

Large cases are brought directly to the ships on the company's own lighter.

2

How the pumps are boxed in the Worthington Works at Harrison, N.J.

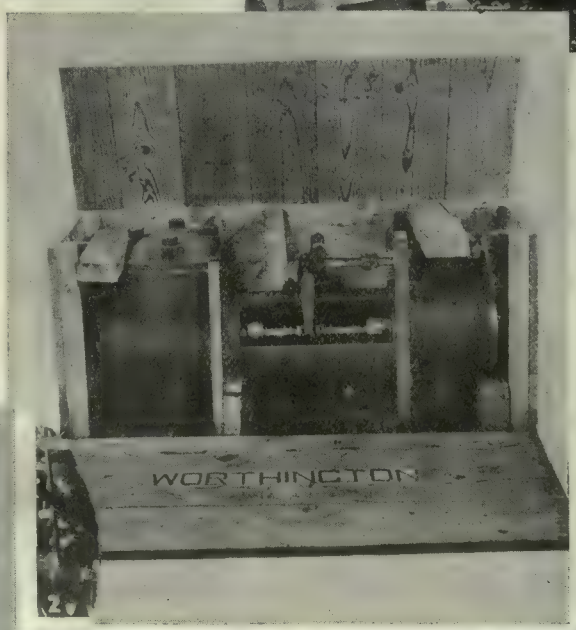


3

Note the bracing provided in the case to prevent strains on the pump.

4

Water meters receive particular care to insure safety.





Testing of Steel for Hardness

By H. M. GERMAN
Metallurgist, Henry Disston & Sons, Philadelphia

Instructions for using Brinell, Rockwell and scleroscope hardness testing machines — The service they render depends upon the judgment and care used in their operation and maintenance

DURING the discussion in the last symposium on hardness testing conducted by this society, the question was asked, "Would it not be possible to formulate some instructions as to how to use the different machines?" The machines under discussion were the Brinell, Rockwell and scleroscope. Acting upon the above suggestion, it was thought that a practical paper dealing with some of the most important factors and elements that introduce errors in the operation of these hardness-testing machines would be useful to the society.

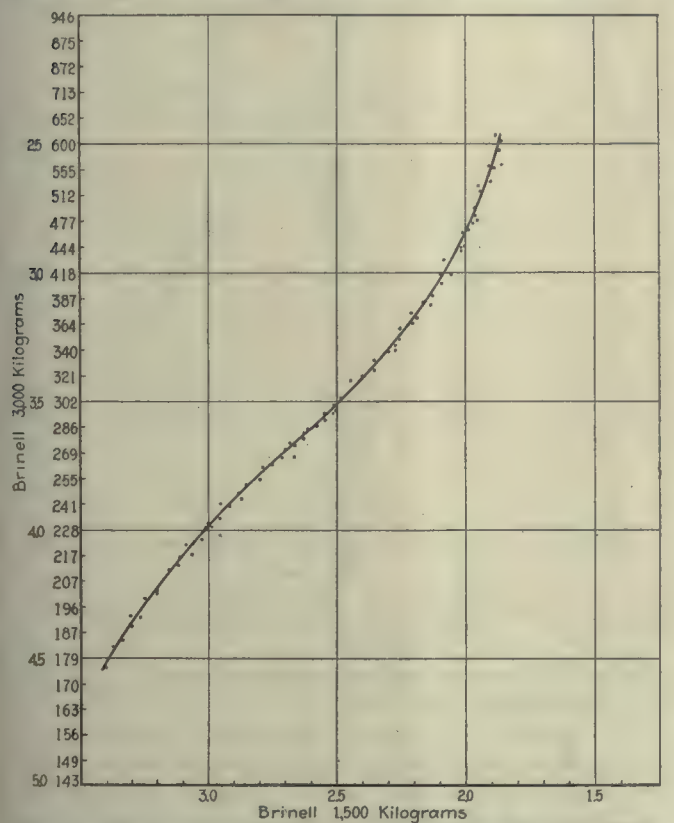


FIG. 1—COMPARISON CURVE FOR TRANSPOSING BRINELL READINGS AT 1,500 KG. PRESSURE TO THOSE AT 3,000 KG. PRESSURE, USING A 10MM. BALL

Brinell Hardness Testing

The Brinell test is a measure of hardness by deformation. In making a standard test a fixed pressure is applied on a hardened and polished steel ball 10 mm. in diameter which in turn penetrates the test piece that is held in a rigid position. The diameter of the impression is proportional to the resistance of the piece tested. For iron, steel and the harder metals 3,000 kg. is the standard pressure, while for the softer metals like lead and babbitt metal, a moderated pressure is used. To obtain the hardness number corresponding to the diameter of the impression, the diameter of the impression may be read with a microscope having a graduated millimeter scale or the depth of impression taken by a micrometer attachment. The readings obtained may be referred to a chart which will transpose them to the corresponding degree of hardness or hardness number.

Several plants use the diameter of impression as the unit of hardness, as for example 3.2 instead of the hardness number 364. This term conveys the same meaning of hardness and saves time in computing or comparing with a chart to obtain the hardness number. The practice of reporting Brinell hardness should be standardized.

The Brinell machine is still recognized as the leading standard for the engineer to compare different degrees of hardness on account of its accuracy and reliability when the necessary precautions are taken in making the tests. The Brinell machine has its limitations in that the standard test cannot be used for testing thin sections, those that will not stand a permanent deformation, or finished articles in which the depression mark would be objectionable. The standard pressure used for the test is 3,000 kg. and should be used whenever possible. However, by reducing the pressure the depth of depression will be decreased and thinner sections can be tested. If a series of test pieces having graduated degrees of hardness are prepared and readings taken with different pressures, it is not difficult to form a curve that will transpose readings at lower pressure to comparative readings at the standard pressure. There is given in Fig. 1 a comparison curve for transposing readings at 1,500 kg. pressure to those at 3,000 kg. pressure.

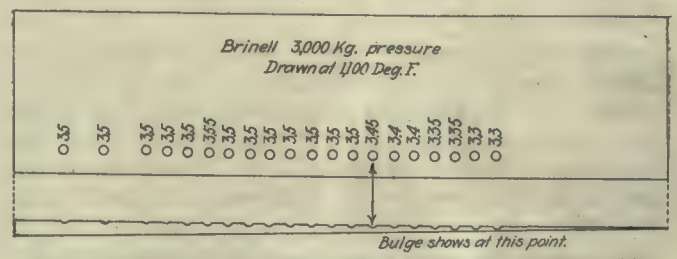


FIG. 2—SKETCH OF TEST PIECE USED TO DETERMINE GAGE LIMITATIONS

The gage limitation of specimens to be tested by the

Abstract of a paper presented at the Symposium on Hardness Testing, annual convention of the American Society for Steel Treating, Pittsburgh, October 8-12, 1923.

Brinell is also influenced by the hardness of the piece to be tested. For example, it is more possible to test a thinner section of high-tempered steel than of low-tempered steel as the impression will be much less in the former than in the latter. An impression which shows as a bulge on the opposite side will not give accurate results and should be discarded.

The minimum gage limits for Brinell and Rockwell tests on 1 per cent carbon steel hardened and tempered at different temperatures is shown in Table I. The results were obtained by hardening eight pieces of steel eight inches long by two inches wide by three-sixteenths of an inch thick, which had previously been ground to remove any presence of decarburization. The hardened pieces were then drawn at different degrees of heat and then taper ground and rough polished. A series of tests were then made on each piece at close intervals from the heaviest to the thinnest section and the point was noted at which the impression produced a bulge on the opposite side and the readings were influenced. The thickness at this point was measured with a micrometer and was taken as the minimum gage limitation for that particular hardness. In Fig. 2 the method used in determining the limitation is illustrated.

Table I

Minimum Gage Limits for Brinell and Rockwell Tests at Different Tempers

1.00 Per Cent Carbon Steel

No.	Drawing Temp. Deg. Fahr.	Brinell 3000 Kg. Pressure Reading	Brinell 3000 Kg. Pressure Gage Limit	Brinell 1500 Kg. Pressure Reading	Brinell 1500 Kg. Pressure Gage Limit	Rockwell Steel Ball Reading	Rockwell Steel Ball Gage Limit
1	700	2.7	0.050	2.2	0.030	114	0.023
2	800	2.9	0.060	2.25	0.035	113	0.024
3	900	3.1	0.065	2.4	0.040	111	0.026
4	1000	3.3	0.070	2.5	0.045	109	0.027
5	1100	3.5	0.080	2.6	0.050	107	0.029
6	1200	2.65	0.090	2.8	0.060	103	0.031
7	1300	4.0	0.105	3.0	0.070	94	0.034
8	Anneal	4.4	0.140	3.3	0.085	87	0.038

One of the greatest factors that will influence the Brinell results is the speed at which the pressure is applied. If the pressure is applied rapidly, the depression will be greater than if it is applied slowly and gradually. This error is strikingly shown when comparing results obtained by an eccentric and weight type of machine with that using a hydraulic action. In the former the load is applied quicker and there is a greater swing of the weight than in the latter. Average readings on these pieces of annealed steel are as follows:

	No. 1	No. 2	No. 3
LeverBrinell—fast pressure. .	4.4 mm.	4.6 mm.	4.3 mm.
Lever Brinell—slow pressure	4.3 mm.	4.5 mm.	4.2 mm.
Hydraulic Brinell—normal pressure.	4.15 mm.	4.4 mm.	4.15 mm.

Part of the above difference may be due to the type of machine used.

The average difference between a fast and a slow application of pressure with the hydraulic machine is about 0.1 mm. in diameter for medium hard metals; the softer the metal, the greater will be the difference. A satisfactory period of time for applying the full load, is five seconds.

Another important factor that will influence the depth of indentation is the duration of time that the full pressure is applied in making the test. A short application of pressure will not give consistent readings as it requires time for the full pressure to exert itself in pressing the ball into the test piece and reach an equilibrium. This is clearly shown in the following test:

Period of Application Seconds	Brinell Readings				Average Reading
5	3.125	3.125	3.125	3.1	3.12
10	3.15	3.15	3.15	3.15	3.15
20	3.2	3.15	3.15	3.15	3.16
30	3.175	3.175	3.175	3.175	3.175
45	3.2	3.175	3.175	3.175	3.18
60	3.2	3.175	3 175	3.175	3.18

In this test the maximum reading was obtained at 45 seconds; there being no increase with an additional 15 seconds. In commercial testing the average duration is 10 seconds, but when more accurate readings are

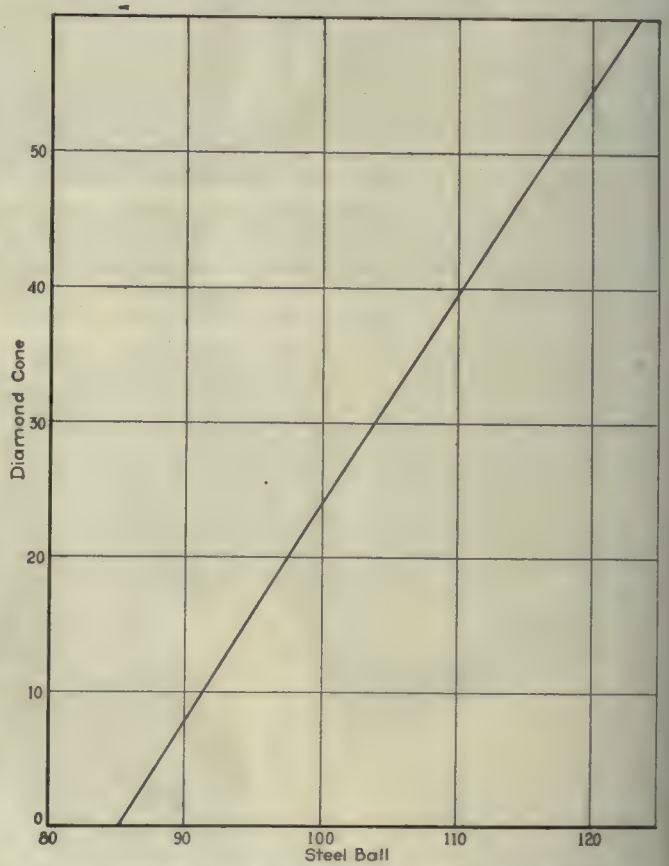


FIG. 3—COMPARISON OF STEEL BALL AND DIAMOND CONE ROCKWELL READINGS

desirable, 30 seconds give consistent results. A standard time should always be used.

One weakness of the Brinell machine is that the steel balls frequently crack or become deformed. This source of trouble is naturally greater when testing harder pieces than when testing annealed pieces. A cracked or deformed ball may be detected when reading the indentation as it will be out of round. Oval-shaped depressions should be discarded.

In order to obtain consistent readings, the following precautions should also be observed:

See that the surface of the test piece is at right angles to the direction of applied pressure and that it rests solid on the support.

See that the movable block on which the test piece rests is flat. The author has frequently seen blocks that had indentations made in them by the Brinell ball. This will give non-uniform results, particularly when testing thin sections. If the block is not flat, have it ground.

Check the reading glass frequently to see that the millimeter lines coincide with those of the standard. They occasionally get out of adjustment.

Check the instrument occasionally with a standard test block of known hardness. This should always be done when a new ball is used as they do not always seat properly in the plunger.

Rockwell Hardness Testing

The Rockwell test is a modification of the Brinell. It consists of pressing a hardened steel ball $\frac{1}{16}$ in. in diameter or a diamond cone, of 120 deg. angle, into the piece to be tested and measuring the depth of depression with a dial micrometer. In order not to confuse readings, separate scales are provided for the ball and diamond depressions. The standard pressure

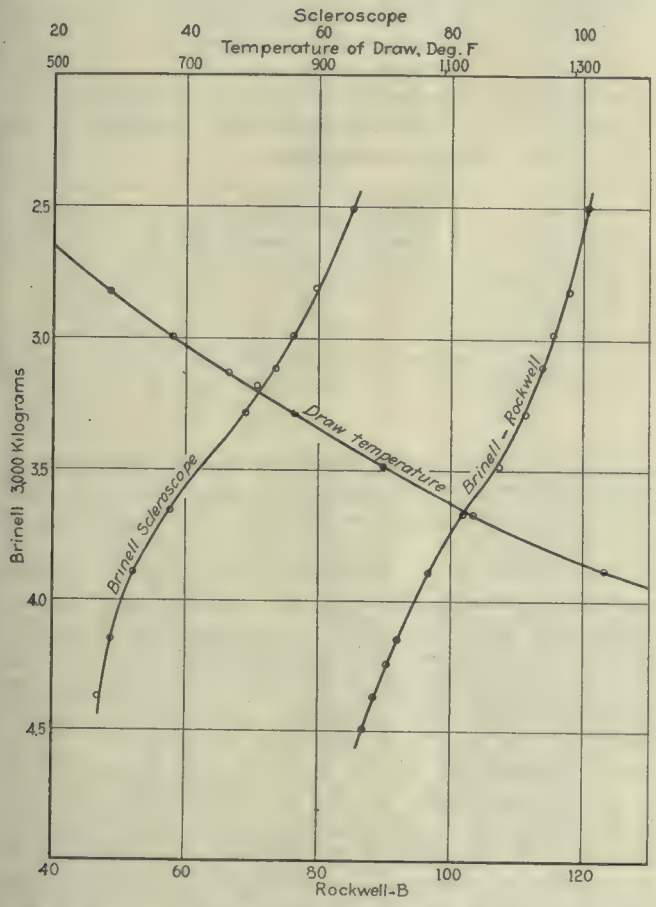


FIG. 4—BRINELL, ROCKWELL AND SCLEROSCOPE COMPARISON CURVES FOR A 1 PER CENT CARBON STEEL

applied for the maximum load is 150 kg. when using the diamond cone and 100 kg. when using the steel ball. The operating principle of the Rockwell machine is different from the Brinell in that the total depth of depression from the surface is not measured. In making a Rockwell test, a minor load of 10 kg., regulated by a spring, is first applied, the micrometer dial is set at zero, and then the major load is applied. Upon releasing the major load, the depth of depression caused by the major load only is indicated on the micrometer dial. This reading is taken as the degree of hardness. The Rockwell test has a special field in that it can be used for testing much thinner sections than the Brinell and it does not spoil the finish of the article tested, except on very highly polished work, but like the Brinell it has its limitation in that it cannot be used for testing thin sections that are brittle or those that cannot stand a permanent deformation.

For testing very hard articles such as hardened high-speed steel, milling cutters, etc., the diamond cone has a very useful field as it will not deform and give inaccurate readings. Steel balls give much trouble in testing high-tempered articles owing to their tendency to break and deform under pressure and, if used, should be tested against a standard specimen at frequent intervals. When testing annealed and low-tempered articles, the steel ball is preferred as it gives accurate results, it is less liable to break, and the scale has a wider range. Fig. 3 shows a comparison curve of steel ball and diamond cone Rockwell readings.

Since the Rockwell is an indentation test, the same factors that were discussed under Brinell testing, such as the rate of application of the major load and the length of time the load is applied, will influence the results. The rate of application can be varied by adjusting the strength of the major load spring. For accurate results, the time for applying the full load

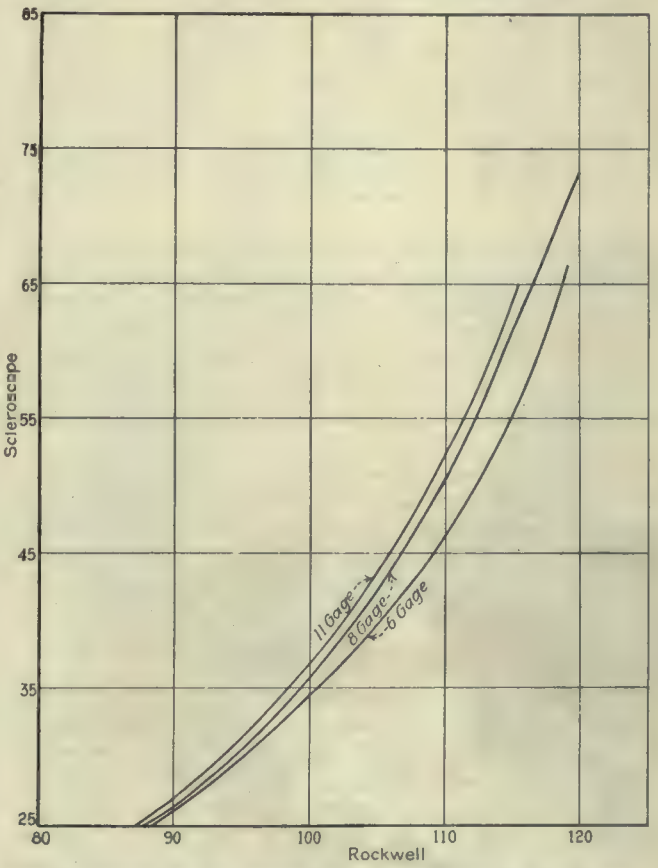


FIG. 5—COMPARISON CURVES OF ROCKWELL STEEL BALL AND SCLEROSCOPE TESTS OF FOUR DIFFERENT GAGES OF METAL

should not be less than five seconds, but if the test is made to roughly sort articles according to their hardness, the time may be lessened.

It must be clearly kept in mind that the Rockwell machine will test on a comparison basis. No factor or formula can be used that will convert hardness numbers obtained from one type of testing machine to that of another for articles of different compositions. If it is desired to convert Rockwell to Brinell or scleroscope terms, the best plan is to prepare a series of test pieces of the same gage and finish that range from hard to anneal in temper, take readings with the dif-

ferent testing machines and plot a curve that will show a direct comparison of the readings. In Fig. 4 is shown a comparison curve for straight carbon steel containing 1 per cent carbon, 7 gage.

Surface defects, such as scale or decarburized surface, do not affect the readings if they are not deep as the minor load overcomes their resistance, but if the thickness of scale or decarburized surface is excessive, the results will be misleading. If accurate readings of unknown samples are to be taken, it is a good plan to grind the surface before testing. Rockwell readings are not influenced by the smoothness or finish of the articles tested. You may confidently expect to obtain the same readings from polished articles that you get when testing them after they have been hardened and tempered. The results of a test made to show the influence of grinding and glazing on hardened and tempered pieces of 0.9 per cent carbon steel, 0.045 in. thick is as follows:

Readings were taken with a steel ball

Sample Number	Hardened and Tempered	Rough Ground (Wet Sandstone)	Rough Glazed No. 100 Emery)	Finish Glazed (Flour Emery)
1	116—117	116 —117	116 —117	116 —117
2	116—117	116 —117	116	116 —117
3	116	115 —116.5	115 —117	116 —117
4	115—117	116.5—117	115 —117	117
5	116—117	116 —117	116.5—117	117
6	115—117	116 —117	116 —117	115.5—117

Special care should be taken in testing that the specimens are properly supported and horizontal. When the piece is large, the overhang should be supported in such a manner that it will not be raised or depressed when the major load is applied. Improper support of the pieces to be tested and the use of improper anvils are two of the greatest sources of errors in Rockwell testing.

After changing penetrators or anvils, readings should always be taken on a standard test piece until uniform and standard results are obtained, as the first few readings are unreliable. This is because it requires pressure for the penetrator, anvil and chuck to seat themselves properly.

Scleroscope Hardness Testing

The scleroscope, as invented by Shore, measures the height of rebound of a standard weight when allowed to fall from a given height upon the article to be tested. When a very hard substance, like a hardened steel ball or a diamond-pointed hammer is allowed to fall on a horizontal surface, the height of rebound is proportional to the resilience of the article on which the hard substance falls. If the article to be tested is very hard, very little of the energy produced by the falling weight will be dissipated by indentation and the energy will be almost entirely expended on the rebound. However, if the article to be tested is quite soft, considerable of the falling energy will be consumed in indentation.

The falling weight of the scleroscope is a steel cylinder $\frac{1}{4}$ in. in diameter by $\frac{3}{4}$ in. long. It has a diamond striking point about 0.02 in. in diameter, which is slightly spherical and blunt in shape. This weight is allowed to fall by gravity from a height of 10 in. through a vertical glass tube on the article to be tested. The degree of hardness is measured by the highest point reached by the top of the weight on the rebound and is measured against a graduated scale in back of the glass tube. The scleroscope does not spoil the finish of the article to be tested, it can be used on very thin sections and by holding in the hand or supported on a movable arm is applicable for testing very large sections.

The scleroscope will give comparative results only when testing articles of like composition under like conditions. This point cannot be made too emphatic. By like conditions, we mean the same gage or thickness and the same surface conditions as rough, ground or polished. If a comparison test is made between Rockwell and scleroscope readings on a number of thin and heavy test pieces all having the same Rockwell degree of hardness, the thin pieces will give a higher scleroscopic reading than the heavy pieces. This is illustrated by comparison curves, Fig. 5, of Rockwell and scleroscope readings for different gages.

The effect of different surface conditions on scleroscope readings may be shown by testing pieces of hardened steel after tempering and after receiving different degrees of grinding and polishing. The results of such a test on 0.9 per cent carbon steel, 0.045 gage, are given in the following tabulation:

Sample Number	Hardened and Tempered	Rough Ground Coarse Wet Sandstone	Fine Ground Fine Wet Sandstone	Rough Polish No. 100 Emery	Fine Polish Flour Emery
1	67—69	68—70	74—75	75—78	78—81
2	69—71	73—75	75—78	75—77	79—81
3	68—70	74—78	75—78	78—82	79—81
4	68—70	73—76	76—79	78—80	79—81
5	69—71	74—76	75—78	77—81	79—81
6	68—70	73—75	76—78	78—81	78—81

Probably the greatest objection to the scleroscope is that the readings obtained from one instrument will not always check readings made by other machines on the same test piece. This has been proved not only by checking readings of instruments that were in service for several months but also by checking new instruments and those returned to the manufacturers for repairs and recalibration. It frequently happens that two instruments will check on part of the scale but not throughout their entire lengths. When several instruments are in use, it is desirable to select one for a plant standard and adjust all the others to agree with it. If an instrument is used to test a single class of work where the readings do not vary more than ten points, as for example 50 to 60, the instrument should be adjusted to check the standard in that range. The author has often felt that it would be quite an improvement in construction if the scale could be adjusted without removing the glass tube as adjustments could be easily and quickly made and the dangers of breaking and not reseating the tube properly would be eliminated.

As the hammer is permitted to fall freely, care should be exercised to keep friction between the hammer and the tube reduced to a minimum. This may be done by keeping the tube in a vertical position by means of the leveling screws and by frequently cleaning the inside of the tube and the hammer with chamois. When the scleroscope is used in a heat treating department or where the air is contaminated with smoke and oil fumes, the soot and oil adhere to the inside of the tube which causes friction and low readings. Also when the instrument is located in or near a chemical laboratory, the acid fumes will corrode the hammer. In replacing the top after cleaning, be sure that it is firmly seated in the proper position.

An Ingenious Device for Making a Peculiar Cam

By ELLSWORTH SHELDON
New England Editor, *American Machinist*

Cam-operated grinder table — A cam of peculiar shape — The problem of machining — An ingenious mechanical device — Result of machining is a number of small steps

THE reciprocating table movement of the Rivett internal grinding machine is unique in that it is derived from a cam instead of through the medium of rack and pinion or hydraulic cylinder usually applied to this class of machines. A peculiarity of the movement, made possible by the use of the cam (and to secure which was the prime objective in choosing the cam principle) is that the rate of travel is not uniform; the table moving at an appreciably accelerating speed as it approaches the point of reversal in either direction and slowing down as it recedes therefrom until mid-stroke is reached.

The advantage claimed by the makers for this peculiar movement is that it counteracts to some extent the tendency to grind holes "bell-mouthed"; and Mr. Rivett spent a great deal of time in experimenting with various rates of acceleration in order to determine just what the shape of his cam should be.

If the table of a grinding machine always moved through the same distance, regardless of the length of the piece of work the machine was grinding, a disk cam could be made to cause any movement, uniform or variable, that might be desired; but, unfortunately for his purpose, the range of table movement—length of stroke—must be variable at will of the operator from zero to the maximum capacity of the machine, and the change must be available instantly, without alteration or substitution of parts.

To make a cam that would provide the desired movement was easy. To make one that could be caused to change its range by a sweep of the operator's hand without at the same time altering any of its remaining characteristics was quite another matter. The object of this article is not to discuss the mental processes involved in the conception of the cam nor the tedious working out of mathematical formulas leading toward the embodiment of the conception, but to describe an ingenious mechanism applied to the making of the original cam and still employed by the Rivett Lathe & Grinder Corporation, the successor of Mr. Rivett, to duplicate it in quantities.

First, a description of the cam itself is necessary. The illustration, Fig. 1, shows three views, or rather a view of three identical cams; the one at *A* being finished and ready to take its place in a machine, another at *B* that has been machined but not ground (polished) and a third at *C* which displays the contour.

The cam is the frustrum of an irregular cone. It changes its mean diameter uniformly from end to end, but the relation of its various radii does not change. In other words the cam, while changing constantly in *size*, is of exactly the same *shape* at one end as at the other, or at any plane between. When assembled into a grinding machine the axis of the cam is either horizontal or vertical, according to the size of the machine, and it revolves about this axis, being driven by means of bevel gears at any desired rate of rotation.

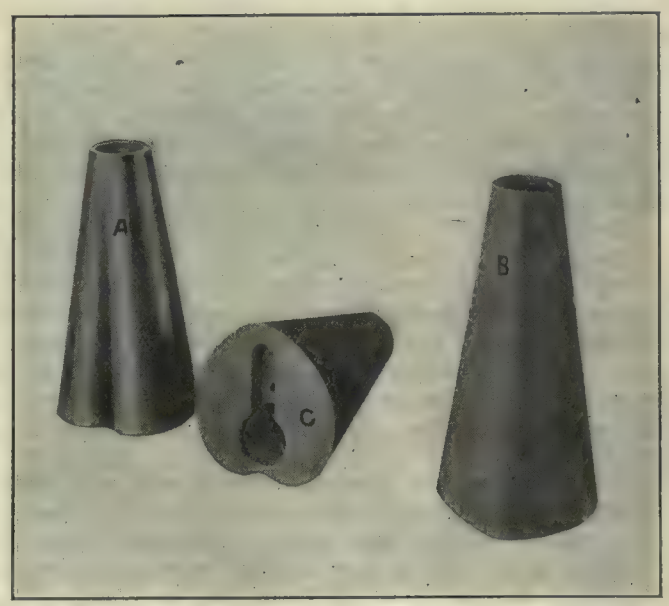


FIG. 1—CAMS FOR RIVETT GRINDING MACHINE

The roller through which the movement is transmitted to the table of the machine is parallel, about an inch long, and is mounted in a swiveling bracket that permits it to seat firmly against the cam and present a full line contact regardless of the position it may occupy. The swiveling bracket is gibbed to the face of a lever of the first class that swings in the same plane in which the axis of the cam lies. The bracket may be moved along the face of the lever, to or from the fulcrum, a distance equal to the length of the cam; the movement being under control of the operator through a handwheel located at the operating position, and is the adjustment for length of table stroke. The roller is held always in contact with the cam by means of springs attached to the upper end of the lever.

A round-bottomed groove having a radius equal to the radius of the roller extends over the full length of the cam parallel to the axis thereof. It ceases, however, to be a groove as it approaches the small end, for at that point the bottom line of the groove coincides with the periphery of the cam and the groove, as such, has disappeared.

The cams are of cast-iron, and are machined by



FIG. 2—FIXTURE FOR PLANING THE CAMS

planing. A general view of the fixture used to plane them is shown in Fig. 2, where the device is mounted on the table of a Gray planer. In Fig. 3 is an end view, showing in somewhat greater detail the indexing mechanism by means of which the accelerated rise is obtained.

Parts *A*, *B* and *C* (either illustration, where the letters appear) are clamped to the planer table and have no movement relative to it. Part *D* is a base to which are permanently fastened an index head and footstock having the usual functions of standard index centers except that they cannot be moved endwise of the base to alter the distance between centers, nor can the head be swiveled in either plane. These adjustments are not needed.

The entire base is, however, carried upon trunnions at the top of the supporting bracket *A*, and is capable of swinging up and down from a horizontal plane to an angle below it equal to or greater than the maximum angle of inclination of the cam surface; which is diametrically opposite to the groove before mentioned.

The casting *B* is a yoke, machined upon its inner faces to confine the tilting unit (the base, head- and footstock) against sidewise movement, but is not fastened to it. The sole duty of part *C* is to locate the large index plate *E* circumferentially; allowing it to rotate when necessary by swinging the latch *F* out of engagement, or locking it, always in the same position, at other times.

The long screw, on the upper end of which the index plate *E*, ratchet wheel *G* and pawl lever *H* are carried, has a ball-shaped thrust bearing at its lower end and passes through a swiveling nut attached to the end of the tilting unit *D*, so that movement of the latter is [illegible]ng unit *D*, so that movement of the latter is The de[illegible] by turning the screw.

point re[illegible] may be seen at *I* in the fixture, ready to be and is m[illegible]casting is made very close to finish size and the glass [illegible]

shape so that the planer tool has but little material to remove. A point to be remembered is that the apex of the conical-shaped cam when in the fixture coincides exactly with the intersection of the line of centers upon which it is mounted with the center line of the trunnions about which the tilting unit swings.

When first mounted in the fixture the cam lies with the groove uppermost and the base of the tilting unit (and consequently its line of centers) is horizontal, in which position the round-nosed planer tool is fed down (with the planer running) until the groove has been machined to finish depth. Having reached this depth, which is determined by a size block placed on the arbor under the tool point, the tool is in correct radial position and is not disturbed thereafter.

The planer table is run back and stopped, the latch *F* lifted out of engagement with its locating bracket *C*, and the screw rapidly rotated by hand until the tilting unit has reached its maximum angle of inclination; a position determined approximately by a witness mark of the casting *B* and exactly by the latch *F* again engaging with its locating bracket.

The cam is then rotated through one-half turn by means of the handwheel *J*, at which time, by reason of the inclined position of the centers, the "high point" of the cam is parallel with the planer table. The planer is started and the tool cuts along the high point of the cam. Handwheel *J* is keyed to the worm shaft of the index head and the small index plate *K* is also keyed to the same shaft so that the (rotative) angular advance of the cam may be gaged with certainty.

The ratchet wheel *G* is keyed to the elevating screw.

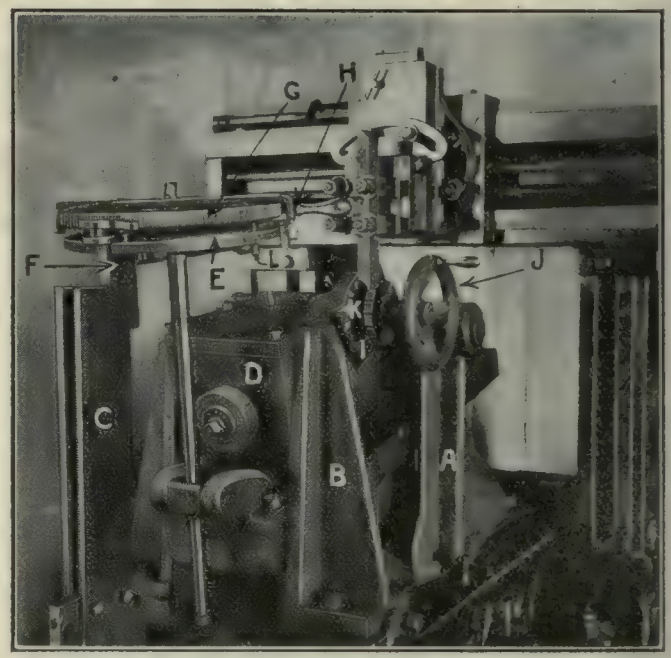


FIG. 3—DETAIL OF THE INDEXING MECHANISM

The pawl lever *H* turns freely upon the upper end of the screw and carries pawls to engage with the ratchet. The amplitude of movement of the pawl lever is limited in one direction by a fixed stop on the index plate *E* and in the other direction by the knurled-head stop pin *L*, which fits any one of various holes in the same index plate.

The machining is started at the high point of the cam. After the tool has passed once over the cam (one stroke of the planer table) and while the table is

running back, the operator turns the handwheel *J* forward one notch of the small index plate *K* and at the same time with his left hand moves the pawl lever *H* through one complete cycle, forward and back to the respective limits in each direction. This combined movement has rotated the cam through a definite (though very slight) angular advance, and at the same time has lifted the large end of the cam toward the cutting tool so that the latter on its second pass will take a slightly deeper cut. The small end of the cam has, of course, been lifted also, but the amount is proportionately smaller because of the closer proximity to the trunnions—the center of swing.

The double movement is made by the operator at each return stroke of the planer table until the tool has made ten cuts over the length of the cam. Between the tenth and eleventh stroke he not only makes the same movements but at the same time shifts the stop pin *L* to another hole in the index plate so that the pawls of lever *G* pick up two less teeth of the ratchet than before.

After ten more strokes of the table the pin is again shifted and again the range of movement of the ratchet has decreased by two teeth. These movements are continued (at no time is the planer stopped) until the cam has been rotated 180 deg. and the tool is again in the groove. So carefully has this differential movement been calculated that the tool drags over but does not cut the bottom of the groove. The latch *F* is then disengaged, the tilting unit lowered to starting position, and the entire cycle repeated with the cam rotating in the opposite direction to allow the remaining side to be finished.

The variation of two teeth of the ratchet to ten strokes of the planer table has been selected merely for the purpose of illustration. The actual variation may be somewhat different at different points as the acceleration curve requires. The operator has nothing to do with it, as it has all been worked out by the designer who located the holes in the index plate. The operator has only to count the strokes and shift the pin progressively at the required time.

The actual acceleration (more properly "deceleration," as we are working backward) is, of course, in the form of minute steps instead of a true curve, but as there are some hundreds of teeth in the ratchet and the elevating screw is of comparatively fine pitch the machined cam presents the appearance of a smoothly planed surface. The cams are surface hardened, and polished perfectlty smooth in succeeding operations.

Who's Boss?

By George Walter

WHO'S boss? I believe that this is one of the most frequent and annoying questions a man engaged in maintenance work has to contend with. It is not a pleasant one at times either.

Present day maintenance takes in a large field and the cut and dried systems used in the shop at large are hard to apply. Putting it as our factory manager did the other day, "Your job, all in all, seems to be doing the work about the shop which no one else appears to think they should do."

When no one seems to know just why this or that is thus and so about the place, they run for the man who has charge of the shop maintenance. The general manager driving in in his car in the morning notices something unsightly in the yard. Before he reaches his office the chances are that he will spy the millwright, or somebody else of the maintenance gang, and want to know why it is there and when it will be removed. Before the man has a chance to explain that he has been busy on some job, or that he is doing something at the express order of some superior, the G.M. is gone.

Then the superintendent comes along with another job and the order to "let nothing interfere with its being done." Before this work can be even started something goes wrong up in the shop and the production manager comes raring to have it fixed right away. Next the lathe foreman wants to know when he can get an emery wheel dressed. The tool room boss wants a surface plate leveled and a couple of work benches moved. The chief draftsman wants a better light, or the windows whitewashed. The office clerk wants a typewriter desk fixed up. The assembly room wants some bins made for spare parts. The tool crib keeper wants a rack made for a set of newly arrived tools.

In the small shop where two or three men take care of all the maintenance work, this condition becomes exasperating. The maintenance foreman finds himself at noon with nothing accomplished and jobs enough piled up to last him a month, and what is to be done?

The job of maintaining the shop in good running order is turned over to the maintenance man and he is supposed to do it in his own way. His job is to figure out the way to do things to the best advantage, and here the elements of time required for the job and its importance are governing factors. He can see how this or that should be done, but can he make those above see it?

The new foreman comes on the job and is introduced. "Do anything he asks within reason," says the superintendent. About the next thing that follows is that the new foreman throws a fit because the millwright does not leave a countershaft suspended halfway between the roof and the floor, long enough to see what's the matter with a clutch pulley that won't pull. The millwright's job is of such a nature that he is apt to have ragged nerves, and the foreman may get it as hot as he sends. Then, under the impression that such jobs were to be done for him without question, he goes to the office to find out why he can't have things his own way.

Presently the G.M. comes back from lunch and finds that unsightly something still in the yard. The chief draftsman makes an error and starts raving about the poor light. In the assembly room an apron cannot be completed because some of the parts are missing. Two reamers out of the new set of tools in the tool crib have been ruined because they rolled off a bench upon the concrete floor. Production has been held up because of a bad countershaft. A lift truck has been broken down and a man injured because it wasn't repaired when reported in bad order by the safety inspector.

About 2 P.M. explanations begin and at 5:30 a check-up shows about two hours work really done out of the ten. Of course there are days when it is plain to see that the maintenance gang is stalling or "putting in time," but who ever saw maintenance work when it didn't come in bunches, and the bigger the bunch the more one wonders—"Who's Boss?"

Ideas from Practical Men

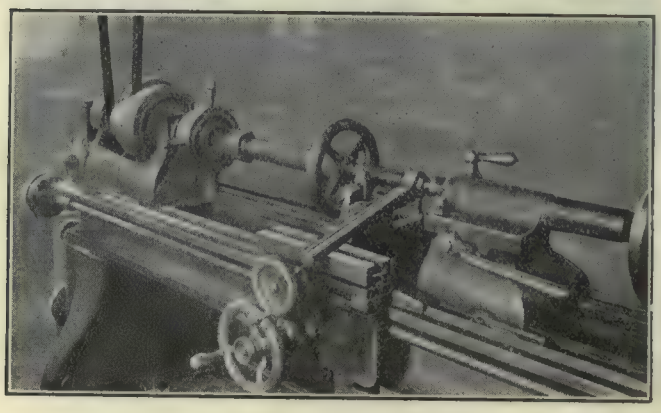
Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

An Ancient but Effective Boring Rig

BY JOHN WILLIAMS

A boring rig that has been in service for seventy years is shown in the accompanying illustration. It was not always used in connection with the lathe in which it is here shown, for that is a more recent product, but it can be used in any lathe as it is supported only by the centers.

The casting with the projecting set screws is a chuck, and is screwed on the spindle nose of the lathe. This chuck was made specially for the job of holding the



AN OLD BORING RIG IN A MODERN LATHE

collars, one of which is shown in place, for boring, but will, of course hold any piece within its capacity. It is not a necessary part of the boring outfit, for the latter can be used with any chuck or upon work that is "swung up" on a faceplate.

The basis of the boring rig is a bar, centered at both ends and having two longitudinal feathers, or keys, set 180 deg. apart, over about one-half its length, while the remainder is cut with a substantial square thread. One end of the bar is squared and a solid-end wrench is provided, the handle of which rests upon one of the wings of the carriage to prevent the bar from turning.

The bits, or actual boring heads, of which the shop has a wide variety of sizes that have accumulated over a long period of years, are splined to fit over the keys of the bar, on which they slide freely. The long bushing with the handwheel on the end is threaded to fit the square threads of the bar. The bits are made of mild steel and have four equidistantly-spaced dovetail slots cut lengthwise of their outer surfaces to take the cutting tools.

The dovetail slots are not quite parallel (radially) with the axes of the bits, but are inclined slightly toward the outer, or cutting, end so that radial clearance is provided for the tools, and also to allow the latter to be set outward (lengthwise) in order to preserve the diameter of the bit as the ends of the tools are ground away. There are no backstops for the tools; they are a tight drive fit in the dovetail slots and the friction is depended upon to keep them from being pushed back by the pressure of the cut.

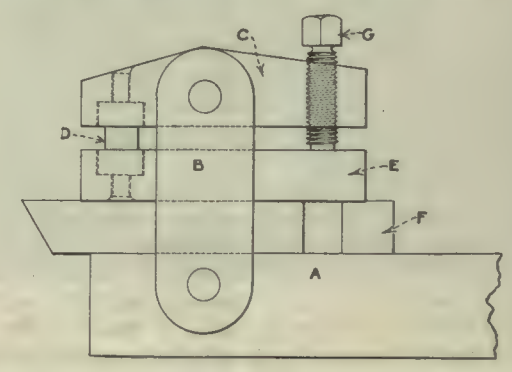
To use the rig the work is centered in a chuck or swung up on a faceplate as the case may be, and the bar, with a bit in place, is put between the centers with the wrench on the squared end resting upon the wing of the carriage (sometimes, I regret to say, upon the shears of the lathe, where it has no business to rest). Turning the handwheel causes the long bushing to push the bit through the work. To change the bit for one of larger size in case it is necessary to make two or more cuts it is necessary only to take the bar off the centers and make the exchange; an operation that can be done with one hand while holding the rig in the other.

Considering the antiquity of the tool it is capable of removing stock with astonishing rapidity. Indeed, no modern tool could be more capable within its limitation as to size. On its regular work it is expected to be followed by a hand reamer, but it can be accurately (though not handily) adjusted for finished sizes by means of a micrometer and dial gage; tools that were undreamed of when this rig was made.

A Toggle Tool Holder

BY CLIFFORD H. FRENCH

Here is a tool holder I saw in the land of million dollar salaries and motion pictures, in the shop of the Cinema Machine Co., Hollywood, Cal., to be exact. It consists of a shank *A* with a pair of links on each side as at *B*. These links carry the upper bar *C* which is tapped for a heavy setscrew at the back end. At the



A TOGGLE TOOL HOLDER

front a sort of loose, wabble attachment *D*, holds *C* to *E*, but allows freedom of movement between them.

By using a small block of steel of the same size as the tool itself at *F*, and tightening the setscrew *G*, the tool is held very uniformly and firmly along its whole length. Although the arrangement looks a bit high or topheavy, it has worked out very well and holds tools with no danger of slipping under any cut.

Two-Tool Attachment for Single-Head Planer

By B. R. Wicks

The two-tool planing attachment shown in the accompanying drawings was designed for the purpose of saving time in the planing of a lot of machine-steel plates 15 in. square by ½ in. thick, which required two cuts over each side, reducing them to a thickness

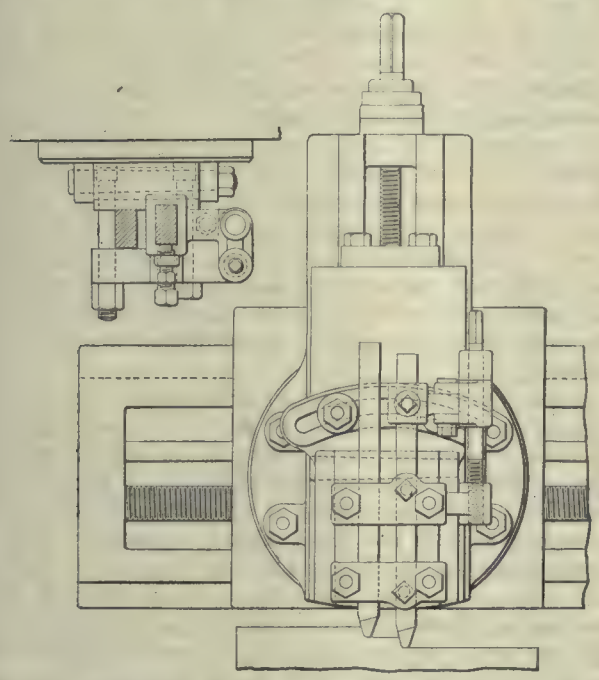


FIG. 1—ASSEMBLY OF THE TWO-TOOL PLANING DEVICE

of ⅜ in. within a tolerance of 0.005 in. With this device the actual passage of two cuts over a side required but very little more time than would have been needed for a single pass.

Six plates were ganged at a time and held by heel and toe dogs. The leading tool was started with a sufficient depth of cut to take off half the stock, less

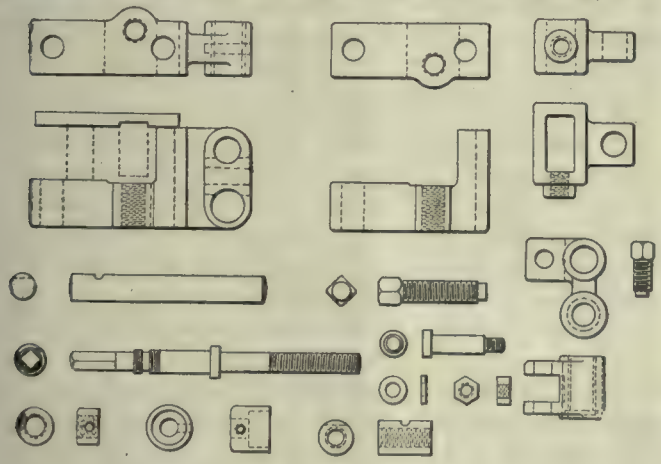


FIG. 2—DETAILS OF THE DEVICE

0.010 in.; which amount was left for the finishing tool immediately following. The wear on the point of the roughing tool in making the cut over a gang of six plates was less than 0.015 in. and the finishing tool showed no perceptible wear.

There were 150 of the plates to be planed, and the work was done in about one-third of the time that would have been required by the ordinary method, for the reason that not only was a large part of the cutting time saved, but two extra set-ups were also eliminated. The plates were finished within the required limits as to thickness and with results as good as could have been obtained by the usual two operations per side.

The drawing, Fig. 1, shows the assembled device and indicates the manner of using it. Fig. 2 shows the details. There are but twelve parts to be made, including the two tool-holding straps to be substituted for those already on the planer. Two O. K. toolholders fitted with high-speed steel bits were used. The first, or roughing, tool is held by the straps in the usual way and is adjusted for depth of cut by the regular down feed. The finishing tool has an independent adjustment by means of the micrometer screw, working in the nut that is a part of the upper tool-holding strap and governing the position of the tool by the double-swivel yoke through which the tool shank passes. A setscrew in the lower tool strap serves to tighten and hold the finishing tool in position after the adjustment for depth has been made.

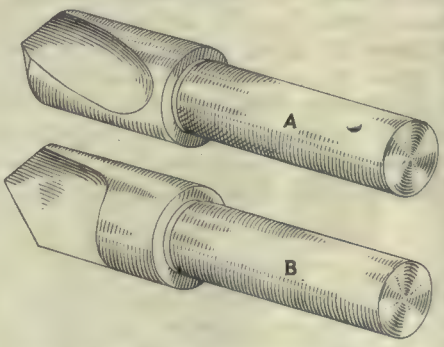
The device may be removed from the planer in a few minutes, leaving the latter in condition to be used in the regular way with a single tool, as the application of this device does not require the alteration of any of the original parts.

Two Handy Centering Drills

By J. A. Davis

Wembley, England

The sketch herewith shows two very handy forms of centering drills to have around an engine lathe. The one at *A* is used for centering machine and tool steel. It is made from a ⅝-in. high-speed steel twist-drill that had been worn down until it was no longer of service for its original purpose. The shank was found to be quite soft enough to be turned without resorting to the annealing process.



TWO FORMS OF CENTERING DRILLS

The drill at *B* is used to center cast iron, brass, phosphor bronze, etc., and is made from a piece of ⅝-in. round tool steel. It is made much like a flat drill and is very short and rigid.

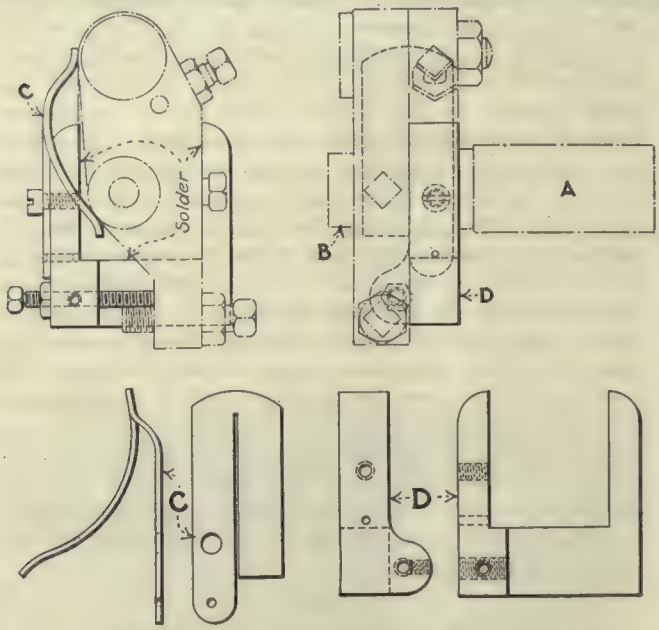
The included angle of the cutting edges of each of the two drills is made slightly less than 118 deg. so that ordinary twist drills, ground to the standard angle, will start true. A point to be watched in case the hole to be drilled is larger than ⅝-in. (the diameter of the centering drills) is that the metal around the countersink made by the centering drill is faced true.

By using these drills to start a hole, little trouble will be experienced in drilling true holes unless, of course, on cast iron we should encounter blow holes. In such case it is sometimes necessary to steady the end of the drill by means of a tool held in the toolpost with the blank end of the tool against the drill.

A Special Recessing Tool

By Edward LaRue

The accompanying illustration shows a modification of a No. 0 Brown & Sharpe standard recessing tool, used for an operation on the main wheel of a watch. As the wheel is somewhat larger than the work for which the



MODIFIED RECESSING TOOL

tool was primarily intended the tool has been modified by the addition of two parts and by giving it a greater range of spring action by means of a coil spring in part *A* to act against a pin in part *B* of the tool.

The two main parts added to the standard arrangement are here noted as parts *C* and *D*, and are shown in detail. Part *C* is made of spring steel, hardened and tempered, held in place by a fillister head screw and dowel. Part *D* is of machine-steel, pack-hardened, and is soldered to the body of the tool on three surfaces.

The action of the device will readily be observed. It has been in operation for a considerable time and has proved very satisfactory.

Chart for Showing the Amount of Liquid in a Horizontal Tank

By J. P. Doolan
Superintendent of Maintenance, Morgan Engineering Co., Alliance, Ohio

The writer has been called upon on different occasions to furnish a chart showing the quantity of liquid at various depths in cylindrical tanks lying in a horizontal position. For instance, it is required to know the number of gallons of oil in a storage tank. The amount of oil is usually ascertained by measuring its depth in the tank and calculating the contents, or finding it from a table which has been previously calculated. The calculation, of course, must be made for each different diameter of tank; but in order to give the same information, closely approximated, without the need of the calculation, the accompanying chart was devised.

Assuming that it is required to know the quantity of liquid in a cylindrical tank 80 in. in diameter, when the liquid measures 30 in. deep at the center, we proceed as follows: Locate 30, the depth of liquid in the tank, at the left-hand side of the chart, following the horizontal line to the right until it intersects with the vertical line for 80, the diameter of the tank. Through this intersection and the zero point at the left draw the line as shown, intersecting the percentage axis at 37.5 per cent. From this point, by moving horizontally to the right, the curve will be intersected at a point indicating slightly over 34 per cent of the total capacity of the tank.

It can readily be seen that the actual quantity of liquid in any tank, the capacity of which is known, can be quickly determined with the minimum of calculation, after the depth of the liquid has been ascertained, measuring it to the lowest part of the tank.

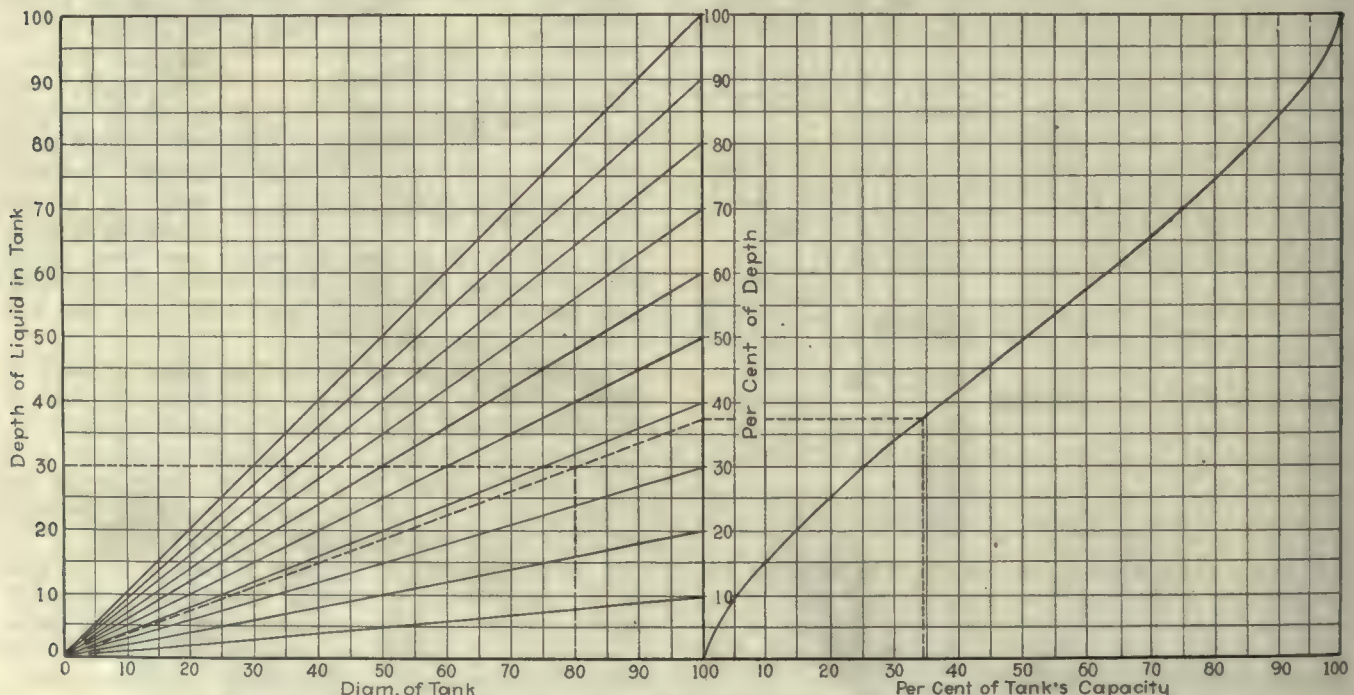


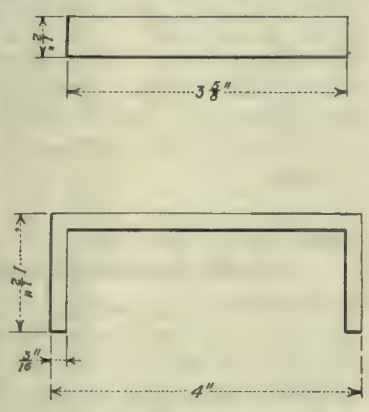
CHART SHOWING HOW THE CAPACITY OF A CYLINDRICAL TANK PLACED IN A HORIZONTAL POSITION VARIES WITH THE DEPTH OF THE LIQUID

Strength of an Automobile Frame Patch

By Donald Hampson

Repair shop machinists are sometimes called on to patch automobile side frames which have cracked. The most natural way to do that sort of work now is to weld the broken channel. This makes a very good job because there is no objection to building up additional metal at the critical point where different grades of steel, together with a possible lack of fusion at the weld, make the frame apt to crack again under the shocks of road work.

There are many isolated sections where welding equipment is not available and there are customers who prefer a mechanical repair to a weld, so that the patch still has a place in repair work. It can be made a first class job too, as proven by the hundreds of cars that were repaired in that way long before welding became so common.



PATCH FOR 4-IN. FRAME

I remember such a repair in the case of an old Knox car. A plate of ⅜-in. steel was put inside the frame, extending 12 in. each side of the break, fitted snugly between the flanges and then hot riveted. The owner thought it a good job but preferred a better one. So he drove the car to the factory where they stripped it and put a new channel (of the same ⅛ steel) inside the broken one for the full length of the car. The new channel was spot welded in places and the various fittings and cross members riveted on, and the break in the outside channel was welded tight. Two months later, the job cracked through both channels in the same spot. Again an inside patch was applied and this time the owner left it alone. That car is running yet and the frame is as straight as when it left the factory. When making such a repair the question arises as to the relative strength of the parts. Take for example the 4-in. frame of $\frac{3}{16}$-in. steel shown and compare its strength with a patch made from a piece of half-inch flat steel. The strength value of each is the section modulus of the section.

For the channel

$$S = \frac{1\frac{1}{2} \times 4^3 - 3\frac{5}{8}^3 \ (1\frac{1}{2} - \frac{3}{16})}{6 \times 4} = 1.4$$

For the plate

$$S = \frac{\frac{1}{2} \times 3\frac{5}{8}^2}{6} = 1.09$$

From the above it may be seen that the original pressed steel frame is stronger than the ½-in. patch. Assuming that both are of equal unit strength, the patch should be made out of heavier stock, preferably $\frac{5}{8}$ in. in thickness. It has been assumed that the channel was made with sharp corners and not with rounds as is the actual case—this would give the channel strength a slight excess on paper.

Where it is possible to get in such an inside patch without disturbing cross members, it is the simplest method of mechanical repairs. It may be cut from a steel flat and is easy to fit very close to the flange rounds, or to such a contour as the gooseneck if the break occurs at this point. By fitting thus closely, part of the bearing is taken off the rivets which tends to keep them tighter in daily service. A channel shaped piece fitted over the outside is of course stronger yet but it is rather difficult to shape up.

Gages for Setting Thread Tools

By Otto E. Seiffert

Parts with internal and external threads of correct angle, diameter and pitch will fit together properly, while in parts with threads of incorrect angle, as shown



FIGS. 1, 2 AND 3—INCORRECT ANGLES OF THREADS

in Figs. 1, 2 and 3, the threads must either be cut deeper or have their width decreased to enable the parts to be properly assembled.

Gages for setting thread tools, as shown in Figs. 4 and 5 have proved very useful and, if properly used, will result in the cutting of threads having correct angles.

The bottom part of the gage shown in Fig. 4 is used for setting the tools for cutting external threads. The upper side can be placed against the work or, if the work is shorter than the gage, the gage can be held between the lathe centers while setting the tool. The

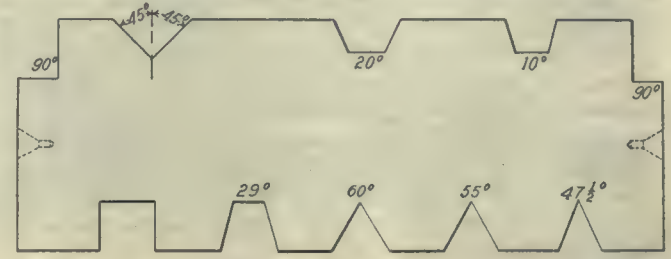


FIG. 4—TOOL-SETTING GAGE FOR EXTERNAL THREADS

upper side of the gage can be provided with notches having any convenient angles.

For cutting internal threads, a gage such as shown in Fig. 5 is very convenient. In setting the tool, the end *A* can be placed against any plane surface of the work, or against the faceplate of the lathe. If more

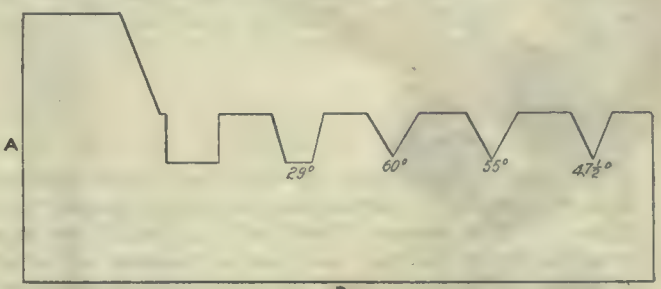


FIG. 5—TOOL-SETTING GAGE FOR INTERNAL THREADS

convenient, the side *B* can be placed against the wall of the hole to be threaded. This gage can also be used for setting the tools for cutting external threads, by placing the side *B* against the work or the tailstock spindle of the lathe.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors

November 22, 1923

Tax Reduction or Bonus?

SECRETARY Mellon's clear and comprehensive letter on the possibility of tax reduction next year contained cheering news for industry. Everybody has been acutely conscious, in the region of the pocketbook, of the cost of carrying on modern warfare, but many of those who should feel the burden of the income tax the most severely have been able to evade it with perfect legality by transferring their investments to tax-free securities. As a consequence the money that formerly went to industry to provide for expansion and normal growth has been missing and has caused universal curtailment of business.

The suggestion of the Secretary that three hundred millions be lifted from the tax load has been welcomed by industrial leaders everywhere as one of the best things that could possibly happen to American business. The only thing better would be the complete settlement of all of Europe's various problems.

But—and it's a very large but—there can be no hope of tax reduction if Congress insists on passing a bonus bill, as it seems likely to do. On the contrary, taxes of some kind would probably be heavier over a period of years. If the bonus were used to help the disabled veterans of the war no possible objection could be raised to its early authorization but it would do nothing of the sort. We cannot rid ourselves of the conviction that the bonus legislation proposed at the present time is purely political, if anything political can be connected with the word "pure."

As a political measure the bonus bill seems to us to be indefensible. We have mentioned its effect on industry. But if industry is further handicapped the consequences will react to the disadvantage of every one connected with it in any way, and that means the great majority of the people in the United States.

If Mr. Mellon has done nothing else he has at least clarified the issue. Bonus or tax reduction, which do we want? And are we sufficiently concerned to instruct our representatives in Congress? Let's hope so.

How Conveyors Cut Costs

THE use of conveyors for handling work between machines, or in assembling has more phases than appear at first glance. Introduced primarily to save labor handling, its use discloses a number of other advantages. In the case of the power driven conveyor, the psychological urge of a constantly moving belt or chain, automatically and unconsciously speeds up the movements of the worker to a certain point. Beyond this it seems to fail and to hinder rather than help production.

There is, however, another and very important effect of introducing conveyors, of either the power or gravity type. The saving in the capital tied up in parts in process is so great in some cases as to be almost unbelievable. This saving as pointed out so forcibly by H. P. Harrison of the Franklin Motor Car Co., in his recent paper before the Society of Automotive Engineers, is always considerable, and in some cases cited, runs up well over seventy-five per cent. The capital so released will be of material help in installing a conveyor system.

It must not be supposed, however, that any old conveyor system will give the desired results. The situation must be carefully studied and the system selected which will give best results for each particular place. Some departments or operations may require gravity and others power driven conveyors. Mr. Harrison has been frank enough to point out his own mistakes and their remedies. Few of us have the courage to admit our mistakes but they are frequently as valuable as successes.

One Out of Twelve on the Public Payroll

FIGURES published not long ago by the National Industrial Conference Board tell us that one out of every twelve persons over sixteen years old and gainfully employed in the United States is on the public payroll. They also indicate that the total salaries of public servants amount to nearly four billion dollars annually which works out to thirty-four dollars apiece as the cost to each man, woman and child in the country.

Things are certainly getting more and more complicated in this hurrying civilization of ours and among them is government. The question is whether or not we ought to spend so much to govern ourselves. In a modern factory overhead is not allowed to rise unless total unit costs are lowered to an even greater extent. In other words, additional management complications are only justified if they more than pay their way.

Is this the case with government complications and overhead or are we just getting a little nearer to the state of taking in each other's washing?

Two Hundred and Sixty-Six Miles an Hour

PERHAPS by the time this issue is in your hands some one will have exceeded the speed mentioned in our title, but even if someone does, isn't the performance of the two navy lieutenants on Long Island a few days ago rather breathtaking? During the war the fastest pursuit planes in action hardly made half of 266 miles an hour! and that is only five years ago.

Many of us are inclined to look upon aviation as a sporting proposition, too fraught with danger and too expensive to find a place in practical commercial transportation. But we must remember that the automobile started out the same way, and made its first impression by its performance on the track.

Did any one in the early days of the automobile have any comprehension of what it would mean in American daily life in 1923? Very few, we believe, and even fewer can foresee what twenty years of airplane development will bring forth.

Shop Equipment News

Potter & Johnston 6-C Automatic Chucking and Turning Machine

The No. 6-C automatic chucking and turning machine recently announced by the Potter & Johnston Co., Pawtucket, R. I., while a development of the type of machine previously manufactured by this company, incorporates many new features both in design and construction.

The box bed is made with closed chambers to house the cams from which the various movements of the machine are derived and thus protect them from the interference of chips that might otherwise affect their functions. The headstock is built as a unit and can be lifted off the base without disturbing other parts. The unit feature of construction is extended to cover the cross-slide, turret slide, change gear boxes, etc., so that repairs may be made or changes effected in any of the individual parts without dismantling the whole machine.

The control cam is located under the headstock and is readily accessible for setting the dogs by removing a cover, shown in Fig. 1 at the front of the base. All movements of the machine are under instant control of the operator through the hand levers in front of the headstock. The machine can be equipped with a pneumatic control movement instead of the usual mechanical control and, when so equipped, the shifting movements are practically instantaneous, thus eliminating some idle time.

The work spindle is a high carbon steel forging $5\frac{3}{4}$ in. in diameter, with a $3\frac{1}{2}$-in. hole clear through. The front bearing is $5\frac{3}{4}$x7 in., the rear bearing being $5\frac{3}{4}$x5 in., and the distance between bearings, $21\frac{3}{8}$ in. The spindle gearing is all of steel, the heavy-duty gearing and shafts being of chrome-nickel alloy, heat treated, and running in a bath of oil. The bearings are flood lubricated.

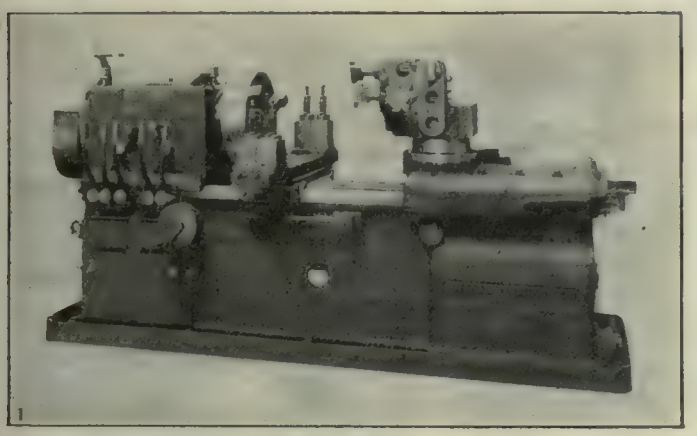
The drive is through a constant speed pulley, equipped with a friction clutch and brake. It should run at 650 r.p.m. There are four combinations of four automatic speed changes, giving 16 spindle speeds, increasing in geometric ratio from 9 to 185 revolutions per minute.

The feed gearing is contained in a box that is attached as a unit to the rear of the base, Fig. 2. There are eight combinations of three automatic changes of feed, making a total of 24 feeds, ranging from 0.007 to 0.250 in. per revolution of the spindle. The feeds are independent of the high constant speed for the idle movements of the machine, this constant speed being derived directly from the driving pulley. The feeds are driven from the spindle and change with its speeds, thereby preserving the ratio.

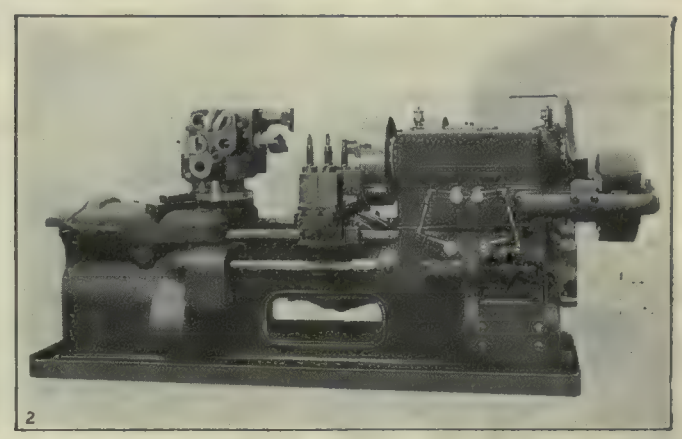
The cross-slide cam drum lies crosswise of the bed directly under the slide and the cam-roll stud is permanently driven into the cross-slide member so that the transmission of power is direct. This arrangement permits a wider range of movement for the cross-member than is usually obtainable, and at the same time makes a much stronger drive. The cross slide may be operated at the same rate of feed as the turret slide, and has a power-operated traverse of 6 in. from center in either direction and a hand adjusting range of 10 inches.

The turret slide is of rugged construction and travels upon ways so designed as to distribute the wear as evenly as possible. The front way is a modified form of inverted V, presenting one surface nearly perpendicular to the sidewise thrust of the tools. The other way is flat. The slide is provided with a hand-operated adjustment of 10 inches. The maximum power traverse is 18 in., approximately 15 in. of which is available for useful tool movement, the remainder being taken up by the functioning of the turret. A 4-, 5-, or 6-sided turret can be supplied.

The machine swings $29\frac{1}{2}$ in. over the ways and 16 in. over the cross-slide. A three-jawed geared scroll chuck with standard jaws and wrenches is included in the regular equipment, and is provided with a pilot bushing to steady the cutting tools. The design of the machine permits overhead piloting also.



1



2

FIG. 1—FRONT VIEW OF POTTER & JOHNSTON AUTOMATIC CHUCKING AND TURNING MACHINE
FIG. 2—REAR VIEW OF MACHINE

Since the drive is through a constant speed pulley and a friction clutch, the machine may be driven from line shaft, countershaft or independent motor with equal facility. The design of the headstock is such that a driving motor may be mounted upon it without alteration or further preparation, delivering its power through a standard silent chain.

The horsepower required ranges from 10 to 15. The machine occupies a floor space 139¾x35¾ in., and weighs 9,460 pounds.

Crescent G-38 Utility Truck

A short wheelbase, general utility truck, designated type G-38, has recently been placed on the market by the Crescent Truck Co., Lebanon, Pa. The over-all length is but 64½ in., folded, so that it can be driven upon a 66-in. elevator. This feature makes the truck of particular use for plants which were constructed before the day of the industrial truck, and in which the elevators and passageways are small.

The usual features incorporated



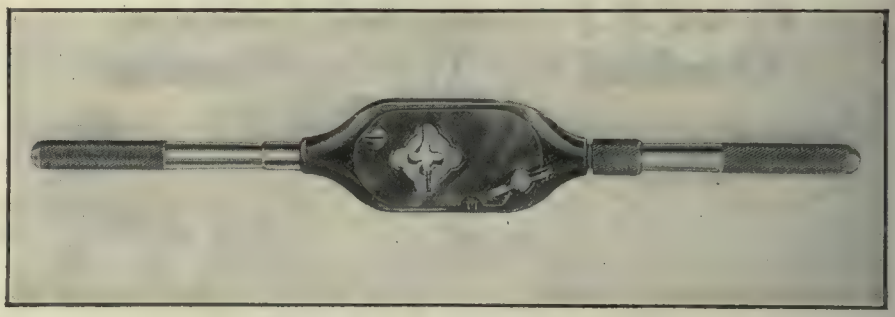
CRESCENT G-38 UTILITY TRUCK

in the trucks made by this company, and previously described in the *American Machinist*, are also found in this short model, which has a load capacity of 4,000 lb. and a platform area of 2,552 sq.in. The wheels are 20 in. in diam. and are four in number, 2 for driving and 2 for steering. The wheelbase is 38½ in., the tread at the front being 32 in., and at the rear, 36 inches.

The standard type of drive is installed and a G. E., 24-volt motor running at 1,200 r.p.m. is used. A Cutler-Hammer drum-type controller provides 3 speeds forward and reverse, and a sliding type, Cutler-Hammer safety switch is connected with the operator's platform.

Frost Adjustable Die Stock

A recent addition to the line of hardware and tools manufactured by C. L. Frost & Son, 30 Ionia Ave., Grand Rapids, Mich., consists of an adjustable die stock.



FROST ADJUSTABLE DIE STOCK

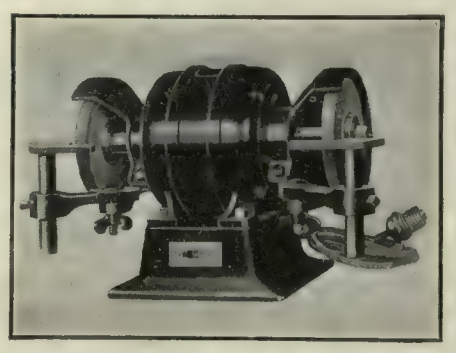
The tool is shown in the accompanying illustration, and its main feature is its ability to cut threads ⅛ in. over or under standard size. The adjustment is made by simply turning the handle and there are no setscrews to adjust. The amount of adjustment is shown on a scale at the side of the stock and the dies are locked in the required position by means of a knurled thumbnut.

A full set of these dies includes all standard sizes from ¼ to ¾ in., in both U. S. S. and S. A. E. form, with taps to match and suitable holders. It is stated that the split construction of the die allows the die to be removed from the work without reversing the threading action, permits the rechasing of worn threads, and makes possible the use of one die for more than one thread.

Bodine Portable Grinder

A recent addition to the line of electrical machinery and apparatus manufactured by the Bodine Electric Co., Ohio St. and Oakley Blvd., Chicago, Ill., consists of a portable, ball-bearing, motor-driven grinder. The machine is especially adapted for use in the different departments of a shop, giving the advantage of greater convenience.

The grinding-wheel spindle is



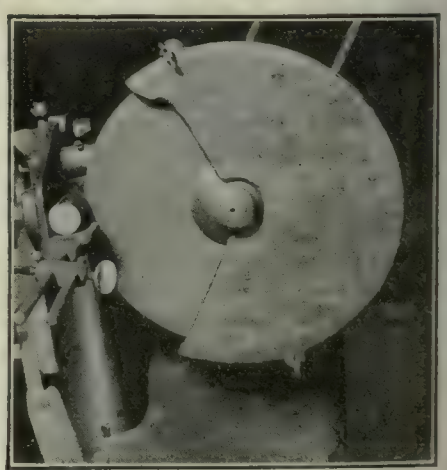
BODINE PORTABLE GRINDER

mounted in ball bearings, and a screw adjustment is provided to take up any wear that may occur. The tool rest is adjustable vertically and sideways, being clamped in position by a thumbscrew.

The wheel guard is heavy and the motor is protected by a dustproof casing. Arrangements are made for ample lubrication. The electric switch is mounted on the machine and a suitable attachment cord and plug is provided.

Aloxite Redmanol Cut-Off Wheels

The Carborundum Co., Niagara Falls, N. Y., is now marketing Aloxite cut-off wheels in which the bonding agent is Redmanol. Redmanol is a phenol resin of the same family as Bakelite and will not soften or melt, thereby giving an open, porous wheel structure which tends to produce a free, clean-cutting



ALOXITE REDMANOL CUT-OFF WHEEL

wheel that will cut without binding.

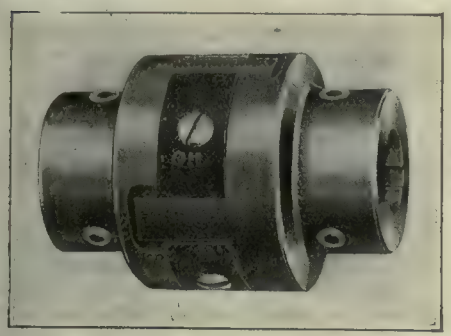
For the cutting of high speed and general steel alloys, for cutting stellite, and for miscellaneous cut-off work, it is claimed that these wheels will effect appreciable savings in time, stock and labor. Practice has shown that wheels 12 in. in diameter are most suitable for cut-off work and they can be made $\frac{3}{32}$ in. thick. Wheels of other diameters are also made, the diameters ranging from 8 to 14 in., and the thickness from $\frac{3}{64}$ to $\frac{1}{8}$ inch.

Various grades of wheels are provided for different materials. The 50K-grit, 4-grade wheel is recommended for stellite; 50K-grit, 6-bond, for miscellaneous work; and the 50K-grit, 8-bond, for high-speed and soft steel. For general cut-off work on materials of low tensile strength and for cutting carbons and brushes of graphite and copper, the 50C-grit, 4-grade wheel is used.

Higgins Flexible Coupling

The Tomkins-Johnson Co., Jackson, Mich., is now marketing the Higgins flexible coupling, the essential features of which are shown in the accompanying illustration.

A flanged member is fastened to the end of each shaft and a third member transmits the power between



HIGGINS FLEXIBLE COUPLING

the two. Lugs on the shaft members fit into slots in the middle piece, in such a way that both angular and axial misalignment of the shafts is possible.

The central member has a reservoir into which oil is introduced through suitable oil holes. This oil seeps through the porous material of which the piece is made and keeps the wearing surfaces of the coupling well lubricated.

When installed the middle member should always be free to float endwise a small amount between the shaft members of the coupling. The coupling will then drive without binding, cramping or backlash.

Edlund Tilted Production Drilling Machine

A tilted drilling machine, intended for use in production work and suitable for drilling small forgings or castings, has recently been placed on the market by the Edlund Machinery Co., Inc., Cortland, N. Y. The machine may be readily adapted for different classes of work by providing the necessary work-holding fixtures on the rotary table, and changing the feed gears and cams.

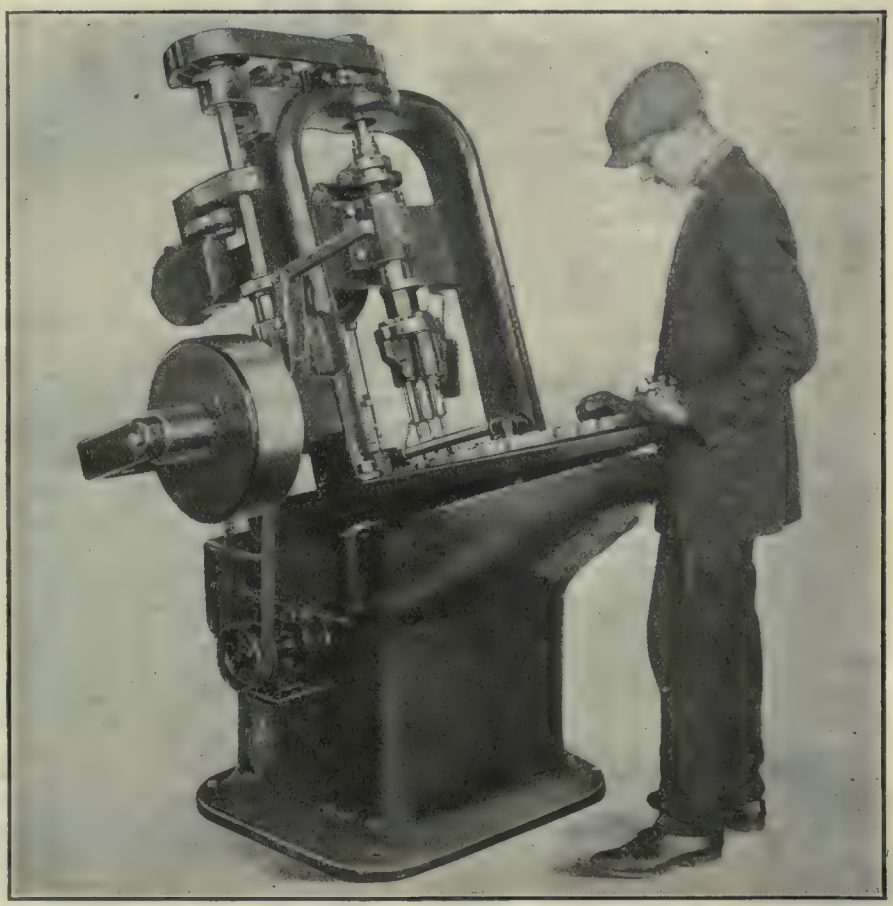


FIG. 1—EDLUND TILTED PRODUCTION DRILLING MACHINE

The machine shown in the accompanying illustrations is equipped for drilling $\frac{3}{8}$-in. holes in rim nuts of two lengths, $\frac{9}{16}$ and $\frac{11}{16}$ in. On this work the machine will drill 700 of the latter and 775 of the former size, per hr. It is stated that one operator can easily run two machines and generally three.

The nuts are carried on the worktable in hardened steel bushings with hexagonal holes, the bushings being arranged in three rows in a steel ring which is indexed at each cycle of the feed cam. Three nuts are drilled at once by means of a three-spindle drilling head.

The drive pulley is mounted in radial ball bearings and drives a vertical shaft through a pair of bevel gears. The vertical shaft is in two parts, the connection between them being a square-tooth clutch operated by means of a lever conveniently located at the operator's left. This

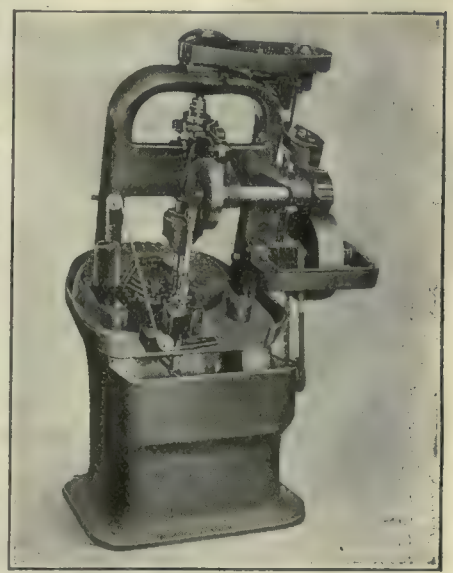


FIG. 2—REAR VIEW OF EDLUND DRILLING MACHINE

clutch controls both spindle and feed, the spindle being driven by a Morse silent chain from the vertical shaft. The spindle is 1⅞ in. in diam. and 26 in. long. The drill head has hardened steel gears and is equipped with ball bearings.

The drive for the feed cam is taken from the vertical shaft above the clutch and it is possible to change the speed of the cam by changing two spur gears in the gear case. The camshaft is driven through worm gearing, the thrust being taken by a ball thrust bearing. A face-cam provides positive return for the spindle and may be quickly changed.

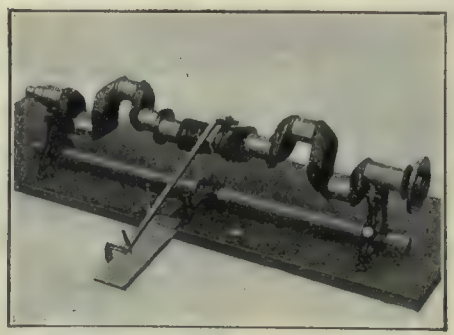
The work-table is indexed by a pawl which engages notches cut in its periphery. The pawl is carried at the end of a lever, the other end of which is moved by a cam. The same cam operates a positive ejector.

"Utility" Crankshaft Testing Machine

For testing used automobile crankshafts, both before and after machining, Utility Tools, Norfolk, Neb., is now marketing the crankshaft testing machine shown in the accompanying illustration.

The shaft to be tested is mounted on rollers which are fastened to the upper ends of two uprights. These uprights are placed on a long heavy bar, their positions being adjustable to accomodate shafts of various lengths.

The crankshaft shown mounted in the device is undergoing a test to show the parallelism of the crankpins in relation to the main bearings. For this purpose an attachment called a parallelograph and shown attached to one of the pins is used. This attachment is clamped over a pin and the rotation of the shaft causes the pencil at the outer end to trace lines on a sheet of paper. The sheet is held by a bracket clamped to the horizontal rod of the device.



"UTILITY" CRANKSHAFT TESTING MACHINE

The configuration of the lines drawn by the pencil indicates the condition of the crank, a straight line at right angles to the center of the shaft indicating a satisfactory crank. Any deviation from the straight line indicates bad alignment, and the shape of the figure drawn also serves as an indication of the plane in which the crankpin is out of parallel, as well as the amount.

For testing the alignment and roundness of the main bearings, an indicator may be mounted on a suitable bracket attached to the longitudinal rod of the device. Rotation of the shaft then shows the wear or misalignment of the main bearings directly.

Customs Rules Will Be Simplified

The American section of the Chamber of Commerce has received a dispatch from Geneva, Switzerland, announcing the conclusion of the International Conference on Customs Formalities, which has been in session for three weeks. As a result of this conference, 34 nations are signing a detailed international convention aimed at overcoming many of the most vexatious aspects of customs regulations and customhouse procedure in international trade. Although the United States government has not officially taken part in the deliberations, representatives of the United States Department of State, the Department of Commerce, the Treasury Department, and U. S. Tariff Commission, have been present throughout the meeting. Likewise, in a consulting capacity, the International Chamber of Commerce, with a delegation headed by former President Clementel, has had a big share in the conference, presenting the point of view of the business of the various countries. Many of the measures adopted were suggested by the International Chamber of Commerce, and a number had their origin in a report submitted by the American Section of the Chamber.

When this convention comes into force, some of the following improvements in customs matters will be accomplished: Harsh financial penalties for clerical and other trivial errors in documents will be a thing of the past. Advertising matter will receive lenient and liberal customs treatment. Consular office hours in connection with the certification of invoices and other trade documents will coincide with the hours of business houses. Consular invoices and certificates of origin will be standardized, and exporters will no longer have to master the intricacies of the scores of varying documents. The customhouse treatment of commercial travelers and their samples will be greatly simplified. Customs inspection of travelers' baggage on trains crossing European frontiers will take place on the trains, rather than requiring passengers to get out and go to the customhouses. A permanent international body of customs experts will be established with headquarters at the Secretariat of the League of Nations in Geneva to deal with international customs disputes. There will be full and prompt publication by each nation of changes in its customs tariffs and customs regulations, and customs publications will be distributed through a central office at Geneva, the International Bureau of Customs Tariffs at Brussels, the headquarters of the International Chamber of Commerce at Paris, and the Inter American High Commission at Washington.

"This Conference," said the American Section of the International Chamber today, "has been a conspicuous example of a great international gathering where business men organized in the International Chamber of Commerce have sat down with government officials, and in a brief period arrived at valuable common agreements."

Far Eastern Business Increases

Figures just released by the Far Eastern Division of the Department of Commerce indicate that our total trade with the Far East during the first nine months of this year shows an increase of more than 25 per cent over the same period of last year, in spite of unsettled conditions in China.

The Far East now accounts for about 22 per cent of our total trade, compared with only 12 per cent ten years ago. Modern transportation facilities are rapidly bringing the Orient nearer to our door and without doubt we shall witness a trade development during the next decade that will outstrip the record of the last ten years, in which this trade increased threefold.

In the full calendar year 1913 we took from the Far East commodities, mainly crude, valued at only $314,078,218 while during the first nine months of the present year our imports from that section aggregated $835,990,611.

Our exports to the Far East which consist largely of manufactured products have shown a similar growth during the same period, increasing from $194,159,465 during the full year of 1913 to $442 260,490 for the first nine months of 1923. The increased purchasing power of the peoples of the Orient. which has raised their standard of living, coupled with the industrial movements in Japan and India, have combined to cause this increased consumption of our manufactured products and machinery.

All the principal Far Eastern countries, with the exception of China, and British India, took more goods from the United States during the first three-quarters of 1923 than during the corresponding period of 1922, while their exports to us were greater in every instance. Japan which heads the list of our Far Eastern customers took goods valued at $163,400,565 during the first nine months of 1923, compared with $155,127,603 during the same period of 1922. During the month of September our exports to Japan were almost $10,000.000 greater than during the same month last year.

News Section

Chamber Committee Recommends Many Transportation Changes

A comprehensive plan for linking organized motor transport with the railroads in the development of a balanced national system of transportation is outlined in the report of the Committee on the Relation of Highways and Motor Transport to Other Transportation Agencies submitted recently to Julius H. Barnes, president of the Chamber of Commerce of the United States.

Sweeping changes in prevailing methods of handling and distributing freight are proposed. Store-door collection and delivery to relieve congestion within the crowded terminal areas of large cities, the use of organized and responsible motor transport to relieve the railroads of various forms of uneconomical service, including the unprofitable short haul, the wider use of self-propelled railway cars and the extension of passenger bus service to supplement existing facilities are recommended.

To pave the way for these changes in the public interest the committee suggests the regulation of common carrier operations of motor vehicles by the federal and state commissions which have supervision of rail and water carriers, and the systematic development of highways in response to general traffic needs that are so necessary.

The committee, of which Alfred H. Swayne, vice-president of the General Motors Corp., is chairman, is one of five designated by the president of the national chamber to study different phases of the transportation problem and lay the ground-work for a national policy to be discussed at a general transportation conference to be announced later. Its recommendations represent the unanimous view of all the important interests directly concerned in or affected by transportation. Its personnel includes railway traffic officials, officers of farm and labor organizations, representatives of the motor industry, motor haulage companies, water carriers and the shipping public.

In connection with the report there has been published by the Chamber of Commerce four other reports made which bear relation to transportation and have been circulated by it for consideration in advance of the national transportation conference. Two of these reports are: "Development of Waterways and Co-ordination of Rail and Waterway Service" which is a report of Special Committee V; and "Taxation of Transportation Agencies" which is the report of the Joint Committee. Other reports will be issued.

Citroen Gives Dinner to Representatives

An unique industrial entertainment was given in Paris recently when André Citroën, the well-known automobile manufacturer, invited five hundred representatives of the concerns that supply him with raw materials, parts, accessories and machinery to a banquet at the Palais d'Orsay. The great banquet hall and reception rooms, when the guests were assembled, resembled a huge convention.

The object of the entertainment, Mr. Citroën explained, was to bring about a closer rapproachement between the Citroën works and its purveyors and to acquaint the latter with the plans and prospects of what has become for France an undertaking of far-reaching importance.

In his opening remarks, Mr. Citroën stated that his present production of 140 cars per day is insufficient to care for the demand and that it had become necessary to greatly increase the output. The immediate increase contemplated is to be 60 cars per day, to be attained by March 1. This figure, while it would not satisfy the demands now being made upon him, he considered to be a conservative venture, especially in the light of the growth of the export trade, which in 1924 will call for 16,000 Citroën cars of a value of 200,000,000 francs (at present exchange rates about $12,000,000). He called special attention to the importance of these figures upon the foreign trade of France and upon the rate of exchange.

Mr. Citroën further stated to his guests that he had caused a thorough investigation to be made of the responsibility and capacity of the concerns represented among the diners and could assure them that as long as they succeeded in helping him satisfactorily to meet the demands made upon his works he would continue to patronize them to the exclusion of all outside competition.

Among the guests were numerous representatives of American manufacturers.

Report on Employment in Coal Mines

The irregularity of employment in the coal mining industry has been studied and a comprehensive report has just been sent to President Coolidge and Congress by the United States Coal Commission. The report was prepared by Horace B. Drury working under the general direction of Dr. Willits, and he was assisted by Miss Bezanson and Anna S. Porterfield. Some of the data was also obtained from the United States Geological Survey.

The report is divided into two parts, the first under the title of "Employment, Intermittency of Employment and Absenteeism in the Bituminous Coal Industry." In this part the number of men working, the hours worked, the days missed either through their own fault or through lack of work, the overtime question, and many other phases are treated. In the second division entitled, "Opportunity for Employment and Time Worked by Men in the Anthracite Coal Industry" practically the same questions are studied and reported as in the bituminous field. There are many interesting charts and graphs showing employment and production in both the bituminous and the anthracite fields in the different sections of the country.

New York Meeting of Welding Society

The New York Section of the American Welding Society made quite a success of the first meeting of the season on Nov. 13. T. F. Barton, president, started by telling of the Fall meeting of the Society that was held in Pittsburgh. A discussion as to the circumstances under which to employ different types of welding was given by C. J. Holslag of the Electric Arc Welding & Cutting Co. Mr. Holslag recommended gas welding for thin work under 14 gage, electric arc welding for medium work, and thermit welding for very heavy work.

An interesting motion picture showing the manufacture of wire beginning with the raw materials and going through the different processes, was presented by W. H. Bleecker of the Page Steel & Wire Co.

Major James Caldwell from England told of the development of flux-covered electrodes. The application of arc welding to fuel tanks was discussed by Pliny P. Pipes, welding engineer of the Lincoln Electric Co.

American Committee to Power Conference

The American committee to the first World Power Conference to be held at the British Empire Exhibition, Wembley, London, has been announced. The conference will be held June 30 to July 12 and is promoted under the council of the British Electric and Allied Manufacturers' Association in co-operation with the technical and scientific institutions and industrial organizations in Great Britain and other countries.

The committee consists of the following: Hon. John W. Weeks, Hon. Hubert Work, Hon. H. C. Wallace, Hon. Herbert Hoover, Gen. Guy E. Tripp, Owen D. Young, Samuel Insull, Prof. Lester Paige Breckenridge, Sidney Z. Mitchell, O. C. Merrill, H. J. Pierce, W. M. Stewart, H. M. Addinsell, Peter Junkersfeld, Calvin W. Rice, David B. Rushmore, Calvert Townley, John W. Lieb and Fred R. Low.

Machine Tool Business Brisk in the Chicago Territory

Industrial buying looks more promising than for some time and the railroads have been active this week. The Rock Island, R.R. has purchased three milling machines, a screw machine, a staybolt threading machine a motor-driven heavy duty turret lathe and a grind wheel. The Illinois Central R.R. purchased 3 bolt cutters and a lathe, the Burlington R.R. has almost completed purchase of its long outstanding list of some 80 machine tools, including 25 lathes ranging from 18 to 30-in. swing and six heavy duty shapers. The lathes were purchased from Manning, Maxwell & Moore. While all dealers are selling a few machines from the floor, business continues comparatively quiet.

The Baltimore & Ohio R.R. is in the market for a 90-in. journal turning lathe; two 36-in. upright drills; one guide bar grinder; two driving box boring and facing machines; one 7-ft. radial drill; two 16-in. engine lathes; one drill grinder; one 20-in. upright drill; one 24-in., one 28-in. and one 30-in. shaper. The Norfolk & Western R.R. has an inquiry out for one 4-in. radial drill; two 6-ft. radial drills; one 26-in. upright drill; one nut facing machine; two 20-in. engine lathes; one universal cutter and tool grinder; one 36-in. draw cut shaper; one link grinder; five 16-in. engine lathes; one No. 12 universal milling machine; and one 60-in. engine lathe.

A buyer for a concern in the Southern part of Illinois has made inquiry for about $35,000 worth of equipment and a Chicago industrial is asking for prices on about $50,000 worth of machine tools. A planer and two lathes were sold to a Milwaukee manufacturer who is in the market for additional equipment. A couple of lathes were sold to the Remy Electric Co., Anderson, Ind.

The Baltimore & Ohio R.R. has ordered 500 hopper bodies from the Pressed Steel Car Co. and 500 box car bodies from the American Car & Foundry Co. The demand for steel bars has been heavy for several weeks. Auto wheel manufacturers and bolt and nut makers have been unusually active in the market. In structurals, fabricators are figuring on projects involving 20,000 tons of steel and architects have plans which call for approximately 80,000 tons, according to reports here this week.

Industrials Buying in New York

Dealers in the New York district report this week that so far during the month of November business has been fair and of a steady nature. Buying has not been as brisk as they had expected, but nevertheless on a comparison with the Summer months it is a great improvement. Industrials in and around New York have shown more interest in purchasing during the past week than they have in a long time. Many small sales have been consummated and the total is most gratifying. There have been some expansions recorded and many inquiries from industrials showing that at the present time there is great faith in the future among users of machine tools.

Will the Railroads Buy?

The anticipated buying by the railroads has not materialized, although all dealers are anxiously waiting some flurry to indicate that this buying will take place before the first of the new year. It was generally believed that the roads would make purchases toward the last part of the month and, while the month is not yet over, there seems to be a feeling that the railroads may let these necessities go over until after Jan. 1.

Automotive buying has not been of any proportion during November, but dealers have full confidence in the production schedules that have been planned by the automobile makers and consider this business their "ace in the hole" for next spring and Summer.

Improvement in the textile field is expected within a few weeks and one dealer stated that some inquiries were coming out of New England, while small sales were continually being made to Southern textile manufacturers.

Used tools found a fairly good market during the past week, but the future prospects do not look as encouraging as in the new tool industry.

Japanese buying is reported by several firms. Truck makers are all getting business and one motorcycle company recently made a big shipment of its product to Yokahoma. Other export business is good and, with the exception of Europe where nothing of a business nature is certain, better export business is anticipated.

More Inquiries in Buffalo District

There has been little change in the machine tool market of the Buffalo territory during the past couple of weeks, excepting that in some cases representatives in this field are slightly more optimistic than they have been for some time because of the more lively interest being evidenced by manufacturers in some lines.

For example, some of the automobile and automobile accessory manufacturers of this city who have been practically off the market for some time are again asking for quotations to fill their machine tool needs. One inquiry is out for five milling machines and four shapers and another list of four lathes. Several inquiries for smaller tools are out.

Railroads of this territory are not buying machinery now, the only inquiry to be noted at this time being one by an Eastern railroad for a heavy duty coachwheel lathe for replacement purposes in its Buffalo shops. Some of the non-ferrous metal manufacturers are making small purchases at this time.

The tendency of the trade not to close deals very quickly is quite noticeable now, as it has been since last Spring. Some of the machine tool representatives are inclined to credit this to the fact that the end of the year is approaching and that annual reports must be made up. Those who hold this belief expect that a number of the present inquiries will be closed immediately after the beginning of the new year. Others are not so optimistic.

There is little selling of machinery in the contractors' field. Business, which was very good up to this time, has fallen off rather sharply since October. It is expected that inquiries will be out shortly for machinery for use in connection with the construction of the new Kenmore Boulevard and there will be some state road lettings within a month or so. About the only thing selling in this line right now is a few pumps and smaller equipment for immediate needs.

Few cranes have been sold in the Buffalo territory within the past few weeks. One firm reported the sale last week of a five-ton electric traveling crane to the Power Specialty Co. of Dansville, N. Y., and another machine of the same size to Pratt & Letchworth, Inc.

More Inquiries in New England

Among the chuck manufacturers of the Hartford district the belief is that the volume of business for 1923, for which figures are now being assembled, will run from fifteen to twenty-five per cent better than for 1922. Two manufacturers have figures which indicate this improvement in the business of this year and others "guessed" at a percentage even higher. Working organizations, as a whole, have been maintained right along since the war and only in a few instances where there were great war time expansions working forces have been reduced.

A much better condition obtaining in the machine tool manufacturers is also indicated in the interviews with heads of organizations. The automatic machinery industry has been comfortably busy continuously and still is. A solid interest was indicated in the inquiry mail of one manufacturing firm for the past week, the volume of which was considerable in excess of $100,000 in business. There was a heavy inquiry mail in another manufacturing concern two weeks ago, the result of which netted $50,000 in orders already.

Automatics Improving

Conditions will continue to improve in the automatic machine trade for several months, it is stated, with a possible let up in some lines for brief periods.

The dealers in used machine tools report a comfortable business, the sales are somewhat higher than at the corresponding period a year ago.

Special machinery builders report an active interest which, when materializing into booked orders, is going to produce a big movement in the machinery trade. Much of this is bound to materialize, although the facts already at hand are clear that it will not be forthcoming for from four to five months at the earliest.

Increased automobile production will be reflected in the machine tool industry in this section in the Spring and early Summer it is anticipated.

Milwaukee Business is Fair

Although it is not a common experience among local manufacturers in the metalworking industries, purchases of machine tools so far in November have been somewhat larger in number than the October average. The majority of concerns, however, are unable to report any improvement and the sales curve has continued to take a horizontal course, if not drooping somewhat.

Tool trade is quiet. Inquiry is fair, but probably for the simple reason that prospective buyers are doing an unusually large amount of "shopping" to find the particular class of tool they need at a price they feel they want to pay. A dozen inquiries may mean only a single tool in the final analysis.

Extensions of plant capacity are becoming rare instances. Owing to high building costs, to say nothing of the inability to get the requisite quantity of suitable labor, have been discouraging the enlargement of foundries and machine shops. More recently the cautious and extremely conservative attitude of customers of such shops with respect to placing orders for nothing but current needs has made it quite unnecessary for production shops to consider enlargement of capacity. Machine shops have good orders for delivery between now and the end of the year, but judging by existing conditions, they are not going to carry much unfilled business on their books into the new year, as they did a year ago. Under these circumstances there are few concerns willing to make any substantial investment in plant additions and equipment which may for some time to come prove excess capacity.

Autos Best Customers

The automobile trade continues probably the best customer of the machine tool industry, yet the volume of sales is far below the average for the first half of the year. Certain of the principal producers are buying in small lots but the great majority of shops seems to have come to a point where buying is for replacement only.

Railroad business placed with local tool shops is hardly to be reckoned with as to volume, yet it comes next to automobile buying.

Manufacturers of woodworking machinery are filling some needs in a small way. With regard to sawmill business, the bulk of needs is filled with full complements of equipment derived from mills which have been abandoned owing to the exhaustion of the major timber supply in the locality. Tools for working hardwoods into stock for automobile and bus bodies are in relatively the best request.

Contractors' equipment, such as concrete mixers, hoists, etc., is moving fairly well, but factories are slowing down pending developments in the building situation in 1924, following the greatest building season on record.

There has been no recovery from the slump in demand from the oil producers for equipment, following the partial collapse of prices in the industry. Mining equipment is rather slow, especially among copper producers.

Municipal buying of water, light and power machinery is largely completed for the present, but it is confidently expected that after Jan. 1 considerable of this business will be placed. The same is true of hydroelectric generating machinery for both private and public utilities.

Canada Views Future with Optimism

In view of the general conditions in Canada, which have been quiet during the last two weeks, machinery and machine tool sales have not been large. However, sales of small lots of equipment for replacement purposes amount to a fair total and jobbers believe the trend is upward. The city of Montreal reports machinery sales to be in fair volume, while individual orders are not large. Railroad buying has been done to a limited extent. In Toronto sales have slightly improved, but the call from general industry is lagging.

In so far as eastern Canada is concerned much significance attaches to a recent statement by Premier Armstrong of Nova Scotia who has just completed a tour of the industrial centers of his province. Discussing the conditions in the various centers he said: "The rail mill at Sydney reports that orders now on hand and pending will mean full time operation up to June 1924. The other various centers report greater activity than at this time last year, and in a number of instances are being conducted at practically full capacity. During 1922 pig-iron production was 120,769 gross tons; this year it is believed the production will reach fully 285,000 gross tons, an increase of about 136 per cent.

An optimistic outlook for the future of the Canadian National Railways is reflected in a statement issued this week by J. E. Dalrymple, vice-president in charge of traffic, in which he declared the present volume of business was greatly exceeding that of last year and the improvement in the financial returns of the system during the first eight months of the year would be accelerated during the coming months if general conditions continue as they are at present.

Building in Canada

Structural material is showing a natural seasonal decline after an active Summer and the number of large building projects on hand is small. On the other hand, small building projects have been registered in numbers unusually large and manufacturers of building hardware look for considerable activity. During October construction contracts awarded throughout the Dominion, according to MacLean Building Reports, Ltd., amounted to $30,000,000, compared with $23,382,100 in September, and $24,270,300 in October, 1922. Business buildings amounted to $4,345,600; industrial buildings, $1,329,000. The value of contemplated new work during October was $33,968,000.

There has been noticeable improvement in the textile situation, and extended operations on the part of producing plants have been the rule.

On the Pacific coast, business has shown a satisfactory improvement, but the change is seasonal rather than fundamental. A number of logging camps which had been closed have resumed operations, as the surplus stock is becoming exhausted. Interior mills are doing fairly well.

Detroit Plans Bigger Auto Output

Announcement made last week that the Ford Motor Co. is planning on a production of 10,000 cars daily by the first of February, 1924, and the continued record-breaking achievements among other firms point to the most prosperous period in Detroit's history.

A survey has been completed by the Board of Commerce showing the activity in the major lines of the city, a survey that clearly indicates the trend of the period.

In the Board's official publication, *The Detroiter*, the following statements are made:

"Business in Detroit is moving along on a sound and more or less conservative basis. It is better than it was at this time last year; more men are working, there is more money in the banks, and neither manufacturers, retailers nor wholesalers are carrying heavy surplus stocks, which in itself is a healthy condition."

In the survey bankers, stove manufacturers, adding machine manufacturers, retailers, brick manufacturers, paint and varnish manufacturers, wholesalers, automotive leaders, real estate men, and others were interviewed. Optimism was the sentiment expressed by all.

The stupendous program planned by Ford, if the factory resumes the three-shift, 24-hour plan, means that seven cars a minute, or about one car in every eight seconds, will be turned out in the Highland Park plant and the assembly branches throughout the country.

All Factories Busy

The situation existing at the Ford plant is said to be typical of most of the factories manufacturing better known cars. The Willys-Overland factory plans an output of 18,000 cars this month and the 1924 production schedule will call for an output far in excess of the 200,000 Willys-Knight and Overland cars that will have been turned out by the end of this year.

President Sloan of the General Motors Corp. in a recent statement announced a greatly increased production program at the Chevrolet plant with the monthly output ranging around 50,000, while the "step-up" order at the Buick plant is equally as great in comparison. The same is true of Olds and Oakland, the speed-up extending also to the higher grade automobiles, with Cadillac schedules, according to General Motors officials, exceeding those of any production program heretofore maintained.

Dodge Brothers, Hudson-Essex, Maxwell-Chalmers, Studebaker, Packard, Lincoln, Paige-Jewett, Reo and Rickenbacker are revising schedules upward to meet what is declared certain to be a steadily increasing demand with the coming of the new year and the stimulus of the national Shows in January in various parts of the country.

Traffic conditions on the railroads continue to give good promise, with movements higher than has been known at this time for years.

The navigation season is drawing rapidly to a close, and by the end of the month movement via water between lake ports wil have become practically negligible.

Machine Tool Manufacturers Sending Engineers to Russia

Engineers representing machine tool builders of this country will accompany H. Saxon, of the Allied American Corp., New York City, to Russia upon his return to that country during the last week in November. Mr. Saxon went to Russia some time ago to establish the engineering department and after an exhaustive study of conditions abroad decided that the interests of American concerns could best be furthered by direct representation in Russia by competent engineers. American machine tools have been purchased by Russians to a considerable extent and both orders and inquiries have been received during the past six months by firms that have joined with the Allied American Corp. in going after this business.

The following companies will send engineers with Mr. Saxon: the Union Twist Drill Co., the American Tool Works Co., the O. S. Walker Co., E. Horton & Sons Co., the Vitrified Wheel Co., the U. S. Machinery Co., the Simonds Manufacturing Co., the S. W. Card Manufacturing Co., the Wilmarth & Morman Co., the National Supply Co., the Bethwith-Chandler Paint Co., and several others.

"Since the overthrow of the Czar," stated Mr. Saxon, "there have been twenty-two forms of government in Russia. Those who are responsible today have been the only ones who have been able to bring the country out of chaos and into order. There is not a doubt that things were in a bad shape two and three years ago, but at the present time an entirely different condition exists. If there are no further disturbances—and certainly none are anticipated—Russia will be the same great commercial power that she was fifty years ago but with a more equal distribution of wealth and with less monarchistic tyranny and oppression.

"It is imperative that American manufacturers have their own representatives in Russia if they are to do business. Secretary Hoover's recent speech before the American Marine Congress at the Hotel Astor on Nov. 9 stressed this point and we are doing everything to encourage manufacturers in this country to extend their trade in Russia, which, if properly managed, will be one of our best customers within five years. Intelligent representation and absolute honesty in all commercial dealings will carry American machine tool makers a long way with these people. Germany, England and France are lively bidders for Russian business because they understand the stability of resurrected Russia and have not been blinded by insidious propaganda against the present government."

Worcester Engineers Hold Meeting

Captain L. P. Crim of the Ordnance Department of the army, who is in charge of the obtaining of supplies in the New England district opened the program at the dinner of the Worcester branch of the American Society of Mechanical Engineers on Monday, Nov. 12. His subject was "American Society of Mechanical Engineers and Industrial Mobilization."

He advised every member present to aid the army in peace time to prepare for war.

D. F. C. Langerberg, a native of Ohio receiving a degree from Ohio University and D.S. in metallurgy at Harvard University, spoke on "The Investigation of the Influence of Temperature on Charpy Impact Value of a Group of Steels of Varying Compositions."

He is a metallurgist at the Watertown arsenal, and also a director of the testing laboratories at Watertown. He showed by pictures the influence of temperature on different kinds of steel.

Gen. T. C. Dickson, formerly a member on the staff of Gen. George Goethals as inspector of shops in the construction of the Panama Canal, and during the World War, brigadier general and assistant to the chief of ordnance, spoke on "X-ray Examinations of Metals," showing in pictures how the white spots on the film show cavities. He also pictured and explained how the bombs were photographed and X-rayed. "The X-ray," he said, "aids the designer and the shopman in detecting the holes in the guns and bombs."

The Tech Musical Association entertained during the dinner. Winthrop G. Hall was the presiding officer, while Prof. Howard P. Fairchild was in charge of the program. Dr. Ira N. Hollis, president of Worcester Polytechnic Institute, entertained the speakers at his home and interesting trips to various parts of Worcester Polytechnic Institute were made.

Mr. Hall announced that the New England section of automotive engineers will meet in Hotel Bancroft, Dec. 4. J. H. Nelson of the Wyman & Gordon Co. will speak on "Drop Forgings as Applied to the Automobile Industry."

New Oakland Factory Is Completed

Extensive alterations and new machinery equipment which have resulted in practically remodeling the entire interior of the Oakland Motor Car Co. factories finally have been finished. The machinery and alterations have involved an outlay of approximately $2,000,000, which is in addition to the new $2,000,000 Fisher Body Corp. factory, completed a month ago, adjacent to the Oakland factory, to build Oakland bodies.

This outlay of $4,000,000 gives the Oakland plant a capacity of 500 cars a day, twice its previous capacity. The company has reached an output of 300 cars daily, which is above peak production in the banner months of 1922.

Improvements to facilitate production have been the establishment of a complete conveyor system throughout the factories and the installation of immense new machines of special design which combine operations that formerly required several machines. These enhance the accuracy of manufacturing methods in addition to the productive facilities.

Tunnels connect the various plants and through these underground passages, a monorail system of conveyor speeds the unfinished products from factory to factory for the final assembly. All handling of the heavy parts of the car has been made automatic insofar as possible.

By the installation of almost entirely new machinery in the engine plant, new specially designed tools and a conveyor system, the production of the motor plant has been doubled, besides affording room in the same building for a complete axle plant.

St. Louis Business Declines

A further decline has been registered in the metal trades business here lately and a consequent falling off in the sale of machine tools. In some instances working forces have been reduced. The railroads, quiet all year in the matter of buying, have become even worse customers lately. Evidently they have stopped active buying until the budgets for the new year become operative when it is expected they will be more active. The amount of inquiries received has not shown a great increase.

The Medart Manufacturing Co., maker of overhead transmission machinery, reports that although its business is now a little more quiet than it has been lately, it is pleased with the outlook for a good business in 1924. Officials say that it cannot be classed as dead with them right now and they recently received a large contract from the Bethlehem Steel plant at Lackawanna, N. Y.

Firms which depend upon the oil fields of the Southwest for sales of machines are doing very little now and the consensus of opinion is that better conditions may be expected in that section of the country within the next 60 days.

The automotive industry is experiencing a slight letup in production here and consequently they are not in need of tools. However, that business is never of any great proportions as most of the automobile plants are assembly stations and not manufacturing units.

Discuss Cost Records in Machine Shops

Methods of keeping an exact cost record of all articles manufactured in the foundry and machine shop in order to determine the exact selling price, was the principal subject dealt with at the special meeting Nov. 13 of the Georgia Division of the Southern Metal Trades Association, held at Columbus, Ga. John S. Schofield, vice-president for Georgia, and president of the John S. Schofield's Sons Co., of Macon, Ga., delivered the address, with an expert accountant present who illustrated the methods used by this company.

It was the consensus of opinion of the membership present, which was representative of the foundry and machinery industries of the Southeast, that business is slowly improving, and that the outlook for the first quarter of 1924 is excellent.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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HAVING reached Chicago on the way from the Southwest to New York I find myself in an environment where the interest is less exclusively agricultural than in Texas. Perhaps I should add that political matters are also much in the minds of people here for three possible presidential candidates have been in Chicago this week and there is no little speculation as to the effect that the campaign and election of 1924 will have upon business.

The prevailing opinion is that there will be no unsettlement. Most of the men of affairs interrogated express the opinion that the country is safe no matter who is elected and that as one prominent merchant put it, "these Western radicals lose their terror when you get close to them."

Secretary Mellon's proposal to reduce taxes is approved in principle, but its adoption is hardly hoped for because it is generally believed that Congress and the President will be unable to resist the demand for a soldiers' bonus.

Business is said to be good everywhere except in certain sections of the Dakotas, Montana and Minnesota, where a poor wheat crop, sold at low prices, has caused some distress and a few bank failures.

The Wheat Council of the United States in session here has recommended a reduction of 10,000,000 acres in the area to be planted in wheat next year. There is the usual skepticism with regard to action upon this recommendation, but those who are best acquainted with the farmer say that he has come to appreciate the value of co-operation and that he is not likely to disregard the advice or mandates of the agricultural organizations.

The low price of wheat is, however, largely offset by the very satisfactory market for the large corn crop, and where both cereals are produced there is but little complaint.

Therefore it is not surprising to read that the retail trade shows a gain of 10 per cent over last year, that an enormous holiday business is expected, and that the mail order concerns find it difficult to keep abreast of their orders.

The advance in the New York stock market and the readiness with which the large bond issues recently brought out have been absorbed have increased the prevailing optimism, which has been further stimulated by the cheerfulness of the railroad men who are almost unanimous in expecting a continuance of the present heavy traffic throughout the Winter.

One of them told me that the passenger travel to California had been and promised to be the largest on record and in the West as in the East there seem to be an unusually large number of people who are able and willing to take a holiday this Winter.

The idleness of so many able bodied and potential producers may be undesirable from the economist's standpoint, but its immediate effect is to put money in circulation and to provide a multiplicity of jobs at good wages for those who are willing to work.

The result is an appearance of opulence and a disregard of small expenditures. One manifestation of this is to be found in the experience of a large chewing gum concern, the market value of whose capital stock has risen to $73,800,000. Attention has been drawn to it because it has just declared a large stock dividend.

> "The demand for automobiles during what is usually the dull season is really phenomenal and the fluctuations of motor car sales in recent years have coincided so closely with the nation's prosperity or depression that the industry is coming to be regarded as barometric. . . . The demand for steel is again improving and copper is active at 13½ cents. Orders for pig iron are improving after a long period of quietness."

Another example of the same kind is a company that makes and operates the taxicabs that are now to be found in all the large cities and most of the smaller places. Its prosperity is remarkable because people no longer hesitate about paying cab fares. The taxicab development is in fact amazing and only second in importance to the road building movement to which allusion has previously been made in these letters. The demand for automobiles during what is usually the dull season is really phenomenal, and the fluctuations of motor car sales in recent years have coincided so closely with the nation's prosperity or depression that the industry is coming to be regarded as barometric.

In so far as the commodity markets are concerned the general tendency appears to be upward, but those who deal in cotton goods say that they are commencing to encounter some protest against the higher prices recently established.

The demand for steel is again improving and copper is in active demand at 13¾ cents. Orders for pig iron are improving after a long period of quietness, and nearly everyone believes that prices are about as low as they will go.

Other staples are moving freely at about last week's levels and most merchants have ceased to expect any decline.

This is equally true of those who postponed building or construction work because of the high prices of materials and they are taking advantage of the declines which have already occurred by going ahead with their projects at an unusually rapid rate for so late in the season.

Rumors that changes will soon be made in some of the Federal Reserve Banks' rediscount rates have been in circulation but there is nothing in the trend of the money markets to warrant them, for the credit supply and demand are varying but little and the Federal Reserve ratio, which is now 75.6 per cent, has changed but little in many weeks.

Here, as in the Southwest, the majority of business men are apparently oblivious of Europe. The return of the Crown Prince to Germany, the threatened emergence of the ex-Kaiser, the decline in sterling and the French franc, the impending dissolution of the British parliament and the general election to be held in England on Dec. 6 are hardly mentioned or discussed as factors in the American business situation.

When asked whether he thought this disregard of conditions overseas was wise or safe, one banker answered me by referring to the report of our foreign trade for October. It shows exports valued at $402,000,000 and imports worth $303,000,000.

"Don't tell me," he said, "that Europe is bankrupt when she is doing business on such a scale."

Whether this view is sound only time can tell, and meanwhile the great Middle West is prosperous and becoming somewhat exultant in its prosperity.

Dr. Johnson Named as Exchange Professor

The appointment of Dr. Douglas W. Johnson as exchange engineering professor to France is announced. Dr. Johnson, the third American to receive this honor, has been professor of physiography at Columbia University since 1901, and is internationally known as an educator, author and scientist.

Serving for the next academic year, he will represent seven institutions on the Atlantic Coast with which the National Department of Public Instruction in France has established exchange relations in engineering and applied science. These institutions include Cornell, Harvard, Johns Hopkins, Massachusetts Institute of Technology, University of Pennsylvania, Yale and Columbia.

Personals

D. DeVries, a director of R. S. Stokvis & Zonen of Rotterdam, Holland, arrived in the United States last Saturday. He will be here for some time with his headquarters at the New York office, 17 Battery Place.

Joseph T. Ryerson of Joseph T. Ryerson & Son., Inc., Chicago, has been elected a trustee of the University of Chicago.

Frederick E. Moskovics, who recently resigned as vice-president of the Nordyke & Marmon Co., Indianapolis, Ind., has been appointed receiver for the Stevenson Gear Co., Indianapolis.

O. L. Henn, factory manager with the National Acme Co., is now in the general office of that company at Cleveland.

Donald C. Evans has resigned as assistant general manager of the Denby Motor Truck Co. He has not disclosed future plans.

B. C. Holder has been appointed manager of the Maritime branch of the Frost & Wood Machinery Co., with headquarters at St. John, N. B., succeeding W. F. Burditt, who retired last June. Mr Holder has been connected with the Maritime branch for twenty-five years.

Percy E. Wright, consulting mechanical engineer of Seattle, has been appointed assistant sales manager in a Western office of the Reeves Brothers Co., Alliance, Ohio. This company recently established an office in Seattle.

Stephen T. DeLaMater announces that he has resigned as chief of the amortization section of the income tax unit, Bureau of Internal Revenue and has returned to private practice as consulting engineer at 907 Fifteenth St. N.W., Washington, D. C.

Marcel Atlas has resigned his position as mechanical engineer with the Auto Strop Safety Razor Co. to become chief draftsmen of the tool engineering division of the Locomobile Co. of America at Bridgeport, Conn.

Martin P. Rice will have charge of the advertising and publication department of the General Electric Co., Schenectady, N. Y., when they are combined on Dec. 1.

Francis B. Bickley has been appointed assistant manager of the Blair Manufacturing Co., of which A. B. Case is general manager, at Springfield, Mass. Mr. Bickley was formerly purchasing agent for the C. C. Lewis Co., wholesale hardware dealer, of Springfield.

D. I. Wheeler, who for the past eight years has been manager of the Cleveland office of the Morse Chain Co., of Ithaca, N. Y., has accepted the position of sales engineer for the Ramsey Chain Co., Inc., of Albany, N. Y.

E. W. Edwards, president of the Edwards Manufacturing Co., Cincinnati, Ohio, has been elected president of the Cincinnati Industrial Investment Co., a newly-organized concern with a capitalization of $1,000,000. This company will assist in financing concerns that seek a business location in Cincinnati.

H. L. Unland, for thirteen years engineer with the General Electric Co., eleven years of which were spent in the Power and Mining Department, leaves that concern Dec. 1 to take the position of electrical engineer with the Victor Talking Machine Co. at Camden, N. J.

E. E. Helm has been appointed manager of the Detroit district for the Bridgeport Brass Co., Bridgeport, Conn.

General Guy E. Tripp, chairman of the board of directors, the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has been decorated by the Japanese government with the second degree order of the Sacred Treasurer. This is the highest honor that can be awarded a civilian foreigner by the Japanese government.

T. J. McManis, who has been manager of the publicity department for the Edison Lamp Works of the General Electric Co., Schenectady, N. Y., will be an assistant manager of the newly created advertising and publication department.

P. G. Zimmermann, chief airplane engineer of the Aeromarine Plane & Motor Co., has just returned to New York from Omaha where he witnessed a series of tests on the metal fuselage light service mail plane constructed by his company. During these tests, Mr. Zimmermann flew from Omaha to Chicago in the mail pit of the ship.

M. J. Cahill has left the employ of the Dominion Engineering Works, Montreal, where he was superintendent of the foundry department for the past four years.

Frank H. Gale, who for the past seventeen years has had charge of the General Electric Co advertising in periodicals, has been promoted to the staff of Dana R. Bullen, assistant vice-president. The advancement will become effective on Dec. 1.

Edmund Herbert Jahnz has been appointed Philadelphia agent for the Mercury Manufacturing Co., Chicago. His headquarters will be at 2009 Market St.

Robert S. Whipple, joint managing director of the Cambridge & Paul Instrument Co., Ltd., of Cambridge, England, is visiting Canada. Mr. Whipple is one of the leading English authorities on the construction of scientific instruments.

Obituary

Albert D. Johnson, aged 58 years, died suddenly Nov. 1 at his home in Indianapolis. He was the secretary and treasurer of the Diamond Chain & Manufacturing Co., Indianapolis, Ind. Mr. Johnson had been identified with the Diamond company since its organization in 1905. He was identified with the bicycle industry when it was at its height and was connected with both the Waverly Bicycle Co. and the Central Cycle Co. His death followed by one day that of his wife.

Charles Wesley Osgood, for many years owner and manager of a foundry and machine shop making a specialty of paper mill machinery in Bellows Falls, Vt., died in that town Nov. 7 at the age of 82 years.

Frank B. Ferris, of Charlotte, N. C., vice-president of the Textile Mill Supply Co. and president of the Charlotte Manufacturing Co., both of that city, died recently at Guthrie, Okla., while on a business trip in the interests of the mill supply company, following a few days' illness. He was 67 years of age

Fenwick Young, of Birmingham, Ala., former president of the Southern Supply and Machinery Dealers' Association, prominently identified with the machinery and machine tool business for years in the South as the president of the Young & Vann Supply Co., of Birmingham, died recently at his home in that city at the age of 54 years, following an illness of about three months.

Business Items

The U. T. Hungerford Brass & Copper Co., New York City, has just opened a new warehouse at 411 to 429 D St., Boston, Mass.

The Atherton Engineering Co. of Milwaukee, Wis., has changed its corporate title to Atherton Transformer Co.

The Rodney Hunt Machine Co., Orange, Mass., suffered a loss of $5,000 by a fire in a storage building recently.

Effective Nov. 12, a new price of $58 is announced on the Black & Decker half-inch special portable electric drill. Another reduction is also announced on the Black & Decker electric valve grinder. The new price is $34, the former price having been $45.

It has been announced by the International Trade Developer, Inc., that its Kobe, Japan, office has advised that there are many inquiries for machine tools listed. Manufacturers in this country are requested to cable their offers setting forth the name of their product, prices and terms.

A Southern warehouse and general sales offices will be shortly established in Atlanta, Ga., by the Koehring Machinery Co., of Milwaukee, according to an announcement made by Phil Koehring, president of the company. Edgar Alexander, of Atlanta, will be in charge of the branch as Southern manager.

The Stanley Works, New Britain, Conn., will erect a brick mill construction addition seven stories high, 60x140 ft. to the Stanley Rule & Level Co. division plant on Elm St., New Britain.

The Renz-Bullen Co., 1400 West Fort St., Detroit, organized last March, when it bought out the trimming and top department of the Puritan Machine Co., has added still more floor space and now has in excess of 20,000 sq.ft. of space.

Babcock, Wilcox, Ltd., of London, England, and the Goldie & McCulloch Co., Ltd., Galt, Ontario, and the Babcock & Wilcox Co. of New York, have organized a new Canadian company to manufacture boilers, engines, etc., under the name of Babcock-Wilcox and Goldie-McCulloch, Ltd. with head office and works at Galt. The capitalization of the new company is $3,000,000, and there will be branch offices in Vancouver, Winnipeg, Toronto, Montreal and the Eastern provinces.

French Automobiles and American Machine Tools

Industries all busy in France and machine tools needed—Exchange rates form barrier for American made tools at the present time—Solution not in sight

BY A PARIS CORRESPONDENT

THE 1923 Salon de l'Automobile which closed its doors on Oct. 14 was the most successful in the annals of motor car exhibitions in France. It is estimated that the total attendance was three times that of last year. On most of the days the crowd was so dense that visitors could move about only with the greatest difficulty, while a careful inspection of the new models of cars was, except to the most determined, out of the question.

The number of entries was so great that it was decided to hold the truck exhibition later. This plan, it is beleved, will also be preferable, since it will afford a better opportunity to visitors to examine the new models at their leisure, free from the crush that characterizes the exhibition of pleasure cars.

The principal reason for the popularity of the 1923 Salon was no doubt the increasing interest of the public in low-powered and low-priced cars. It may be said that the universal use of motor cars in France is at last coming into its own and that flivver makers are beginning to feel that they are on the verge of a buying boom that only the most optimistic thought either possible or probable a year or two ago. Some of the makers of flivvers operated so many fleets of trial cars during the period of the show, for the benefit of prospective buyers, that circulation on the broad Avenue des Champs Elysées, one and a quarter miles in length, on which the Salon is situated, was almost impossible.

It is reported that all makers of low-priced cars received substantial orders from agents and that André Citroën, the most important small car builder in France, is about to increase his production to 250 cars per day. He has recently issued lists of several hundred machine tools on which he is asking bids and on which already a considerable number of orders has been placed.

CITROËN'S PLANS

Citroën's business has far outgrown the original great shell factory on the banks of the Seine, near the Champ de Mars. In this plant only 10 hp. cars are built, the new 5 hp. model being constructed in the former Clément-Bayard factory at Levallois-Perret, taken over last year. In addition, a number of smaller plants for parts are operated in the suburbs of Paris. The success of the Citroën undertaking has given rise in France to a great deal of pride in the far-sightedness of this French automobile builder, who was undoubtedly the pioneer in France in the belief that this country could support a factory designed to build cheap cars on mass production lines and thereby to convert a traditionally conservative population to the widespread use of the motor car.

Citroën's success has encouraged many others and the coming year promises to see a very large number of new small cars on French roads. This industry is also greatly favored by the exchange rate, which at 75 to 80 francs to the pound sterling permits French makers to export their cars in increasing numbers to England, Holland, Spain, Switzerland, Scandinavia and other countries whose currency is at par. In this respect it may be claimed that the depreciated franc is of real benefit to this great French industry, while it is a serious handicap to British builders.

MACHINE TOOL DEMAND

The general and widespread improvement in the automobile industry has naturally brought about a fairly active demand for machine tools, which has to a great extent been satisfied by purchases within the country of new and second-hand machines left over from the war and imported during the boom that followed the armistice. In some cases, also, builders have rented completely equipped factories in which to make parts. The low purchasing value of the French franc that has helped the automobile builders to export has inversely prevented them from satisfying their machine tool needs by purchases from other countries, except in those rare cases where certain types of machines are needed that cannot be found in surplus stocks in France.

The amount of capital at the disposal of French builders is still insufficient to permit them to pay the heavy prices for American machine tools that obtain after the dollar has been converted into francs at the rate of 17 or 18:1. What the situation will be after the present stocks of surplus machines are exhausted is problematical.

Already there is a scarcity of numerous types of machines both in France and Belgium, and the prices of many second-hand machines have doubled during the past year. It may be that increasing prices will bring out quantities of machines that have hitherto been held back from the second-hand market or that an early settlement of the Ruhr situation will pave the way for the importation of German machines at considerably lower prices than those asked for machines coming from America. Whatever is to be the origin of the machinery, it is certain that if French industries are to continue developing new and modern machines will be required to fill the gap created by the scarcity of men with which they are now confronted.

It is common to see in the press of other countries attention called to the fact that there is no unemployment in France, and comparisons are frequently drawn with the situation in England as proof that France is more prosperous than England. In these comparisons, however, it is quite overlooked that France has never had the numbers of industrially trained men that some of the other nations possess and that her losses during the war were proportionately heavier. It is this fact more than anything else that has been responsible for the comparatively small number of unemployed and that now accounts for the fact that there are practically no unemployed whatsoever in the country.

Outside the automobile and parts industry, the general improvement is also marked and factories seem to be well filled with orders. Manufacturers of lathes, of which there are several in France, are busy and one of the largest is several months behind on his orders. Planer builders likewise have many orders, the selling prices of French-built planers being about half the cost of bringing planers from the United States. In general, however, if a few types of machines such as lathes, planers, upright drilling machines, slotters and shapers are excepted, it can be said that very little progress in machine tool building has been made in France.

In upright drilling machines, the well known woodworking machinery firm of Gilliet et Fils in Auxerre is building a very complete and well-designed line and as its prices for both cone and all-geared machines are considerably cheaper than those of similar American machines it is likely that the French machines will grow in popularity.

In shapers, the French built machines are greatly inferior in design, power and workmanship to American machines, but as they are sold for approximately one-third to one-half the prices asked for new American shapers they are purchased when good second-hand American shapers are unobtainable. When it is considered that an American shaper that lists for $1,000 costs landed in France about 20,000 francs, while the same machine before the war cost less than 4,000 francs it will be seen how great are the present obstacles to the Franco-American machinery trade. It is, of course, out of the question for the average buyer to pay 20,000 francs for an American shaper, even though it may be greatly superior to the French or European machine. And it will continue to be out of the question either until the exchange rate materially improves or until some marked change takes place in the industrial situation that will oblige or permit factories to invest such large sums in equipment.

EXPANSION OF AMERICAN COMPANIES

American companies that operate branch factories in France are apparently prosperous, since most of them have greatly increased their manufacturing capacity during the past year, several having even built new works to cope with the increased demand for their product. Their wisdom in establishing manufacturing facilities in France has been amply demonstrated during the last few years and should be an encouragement to others who are at present excluded from the French, Belgian and Italian markets by the high rate of exchange.

Great Britain and the Bicycle Business

Important source of trade for the machine tool business steadily improves—Motorcycles also in good demand—General conditions badly slumped, but prospects better

BY OUR LONDON CORRESPONDENT

IT MAY be well to begin by indicating a brighter outlook, even if the view changes suddenly to one of a different character, and the recent cycle show held at Olympia, London, W., has drawn public attention to a branch of the British engineering industry which may fairly be claimed to be holding its own, and perhaps a little more when present conditions are kept in mind. The exports of ordinary cycles and parts from this country during the first eight months of this year have been valued at more than 1¾ million pounds, while the corresponding imports were worth less than a quarter of a million pounds. Great Britain in this direction has done better of late i Australia, South Africa and India. Japan too, is one of the best customers, and, it has been stated, has six million bicycles. The view is not very different as regards motorcycles, for exports, in worth, have exceeded three-quarters of a million pounds, while the motorcycle imports amounted to but £54,000.

One of the leading British cycle firms will build for next season 100,000 ordinary cycles plus 10,000 motor cycles, and sold last year 71,000 cycles. The ordinary bicycle industry dates back now 50 years, to the early productions in Coventry. The motorcycle trade is of course of more recent growth, and in its earliest years depended pretty thoroughly on imported engines, the British engine dating, it has been stated, from 1903. Now, apart from accessories, we have about 100 firms engaged in the manufacture of these engines and motorcycles.

Taking a larger view, the outlook is less pleasant, and the numbers of unemployed recently registered have steadily increased and have passed the 1¼ million mark. In addition, it is necessary to repeat, are many persons only partly employed, and a considerable number who, being temporarily or permanently outside the unemployment insurance benefits, are not recorded in the figures given. Then too, the cost of living has again increased, and in this direction almost all the gain that had been made as compared with a year ago has been lost. It is beyond question that the costs and profits of distribution bulk largely in the increased figures, and traders and others are being plainly told that one way to improve the present position would be to lower their prices. The rising cost of living figures will imply increased wages in certain industries; indeed for three months now the increases reported have more than equalled the decreases. But taking 1923 as a whole, so far, a net reduction is still shown.

The machine tool industry may be rather better off than it was, but in any case the difference is trifling. Certainly some firms have been able to reduce their stock and are proceeding to manufacture up to the limit they consider desirable. Some of the firms have thought that in the stress of circumstances the policy of specialization generally adopted would be broken down, and this is true in certain instances. On the other hand, complaint has been made that firms will not build machines outside their usual lines, and that it has been necessary to import from America for this reason.

The small tool side has several times been regarded as at least comparatively busy, but a visit to some of the shops would not confirm any such impression at the moment. As for some time past, it is the railway shops that have been looked to for orders for machine tools, and in preparation for next year some of the motor car firms have also been attempting to put their houses in order. The German machine tool has been described as the bugbear of the British machine tool man. It is undeniable that for some time machines have been slowly moving into the country, mainly to be put into stores to await the better times that must come. A few relatively large tools have lately been definitely put into commission, and apparently two or three firms on the Northeast coast of England and in the Glasgow area of Scotland have provided customers for Germany in this direction.

> "As for some time past the railways have been looked to for orders for machine tools, and in preparation for next year some of the motor car firms have also been attempting to put their houses in order. The German machine tools have been the bugbears of the British machine tool dealer. It is undeniable that for some time past machines have been slowly moving into the country from Germany to be held in storage until better times."

Some machine tool men have argued the need for their services in a number of our shipyards, but the fact that the times are not propitious is made evident in the latest report on shipbuilding, which indicates that the gross tonnage under construction in Great Britain and Ireland is rather more than 1¼ million, or, taking into consideration the fact that on nearly ¼ million tons work has been suspended, rather more than a million tons is actually under construction. This is the lowest figure for about 14 years. It happens to coincide almost exactly with the total tonnage under construction in all countries abroad, as far as is known. Here Germany and Danzig together account for about one-third million tons, Italy and France each about one-seventh million tons, and Holland and the United States each about one-tenth million tons. The position will be understood more readily by the statement that in the United Kingdom during the 12 months preceding the war 1,890,000 tons was the average under construction.

Meanwhile, spurred on by circumstances, the government is announcing and supporting a number of schemes of work to be put in hand at once, the expenditure on which will probably amount to at least 50 million pounds. The railway companies have also been almost forced to publish their programs, and, apart from maintenance work and renewals, are to spend considerable sums on locomotives, rolling stock, etc. The tube railways of London, which have already had a guarantee of 6 million pounds, will have that sum doubled, and a power scheme in North Wales has been guaranteed up to more than 1½ million pounds.

Another Canadian Ford Plant

The Ford Motor Co. is looking for a convenient site in the Province of Quebec, Canada, to build a manufacturing plant, it is understood. Up to the present time, four cities have been visited by an official of the company, and offers of sites have been made by Three Rivers, Sherbrooke, Montmagny and Levis.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Concrete mixers, stone crushers, and concrete chuting plants. Barcelona, Spain. Purchase. Reference No. 8113.

Machine tools. Calcutta, India. Agency. Reference No. 8107.

Forthcoming Meetings

National Founders' Association. Twenty-seventh annual convention. Hotel Astor, New York City, Nov. 21 and 22. J. M. Taylor, secretary, 29 S. LaSalle St., Chicago.

American Society of Mechanical Engineers. Annual meeting, Dec. 3 to 6, in New York City. Calvin W. Rice, 29 W. 39th St., New York City, secretary.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8. Headquarters, Grand Central Palace, New York City.

Society of Automotive Engineers. Annual meeting, Jan. 22 to 25, at the General Motors Building, Detroit, Mich. Coker F. Clarkson, 29 W. 39th St., secretary.

Foreign Trade Council. Eleventh annual convention at Boston, June 4, 5 and 6. O. K. Davis, India House, Hanover Square, New York City, secretary.

Society of Industrial Engineers. Eleventh annual convention. Buffalo, N. Y. April 30, May 1 and 2. Headquarters, 608 S. Dearborn St., Chicago, George C. Dent, executive secretary.

New and Enlarged Shops

Machine Tools Wanted

Ind., Indianapolis—W. J. Holliday & Co., 326-90 West Georgia St., J. S. Holliday, Pres. — complete equipment, including punches, brakers, saws, plate shears, etc., for proposed steel fabricating plant.

Kan., Baxter Springs—Baxter Machine Co.—20 in. swing, belt driven lathe.

Kan., Baxter Springs—Gilam Garage—drill press (used).

Kan., Baxter Springs—J. Higgenbothan, Military Ave.—drill press for blacksmith shop.

Md., Baltimore—Baltimore Tube Co., 1301 Wicomico St.—roll grinder to grind chilled rolls for 12 to 24 in. diameter.

Mich., Detroit—J. E. Barrett Co., 6545 Epworth Blvd. (machine shop)—one structural type punch press and one bolt threader.

Mo., Carl Junction—Magoon Auto Co.—drill press.

Mo., St. Louis—T. H. Glancy, Marquette Hotel—general equipment for garage on 18th and Charles Sts.

Mo., St. Louis—H. L. Kuhlmann, 5149 Easton Ave.—lathes, etc., for garage.

N. Y., Le Roy—F. W. Syler, Main St.—equipment, tools, press and vise for garage repair shop.

N. Y., Utica—J. S. Pickell, Lincoln Ave.—press, tools and equipment for new garage.

N. Y., Watertown — Weldon & Gillock, Factory St.—garage repair tools and equipment.

N. Y., Watervliet—J. F. Ballard, 1-11 19th St.—small lathe, press and tools for garage.

O., Columbus—L. E. Lowe & Sons, 705 Southwood Ave. (manufacturer of air compressors, also general machine shop), L. E. Lowe, Purch. Agt.—machine tools, including grinder and drill press, to enlarge shop.

O., North Baltimore—France Fdry. & Machine Co., H. M. France, Mgr.—equipment, including grinder, 24 in. lathe, etc., to enlarge capacity of plant.

O., Painesville—Main St. Automotive Co., C. C. Hawkins, Purch. Agt.—repair tools, press and equipment for new garage.

Okla., Hockerville—Craig & Borthick—lathe and drill press for garage and machine shop.

Okla., Hockerville—J. M. Johnson—lathe, hand tools, anvil, vise, forge and drill press for blacksmith shop.

Pa., Northampton—Lilly & Lentz—tools, press and equipment for proposed automobile repair shop.

Pa., Pennsburg — Jackson Motor Co. — emery wheel, presses, tools and equipment for new garage.

Pa., Pittsburgh—Natl. Tube Co., Frick Bldg., S. M. Lynch, Purch. Agt.—shaper, lathe and drill press for Riverside Wks. at Benwood, W. Va.

Pa., Pittston—Falcone Bros., Jenkins Alley—tools, small lathe and equipment for new garage repair shop.

Pa., Sugargrove—Malian & Stoddard, R. Stoddard, Purch. Agt.—small lathe, press and repair tools for garage.

Tex., Kaufman—Kaufman Machine Shop—lathe, 24 in. swing, 12 ft. bed; lathe 14 ft. bed.

Va., Ashland—W. F. Fuque—drill press and lathe for automobile repair shop.

Va., Ashland — V. Priddy, Washington Highway and England St.—lathe for automobile repair shop.

Wis., Hurley—Norman Auto Co., B. E. Norman, Pres. — automobile repair machinery, gasoline tanks, pumps, etc., for proposed $40,000 garage.

Wis., Milwaukee—Sunbeam Mfg. Co., 166 Martin St. (manufacturer of automobile accessories), W. M. Baumhackel, Purch. Agt.—20 in. drill press, tool room lathe, emery wheel, stand, etc.

Ont., Avonmore—W. A. Aubury—lathe for automobile repair shop.

Ont., Cornwall—Fursey's Sales & Garage Co., Pitt St., R. J. Fursey, Purch. Agt.—drill press, vise, tools, etc., for garage.

Ont., Lancaster — H. MacLeod — garage tools and equipment.

Ont., Ottawa—F. H. Plant, Ltd., 111 Murray St. (carriages, etc.)—blacksmith and machine shop equipment.

Ont., Renfrew—W. Dean—complete garage equipment, to replace fire loss.

Que., Lachine—O. Ouenneville, 370 St. Joseph St.—garage equipment, bench tools, etc.

Que., Longueuil—J. F. K. Leduc, 168 St. Charles St.—automobile repair machinery, tank and pump for garage.

Que., Montreal—D. Lalonde, 634 Parc Lafontaine—small drill press, air compressor, etc.

Que., Montreal—T. Lalonde & Fils, 3034 Notre Dame St., E.—equipment and tools for garage.

Que., Westmount—P. H. Reid & Co., 118 Strathern Ave.—complete equipment for garage and automobile repair shop at 92 Inspector St., Montreal.

Machinery Wanted

Calif., Los Angeles—J. Ward, 108 East 98th St.—12 x 18 in. job press, also cylinder press.

Conn., Waterbury—Bd. Educ.—$5,000 worth of small machinery for manual training department at Malony School.

Ill., Chicago—Illinois Central R. R., 135 East 11th Pl., J. J. Bennett, Purch. Agt.—1½ to 6 in. motor driven tube cutting machine.

Ill., Chicago—Junkunc Bros., 1145 West Garfield Blvd.—18 gage salvage steel cold rolled or pickled to stamp out blanks 1⅝ x 17⅞ in., car load or less; cold rolled bar steel, 1½ x ⅞ in.

Ill., Chicago—Wanner Mchy. Co., 716 South Dearborn St.—10 x 15 in. Chandler & Price press and a 25 in. lever paper cutter.

Ill., Riverdale—G. L. Kochler—25 x 38 in. Miehle printing press.

Ill., Rockford—Free Sewing Machine Co., 18th Ave. and 11th St., A. E. Johnson, Purch. Agt.—electric furnace, traveling crane and moulding machine.

Ind., Fort Wayne—The city, A. W. Grosnevor, 122 East Washington St., Engr.—receiving bids about Dec. 10 for a 100 ton hoist for a movable dam on the Maumee River.

Ind., Mount Vernon—The Print Shop, B. O. Hanly, proprietor—10 x 15 in. and 12 x 18 in. job press with throw off.

Ia., Cedar Rapids—Iowa Ry. & Light Co., 201-203 2nd Ave.—one electric traveling crane, about 5 ton.

Kan., Baxter Springs—F. M. Congdon & Son—bandsaw for planing mill.

Kan., Baxter Springs—Herald, Box 287—paper cutter, Miller feeder and job printing press.

Kan., Baxter Springs—Hub Shoe Shop, 1022 Military Ave.—stitcher and dustless finisher (used).

Kan., Pittsburgh—Hull & Dillon Packing Co.—raw water ice plant.

Mich., Detroit—Wolverine Stone Co., 7976 Riopelle St.—one Bradley or Beaudy power trip hammer for blacksmith shop.

Mo., Bernie—G. W. Ray—cylinder, 6 column, quarto newspaper press and a 10 x 15 in. job press.

Mo., Clinton—Daily Clintonian—Miller saw with router.

Mo., St. Louis—Burke Coal Co., 1626 Chemical Bldg., J. T. Burke, Purch. Agt.—electrically driven coal conveyor, tipple machinery, etc., for mine, 500 ton daily capacity, near Shelbyville, Ill.

Mo., St. Louis—H. Habben, 312 North Locust St.—automatic card printing job press.

N. Y., Amsterdam—Carana Mfg. Co., H. Hanna, Purch. Agt.—machinery and equipment for new plant for the manufacture of automobile accessories.

N. Y., Ballston Spa—Saratoga County Paper Co., Inc. (manufacturer of box board), F. A. Talbot, Jr., Treas.—four beaters, and one pipe threader, similar to Oster 6 in. size, to be purchased in the spring of 1924.

N. Y., Bath—L. S. Everson, McMaster St.—complete sawmill machinery and equipment.

N. Y., Binghamton — J. A. Polakas, 1 Miles St. (publisher)—presses and equipment for immediate expansion program.

N. Y., Breesport — Breesport Mineral Spring Bottling Wks., E. Furgeson, Purch. Agt.—machinery and equipment for the manufacture of soft drinks.

N. Y., Brooklyn—D. MacMillan & Son, 1371 Atlantic Ave. (pneumatic carriers)—one splitting machine for leather.

N. Y., Buffalo—Erie County, 76 Exchange St.—equipment for workshop of asphalt plant at Hamburg.

N. Y., Buffalo—F. A. Flierl, 854 Kensington St.—planing mill machinery and equipment (new).

N. Y., Dunkirk—Dougherty Bros., F. L. Dougherty, Purch. Agt.—complete gas well drilling outfit.

N. Y., Dunkirk—Thomas Furniture Wks., E. C. Thomas, 312 Leopard St., Purch. Agt.—woodworking machinery and equipment for proposed plant.

N. Y., Hamilton—Madison County Basket Corp., C. F. Robb, Jr., Webster, Purch. Agt.—machinery and equipment for proposed plant for the manufacture of baskets.

N. Y., Kingston—Pepco Stations, Inc., D. R. Peffer, Purch. Agt.—several gasoline pumps and tanks for proposed service stations.

N. Y., Lockport—Vera Chemical Co. (manufacturer of gloss oil)—machinery and equipment for proposed plant, including two 10,000 gal. storage tanks for naphtha.

N. Y., Morris—Tioga Wood Products Co.—chemical machinery and equipment for new plant.

N. Y., Niagara Falls—Carborundum Co., Buffalo Ave. and 18th St.—machinery and equipment for proposed $60,000 factory for the manufacture of carborundum products.

N. Y., Oakfield—United States Gypsum Co.—special machinery and equipment for new plant for the manufacture of wall board and sheet rock.

N. Y., Palmyra—Alert Products Co., Inc.—chemical machinery and equipment for the manufacture of automobile pumps and accessories, to replace that which was destroyed by fire.

N. Y., Penn Yan—Tempter Corn & Fruit Products Co.—canning machinery, equipment, shafting, hangers, etc., for corn and pea canning plant.

N. Y., Potsdam—Wood Bros., Depot St., F. Wood, Purch. Agt.—complete machinery and equipment for proposed laundry.

N. Y., Rochester—Carrib Mfg. Co., 46 Stone St. (manufacturer of carbon paper and ribbons), W. C. Runne, Purch. Agt.—machinery, equipment, shafting, hangers, etc., for new plant.

N. Y., Rochester—Verwey Printing Co., 15 Euclid St.—presses and equipment for proposed $50,000 printery.

N. Y., Saratoga Springs—Baker Mfg. Co. (foundry), J. J. Case, Purch. Agt.—ten sets of ball bearing applications and forty cylinder moulds for paper machine.

N. Y., Syracuse—Associated Laundries, Inc., 405 Hickory St., C. H. Parmelee, Pres.—laundry machinery and equipment, to replace fire loss.

N. Y., Utica—Scala Packing Co., 713 Bleeker St. (meat packers)—refrigeration equipment and special machinery for proposed plant.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Belief prevalent among consumers that pig-iron prices have about reached bottom. Buying now fairly active. Steel prices stiffening at Pittsburgh mills, particularly in light rails. Iron and steel scrap higher. Pittsburgh mills active with increased employment. Volume of steel buying by railroads and automotive industries, however, not up to expectations.

Advances—Aluminum ingots up 1c. per lb.; increase reported due to tariff influences. Lead advanced 5c. per 100 lb. in week. Solder also higher in New York. Non-ferrous metals advanced in Cleveland warehouses.

Declines—Minimum on galvanized steel sheets down 10c. per 100 lb. at Pittsburgh. Tin declined ¼c. per lb. in week. Antimony ¼c. per lb. lower in New York on European shipments; no quotations on Asiatic metal.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.05
Northern Basic	24.00
Southern Ohio No. 2	24.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	28.00
BIRMINGHAM	
No. 2 Foundry	22.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.25
Virginia No. 2	28.17
Basic	24.00
Grey Forge	24.00
CHICAGO	
No. 2 Foundry local	24.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	27.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.77
Basic	25.77
Bessemer	26.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.75
Cleveland	4.75
Cincinnati	....
New York	5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.00
No. 12	3.10	4.64	3.80	4.05
No. 14	3.20	4.69	3.85	4.10
No. 16	3.40	4.79	3.95	4.20
Black				
Nos. 17 and 21	3.70	4.95	4.45	4.70
Nos. 22 and 24	3.75	5.00	4.50	4.70
Nos. 25 and 26	3.80	5.05	4.55	4.75
No. 28	3.85	5.15	4.65	4.85
Galvanized				
Nos. 10 and 11	3.90@4.00	5.15	4.70	4.85
Nos. 12 and 14	4.00@4.10	5.25	4.80	4.95
Nos. 17 and 21	4.30@4.40	5.55	5.10	5.24
Nos. 22 and 24	4.45@4.55	5.70	5.25	5.40
No. 26	4.60@4.70	5.85	5.50	5.55
No. 28	4.90@5.00	6.15	5.80	5.85

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded.	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0,17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold drawn shafting or screw	4.65	3.90	4.55
Cold drawn flats, squares	5.15	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.10@3.15 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 5/32, 8.35c.; 1/8, 7.85c.; 5/32 to 1/4, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound			
Copper, electrolytic (up to carlots), New York			14.00
Tin, 5-ton lots, New York			43.62½
Lead (up to carlots), St. Louis	6.70	New York	7.22½
Zinc (up to carlots), St. Louis	6.40	New York	6.85

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.20	27.00	26.50
Antimony (Chinese), ton spot	10.12½	10.50	10.50
Copper sheets, base	20.25	21.00@21.25	23.00
Copper wire, base	15.00	19.00	16.25
Copper bars, base	19.25	22.50	19.50
Copper tubing, base	23.00	27.25	23.00
Brass sheets, base	17.00	22.00	18.75
Brass tubing, base	21.50	27.00	20.50
Brass rods, base	14.75	18.00	15.75
Brass wire, base	17.50	22.00	....
Zinc sheets (casks)	10.25	10.45	....
Solder (½ and ½), (case lots)	31.00	30.00	28.50
Babbitt metal (83% tin)	52.00	54.00	45@48
Babbitt metal (35% tin)	25.00	17.50	20@25
Nickel (ingot and shot)	29.00	....	....
Nickel (electrolytic)	32.00	....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00

Shop Materials and Supplies

METALS—Continued

Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.75	11.25	11.25
Copper, heavy, and wire	10.75	10.75	10.50
Copper, light, and bottoms	9.50	8.75	9.50
Lead, heavy	5.75	5.25	5.75
Lead, tea	4.75	4.00	4.75
Brass, heavy, yellow	7.00	.....	7.00
Brass, heavy, red	8.75	9.25	8.75
Brass, light	6.25	5.00	6.00
No. 1 yellow brass turnings	7.00	5.75	6.50
Zinc	3.75	2.75	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$25.10	$22.85	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.40	18.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	13.00	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.14
Cotton waste, colored, per lb.	.08@.13	.12	.10½
Wiping cloths, 13¼x13¼, per lb	11.00	36.00 per M	.16
Wiping cloths, 13¼x20½, per lb	.....	52.00 per M	.16
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.98	1.05	1.14
Lard cutting oil (50 gal. bbl.) per gal	.55	.50	.67½
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.297	.35	.40
Belting—Present discounts from list in fair quantities (⅓ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30–10%	30–10%	30–10%
Heavy grade	20–5–2½	30%	20–5–2½%
Rubber and duck:			
First grade	50–10–5%	50–10%	40–10%
Second grade	60–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20
Fire clay, per 100 lb. bag	.....	.65	.60
Coke, prompt furnace, Connellsville	per net ton		3.50@4.00
Coke, prompt foundry, Connellsville	per net ton		5.00@5.50
White lead, dry or in oil	100 lb. kegs		New York, 14.00
Red lead, dry	100 lb. kegs		New York, 14.00
Red lead, in oil	100 lb. kegs		New York, 15.50

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0354	$0.0354	$0.0304
Cold finished shafting	per lb.	0.0465	0.0465	0.039
Brass rods	per lb	0.1475	0.1525	0.17
Solder (½ and ½)	per lb.	0.31	0.295	0.275
Cotton waste	per lb.	.10@.13	.10@.13	.09@.11½
Washers, cast iron (½ in.)	per 100 lb.	6.50	6.50	6.00
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.02
Lard cutting oil	per gal.	0.55	0.55	0.60
Machine oil	per gal.	0.31	0.297	0.33
Belting, leather, medium	off list	30–10%	30–10%	30–10%
Machine bolts up to 1x30 in.	off list	40–10%	40–10%	40%

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40–10%	60%	45–5%
1⅛ and 1¼x3 in. up to 12 in	15%	50–5%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	25–10%	$3.50 net	.....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30–10%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65–5%
Lag screws, coach screws	40–10%	.....	60–5%
Square and hex. head cap screws	60%	70%	70–10%
Carriage bolts, up to 1 in.x30 in.	30–10%	50%	40–5%
Bolt ends, with hot pressed nuts	40–10%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 9/16 and smaller	60%	.....	.....
Semi-finished nuts, ⅝ and larger	55%	70%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	0.50	3.50	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	0.50	3.50	2.50
Nuts, cold punched, sq., per 100 lb. Off list	0.50	3.50	2.50
Nuts, cold punched, hex., per 100 lb. Off list	0.50	3.50	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	50–10%	60%	60%
Rivets, tinned	50–10%	60%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3.60	$3.75
Cone heads, ditto (net)	5.60	3.80	3.85
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

N. Y., Walker—Walker Evaporator Co.—complete machinery and equipment for apple evaporator, to replace fire loss.

N. C., Wilmington—Carter's Production Wks., 210 South Front St., O. Carter, Mgr.—buffer fitted up with long spindles through a 2 hp. 60 cycle single phase, 110 volt enclosed motor.

O., Ada—M. A. Conner—complete paint shop equipment and automobile repair tools.

O., Cincinnati—C. Todd, 615 Elm St.—job printing press, belting, hangers and paper cutter.

O., Columbus—Miller-Lerch Shoe Mfg. Co., 31 North 4th St., E. E. Lerch, Purch. Agt.—equipment for shoe factory.

O., Lima—R. L. Graham Co., 223 East Market St., F. Townsend, Purch. Agt.—machinery for the manufacture of ice cream (new).

O., Willard — Willard Times — saw trimmer.

O., Youngstown—Bertolini Bros., 26 North Walnut St.—equipment and stone cutting machinery for proposed tile, slate and marble plant.

Okla., Beggs—R. C. Wright—job printing press.

Pa., Bellwood—Weaver Bros—machinery and equipment for bakery, to replace fire loss.

Pa., Chester—Congoleum Co.—machinery for proposed expansion program.

Pa., New Castle—Pennsylvania Eng. Wks.—multiple punch about 120 in between housings, depth of throat 12 in.

Pa., Phila.—W. M. Steppacher & Bros., Inc., 146 North 13th St. (manufacturer of shirts)—laundry machinery, belting, hangers, shafting and pulleys.

Pa., Phila.—I. Q. Wenner. 424 West Berks St.—Universal woodworker, sander, belting and hangers.

Pa., Phila.—Woodworker Shop, 1828 East Wishart St. (cabinet shop)—belting, upright molder, cutters and bandsaw.

Pa., Phila.—E. Wrigley, 821 Callowhill St.—8 x 12 in. job press, also a 10 x 15 in. printing press.

Pa., Pittsburgh — Guibert Steel Co., Diamond Bank Bldg.—one 5 ton, 50 ft. 6 in. span, 3 motor crane.

Pa., Pittsburgh—Standard Sanitary Mfg. Co., Bessemer Bldg. (manufacturer of plumbing fixtures)—seven cranes for new Baltimore plant.

Pa., Scranton—Riccardi Macaroni Co., 716 West Lackawanna Ave.—complete machinery for the manufacture of macaroni.

Tex., Karnack—Taylor Mill & Elevator Co., T. J. Taylor, owner—machinery for grain elevator at Marshall.

Tex., Texas City — Pierce Oil Corp. — equipment for refinery.

Vt., East Dorset—Manchester Marble Co.—small tools and machinery for roughing, polishing and finishing marble, to replace fire loss.

Va., Ashland — C. S. Boschen, Railroad Ave.—5 ton ice making machine.

Va., Ashland — Burgess Bros. (job printers)—paper cutter.

Va., Ashland—S. R. Carter, et al., England St.—equipment for creamery.

W. Va., Charleston—Gibraltor Coal Co., 110 Hale St.—conveyors, mining machinery and equipment for proposed coal operations in the Kanawha field.

W. Va., Charleston—Job Print Shop, Box 1395—40x55 in. or larger Optimus or Miehle press.

W. Va., Weirton—Weirton Steel Co.—one 10 ton crane for Steubenville, O.

W. Va., Wheeling—Dillon Bros. Machine Co.—one 5 ton, 27 ft. span, 3 motor crane.

W. Va., Wheeling—Scott Lumber Co.—complete planing mill machinery and equipment, to replace that which was recently destroyed by fire.

Wis., Ashland—J. M. Chapple & Co., 321 West 3rd St.—presses, linotype machine, etc., for proposed $50,000 printing plant.

Wis., Atwood (Owen P. O.)—Farmers Co-operative Co.—produce loading and unloading machinery.

Wis., Bowler—Bowler Lumber Co., W. O. Baum, Purch. Agt.—large re-saw, planer and bandsaw.

Wis., Eau Claire—Newman Electric & Mfg. Co., 428 Water St.—equipment for the manufacture and repair of electrical specialties and appliances.

Wis., Milwaukee — Fillmann Bros., 334 Bway., W. Fillmann, Purch. Agt.—one 20 to 30 in. paper cutter and one platen press.

Wis., Milwaukee—R. Kiel, Concordia and 31st Sts. (machine shop)—one 5 to 10 ton traveling crane.

Wis., Oshkosh—M. C. Flanagan, 68 Evans St. (newspaper and job printer)—rotary press, belting, hangers, pulleys, linotype machine and bearings.

Wis., Owen — Master Package Corp. (manufacturer of fibre containers), H. M. Wollum, Purch. Agt.—paper cutter and corner turning machine.

Wis., Waukesha—Manitowoc Church Furniture Co., 1214 Lincoln Ave.—woodworking machinery, motor driven, for proposed $50,000 addition to factory.

Wis., Wausau—Underwood Veneer Co.—8 ft. single bandsaw, planers, lathe and woodworking machinery for sawmill.

N. B., Shippigan—Shippigan Packing Co., Ltd., J. J. Robichaud, Lameque, Purch. Agt.—equipment for curing and treating fish, also for the manufacture of fertilizers.

Ont., Alexandria—F. Leslie Co., F. A. Leslie, 718 Somerset St., W., Ottawa, Purch. Agt.—machinery and equipment for the manufacture of tinware.

Ont., Arnprior—F. G. Atack, c/o A. Burwash—complete equipment for the manufacture of dye and other pharmaceutic preparations for plant at Kingston.

Ont., Maxville—A. J. Filon—small tools, chain hoist, etc., for garage.

Ont., Smooth Rock Falls—Mattafma Pulp & Paper Co., Ltd.—equipment for the manufacture of unbleached sulphite pulp.

Que., Longueuil—E. Heroux, 71 4th Ave.—tool room equipment and air compressor for garage.

Que., Montreal — Belanger Fdry., Ltd., 1165 Carriere St., J. Lamarre, Mgr.—furnaces, melting pots, etc.

Que., Montreal—Bertrand Wooden Box Co., 34 Benoit St.—dove tailing machine.

Que., Montreal—Bourgie & Fils, 494 Nicolet St.—planing mill machinery.

Que., Montreal—Bruce & Price, 159 Prince St.—foundry equipment.

Que., Montreal—R. de Montigny, 1396 St. Dominique St.—equipment for the manufacture of cement blocks, etc.

Que., Montreal—J. Desautels & Co., 2821 Papineau Ave.—machinery and equipment for the manufacture of shoes, to replace fire loss.

Que., Montreal—Gunn, Langlois & Co., Ltd., 105 St. Paul St., E., H. R. Gray, Purch. Agt.—bond and shell crushers.

Que., Montreal—H. Hotte, 1401 St. Urbain St.—chain hoist, pump, etc., for garage.

Que., Montreal—Pacific Dairies, Ltd., c/o E. Leboeuf, 80 St. Clement St.—equipment for smoking and curing hams, etc.

Que., Montreal—Wood's Garage Co., 23 Ccurrol St., A. Wood, Purch. Agt.—bench tools, planer, etc.

Que., Quebec—P. Moisan, 926 Valier St.—equipment for blacksmith shop.

Que., St. Laurent—St. Laurent Quarry, C. Lapailleur, Mgr.—stone cutting machinery and equipment.

Metal Working Shops

Ala., Birmingham—The Southern Ry., 13th St. and Pennsylvania Ave., Wash., D. C., plans to build car repair works at Findley Yards, here. This will replace the one at Gadsden, which was destroyed by fire. Estimated cost $1,000,000. T. H. Gatlin, Ch. Engr. Constr.

Ark., Little Rock—The N. O. Nelson Co., 502 East 2nd St., plumbing supplies, will soon award the contract for the construction of a machine shop, warehouse, office building, etc. Estimated cost $80,000. Sanders & Ginnochio, Hall Bldg., Little Rock, Archts.

Calif., Fresno—E. Bradley, c/o Trewhitt-Shields Co., Contrs., Rowell Bldg., awarded the contract for the construction of a 1 story garage on Stanislaus and L Sts. Estimated cost $100,000, including equipment.

Calif., Los Angeles—Monaco & Bordeaux, Archts., Bank of Italy International Bldg., are receiving bids for the construction of a 1 story, 100 x 150 ft. garage on Hoover and 11th Sts. for J. Green, 1758 North Spring Street.

Conn., Bristol—The New Departure Mfg. Co. has had plans prepared and will soon receive bids for the construction of an addition to forge shop. Lockwood. Greene & Co., 24 Federal St., Boston, Engrs.

Conn., Hartford—S. Kaplan, 105 Windsor Ave., awarded the contract for the construction of a 1 story, 60 x 100 ft. garage. Estimated cost $40,000. Noted Apr. 26.

Conn., Putnam—The Putnam Fdry. & Machine Co., Mechanics St., is having plans prepared for the construction of a 1 story, 100 x 160 ft. foundry. Estimated cost $40,000. Private plans.

Conn., Waterbury—The Waterbury Farrell Fdry. & Machine Co., 425 Bank St., is having plans prepared for the construction of a 2 story, 48 x 52 ft. factory. Estimated cost $40,000. Wescott & Moses, 207 Orange St., New Haven, Archts.

Ill., Chicago—The Nugent Electric Steel Casting Co., 3100 South Wood St., is having plans prepared for the construction of a 2 story (ultimately 3 story), 40 x 120 ft. pattern and storage building. Estimated cost $70,000. F. D. Chase, Inc., 645 North Michigan Ave., Archt.

Ind., Connersville—The Connersville Automobile Dealers Assn. plans to build an automobile repair shop. Estimated cost $65,000.

Ind., Indianapolis—W. J. Holliday & Co., 326-90 West Georgia St., is having plans prepared for the construction of a steel fabricating plant, 300 x 400 ft. warehouse and 3 story office building at 600 West McCarty St. J. S. Holliday, Pres. J. C. Troyer, c/o owner, Engr.

Md., Baltimore—H. Gamse & Bros., 421 Exchange Pl., will soon award the contract for the construction of a 2 story, 25 x 104 ft. garage, etc., at 423 Exchange Pl. Estimated cost $40,000. E. H. C. Browne, Equitable Bldg., Baltimore, Archt.

Mo., Moberly—The Wabash R.R., Ry. Exch. Bldg., St. Louis, is having plans prepared for the construction of additions to shop, etc., here. A. O. Cunningham, Ch. Engr.

N. J., Jersey City—The Continental Can Co., 61 Bway, New York awarded the contract for the construction of an addition to its factory on 16th St., here. Estimated cost $500,000. Noted Sept. 6.

N. Y., Brooklyn—The Cordial Realty Co., c/o E. M. Adelsohn, Engr., 1778 Pitkin Ave., will build a garage on Pitkin Ave. Estimated cost $60,000.

N. Y., New York—The Reo Motor Car Co., 1709 Bway., will soon receive bids for the construction of a 4 story, 100 x 175 ft. service station on West 55th St. Estimated cost $200,000. Parker & Shaffer, 280 Madison Ave., Engrs. and Archts.

O., Lorain—The Amer. Stove Co., 4301 Perkins Ave., Cleveland, awarded the contract for the construction of a 1 story, 65 x 195 ft. factory and shop building, an 82 x 110 ft. japanning building and a 50 x 82 ft. warehouse, here. Estimated cost $150,000. Noted Nov. 8.

Pa., Erie—The Erie Steam Shovel Co., is having preliminary plans prepared for the construction of a 1 story addition to its factory. Cost will exceed $40,000. Osborn Eng. Co., 7016 Euclid Ave., Cleveland, Engrs. and Archts.

Pa., Erie — H. P. Westcott, Pittsburgh Ave., awarded the contract for the construction of a 1 story, 62 x 100 ft. machine shop. Estimated cost $35,000.

Pa., Phila. — The Fleischmann Co., 701 Washington St., New York, awarded the contract for the construction of a garage and office building on 20th and Venango Sts., here. Estimated cost $117,500. Noted Sept. 6.

Pa., Pittston—The Motorin Garage, Tompkins St., c/o W. J. Gillespie, is having plans prepared for the construction of a garage on Dock St. Private plans.

Pa., Sharpsburg (Pittsburgh P. O.)—The Pennsylvania R.R., Union Sta., Pittsburgh, awarded the contract for the construction of a 1 story, 6 stall roundhouse and machine shop, here.

Tex., Denison — The Missouri-Kansas-Texas R.R. of Texas, Missouri-Kansas-Texas Bldg., Dallas, awarded the contract for the construction of car shops, here. Estimated cost $200,000.

Utah, Salt Lake City—The Ford Motor Co., Highland Park (Detroit P. O.), Mich., awarded the contract for the construction of a 2 story, 165 x 247 ft. assembly plant on 3rd South St., here. Estimated cost $250,000. Noted Sept. 20.

Wis., Madison—The Fox Motor Car Co., c/o C. N. Fox, 107 East Doty St., plans to build a 2 story, 60 x 95 ft. garage and repair shop on University St. Estimated cost $40,000. Engineer or architect not selected.

Wis., Milwaukee—The Curtis Auto Co., 142 8th St., will soon award the contract for the construction of a 3 story, 100 x 127 ft. garage on Bway. Estimated cost $200,000. Federal Eng. Co., 440 Milwaukee St., Milwaukee, Engrs. and Archts. Noted July 26.

Wis., Racine—The Belle City Malleable Iron Co., Kewaunee St., awarded the contract for the construction of a 1 story, 77 x 100 ft. addition to annealing building. Estimated cost $45,000. C. S. Anderson, Mgr.

Ont., Port Colborne—The Marine Welding & Boiler Co. plans to build additions to its plant. Estimated cost $25,000. J. Sherk, Mgr.

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DWIGHT FILLEY DAVIS, Assistant Secretary of War, the author of the accompanying article, is in immediate charge of the work which has as its object the industrial preparation of the Nation for any military emergency which may arise. He was born in St. Louis in 1879. He was graduated from Harvard University in 1900. Mr. Davis and Holcombe Ward won the international doubles tennis championship in 1899, 1900 and 1901.

Mr. Davis' prowess as a soldier was none the less striking than his capabilities as an athlete. He was awarded a Distinguished Service Cross for conspicuous bravery and gallantry in action at San Mihiel and in the Argonne. After the war, Mr. Davis embarked upon a political career. He entered the race for the Republican nomination for the United States Senate in Missouri, but was defeated by Selden P. Spencer. When Mr. Harding became president, he selected Mr. Davis as a member of the War Finance Corporation. He served with that body until his selection this year to be Assistant Secretary of War.


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General scheme of mobilization is complete—What the men in the mechanical field can do to help

The Plan for Mobilizing Industry

By DWIGHT F. DAVIS
Assistant Secretary of War

"IT IS pardonable to be defeated but never to be surprised." This is an ancient military maxim. It is intended to emphasize the essentiality of being prepared for anything that may develop in connection with war.

In the World War, the United States was in effect surprised. This was due to the fact that the country did not appreciate for one reason or another the tremendous requirements of munitions and other supplies needed by the present day army and especially the length of time and the amount of effort required to assemble the raw materials, fabricate them into issue items of such munitions and other supplies, and then deliver them to the army at the fighting fronts.

It is doubtful if the country sufficiently realizes the fact that in general man-power can be mobilized, trained, and placed in action on the fighting fronts nearly a year before munitions therefor can be fabricated and delivered to the firing lines. Nor does the country fully realize that the American Army in the World War was dependent upon the Allies for the great part of its munitions supplies and that without such a source of supply the American Army, in spite of its 4,000,000 soldiers and in spite of the billions of dollars spent for the procurement of *American made munitions*, would have been practically impotent.

With a really remarkable appreciation of the fundamental causes which were responsible for the surprise that in a great measure hindered our efforts in the World War, the leaders in Congress and the administrative departments of the Government and in the industries have set out to make such adequate arrangements as will not again allow us to be found in such an unsatisfactory position. Congress passed a broad and far-seeing law in the National Defense Act of 1920. Very careful plans are being drawn for the purpose of accomplishing the objective sought by this law.

The phase of the war preparation with which my office is definitely charged relates to the mobilization of the nation's industries in order to meet the gigantic requirements placed upon them for the supply of probable war armies. While the planning has reached an advanced stage, much work remains to be done. The nature of the endeavor is such that full details cannot be made public but it may be said that literally scores of industrial leaders are co-operating actively and unselfishly with the War Department in the hope that industrial mobilization may be accomplished with a degree of promptness and at a cost commensurate with our peace time efficiency.

Much study is being given at this time to the capacity of the country to meet the probable war requirements and especially as to the best method of converting manufacturing plants from peace time to war time activities. If full advantage can be taken of conversion possibilities the number of new plants with the attendant loss of time, which it would be necessary to spend to erect such plants, can be reduced to a minimum. One of the great advantages of conversion is the fact that there is an existing organization. The management has all the avantages of intimate knowledge of the possibilities of the plant's facilities and of its personnel. Housing arrangements for the personnel already exist. Transportation facilities have been provided by the plant

and it has its own arrangements for securing power and raw materials, etc.

From a manufacturing standpoint, the most difficult problem which must be faced is the production of ordnance and aircraft. The peace time manufacture of the materials needed by those services is so insignificant in comparison with war time requirements that elaborate new facilities must be created for the emergency over and above converted facilities. It is possible however to determine in advance where these plants can be constructed and to have in readiness plans for their construction and operation.

The broad problem of economic use of transportation is likewise being studied. Realizing that transportation is one of the vital things in war, efforts are being made so to distribute the industrial war load as to cause the minimum extra burden on transportation. One of the ways in which this can be accomplished is by placing a manufacturing plant in a place where it has the easiest access to the necessary raw materials.

Power shortages at critical points during the last war have led to a very careful survey of the power situation. The Corps of Engineers at this time is making a careful study of the power possibilities of the United States so as to know the extent of the power resources of each individual district. In allocating work, it is planned to take due cognizance of such power resources.

Super-Agencies Get Under Way Slowly

It is admitted that super-agencies such as a War Industries Board, a War Finance Corporation, a War Trade Board, a Fuel Administration, must necessarily be created if we are to be called upon to make war on a large scale. During the last war, it took a long time to organize these super-agencies and co-ordinate their work with those of the existing executive departments. Full advantage is being taken of this experience and it is hoped that definite relationships will be available in concrete form the next time it becomes necessary to create them.

Definite studies are being made as to the relative essentiality of industries. It is recognized that few industries are non-essential but one of the most important things to know in case of war is the degree of the importance of each activity to the most efficient conduct of the war program.

It is fundamental in industrial preparedness that sufficient reserves of important items of supply be maintained in order to supply the army until new production can be developed and delivered to the firing line and this phase of the problem is likewise being studied.

Much thought is also being given the control of capital, the control of labor and the prevention of runaway markets in time of war. Since these questions are social as well as economic and materialistic, they involve vast problems of public education.

In dealing with problems of this magnitude, it is requisite that all patriotic citizens give them thought. Most industrial executives today were engaged in similar duties during the World War. They were in a position to see the mistakes of that period. They now are in a position to have particularly valuable thought on the whole national scheme of industrial mobilization. These ideas should be reduced to concrete suggestions and recommendations and submitted to the War Department for they may be of great help in working out a sound and complete solution.

One of the very important classes of work necessary for successful industrial mobilization is that of the machine shop. The American machine shops of all sizes did a wonderful job in the days of the World War. They are continuing it in times of peace by assisting, among other things, in the survey now being made of the nation's machine tool resources and its machining ability. We feel sure, of course, that their help will continue to be given in assisting in the preparation for future war even though we all hope such war will never come.

Welding High-Speed Tool Steel to Ordinary Shanks—Discussion

By Frank A. Hurst

THE article by W. J. Seibert, on "Welding High-Speed Tool Steel to Ordinary Shanks," on page 254 of the *American Machinist* is of interest, but I cannot pass it by without bringing forward some points that I contend are not justified by facts. It is a very optimistic statement to make that any user of 50 lb. of high-speed steel per week can save $1,820 a year. There are many factors entering into the high-speed steel tipping question that must be put on the debit side, and I know that many people have found the balance to be quite on the wrong side.

Those who have spent much of their time in actual cutting tests with high-speed steel will agree that the forged tool will, every time, give a much greater cutting efficiency than will a welded tool; this fact needs no explaining to the metallurgist. Is it, however, for purposes of comparison of the systems necessary to consider forging at all? Is it not a fact that in many of the most up-to-date shops all tools with the exception of very intricate shapes are formed on the grinder? Has not the tipped tool also to be ground?

A solid tool can be worn down much further than a tipped tool, so that you require several weldings to get the same life as one forged or ground nose. The "ordinary shanks" need preparation, as also the bit for tipping, if you are to get efficient tools, and there are failures in welding also to take into account. When the high-speed steel tip is getting well worn down and near the weld, you come into a material of coarse structure which is very apt to chip and cause extra grinding or breakage.

The writer of the original article also gives the heat-treatment necessary to get good results, stating that the matter is of vital importance. All this handling as compared with the handling of a piece of ordinary high-speed steel adds considerably to the cost, and is quite a complication to the small shop.

It will be interesting to have the opinions of others on this question; but I consider that the information given by Francis S. Walters in an article "Costs of Solid and Welded-Tip Tools," on page 767, Vol. 41, of the *American Machinist*, still holds good, and that taking into consideration all the facts of the case, the balance of expenditure on tools is still very much in favor of the solid tool. Though Mr. Walters deals with tipping, and Mr. Seibert with butt welding, I think the comparison made by the former will still apply. He found in experiment with twenty-four tools that on the tool-making and grinding alone he got $0.90 in favor of a solid tool, without taking into consideration other factors of efficiency previously mentioned.

Production Grinding Developments in the Automotive Industry

By OSCAR A. KNIGHT

Heavier, stronger and more accurate machines — Cam grinding—Use of the wide-faced wheel—Special attachments and machines — Crankshaft grinding machines

ADVANCEMENT and development in any art or science is brought about by necessity, and the developments in precision grinding in the automotive industry have been accomplished to meet the demands for greater production and refinement at less cost.

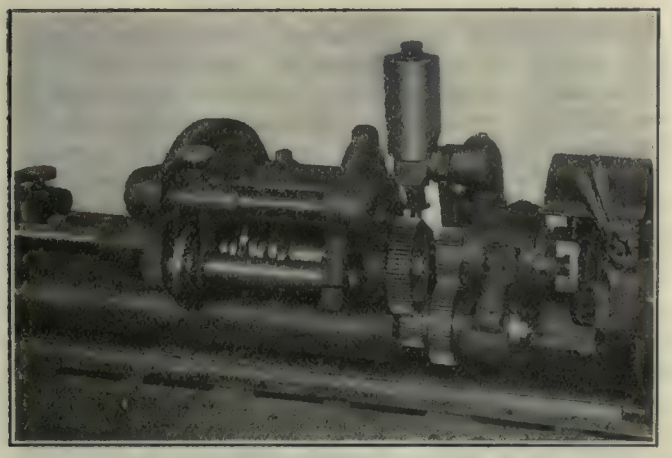


FIG. 1—CAM-GRINDING ATTACHMENT

To cover the developments that have been made in all classes of production grinding would consume too much time. Therefore, I will deal with only one class, namely, cylinder production grinding as performed within the automotive industry, with only a slight reference to other classes. Production grinding should also be classified as precision grinding because to secure the largest production of good ground-work the exact limits required for size and finish must be considered. Webster defines "precision" as "exact limitation, strict conformity to a rule or standard." This means that modern precision production grinding is always performed within exact limitation to some given rule or standard.

The progress made in production grinding during the past few years has been along the line of multiple-work grinding on such parts as piston rings and roller- and ball-bearing cups. It brought about the use of much wider grinding wheels to cover the entire surface of work that had formerly been ground with narrow wheels by the traversing table method. Along with the development of these operations came the cylindrical grinding of square and distributer cams; also square shafts, using oscillating cam-grinding attachments; piston relief grinding, with the same attachments; and two-wheel or double-wheel grinding for such parts as steering-knuckles and pinion shafts of different diameters or where the diameters are separated by some protrusion as in steering-gear worm-shafts.

Better Machines for New Operations

To perform these new operations more care has been taken to build machines that are stronger, heavier and more accurate so that operators can place greater dependence upon the operating mechanism than was possible with previous machines. Greater care has to be taken to balance the grinding wheels more accurately to overcome imperfections in finish and to eliminate excessive repairs on the grinding machine itself. At the same time, grinding-machine builders have devised means for bringing back into approximate running-balance wheels that have developed vibrations as they have worn smaller in their use.

New machines and special attachments have been put into use recently and the accompanying illustrations show some of the developments that have been made in production grinding in the automotive industry. It is

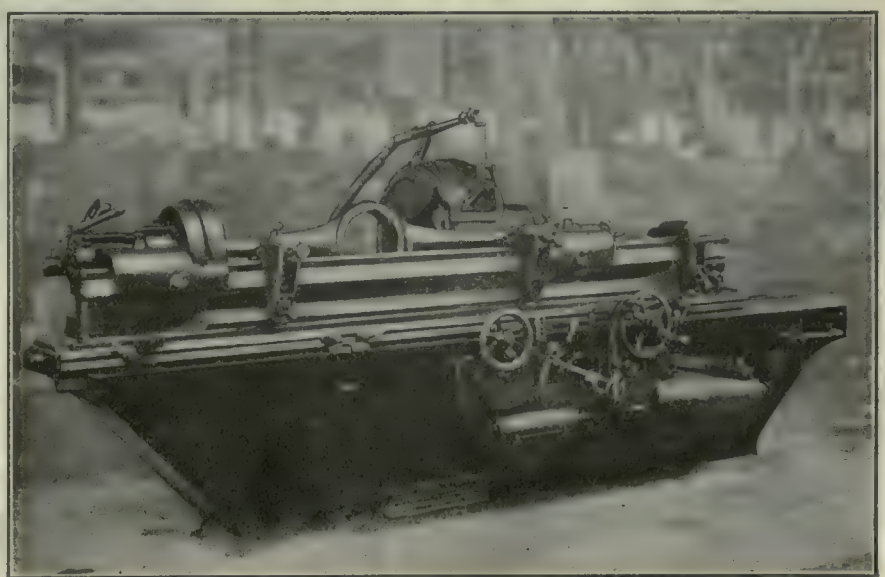


FIG. 2—GRINDING REAR AXLE HOUSING WITH WIDE-FACE WHEEL

A paper presented at the Production Meeting of the Society of Automotive Engineers, Cleveland, Ohio, Oct. 25, 1923.

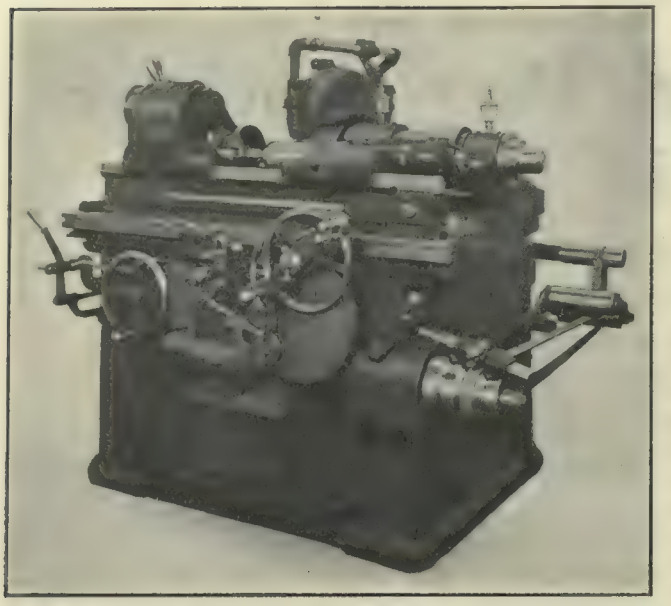


FIG. 3—PISTON GRINDING WITH SPECIAL ATTACHMENT

unfortunate that some of the very best examples of real progress could not be photographed for inclusion in the paper.

In the early days of the industry cams were made individually and pressed over a straight shaft and located in their respective positions by a Woodruff key. The attachment which ground these individual cams according to the shape required, oscillated in its movement. The shape was reproduced from a master cam contained within a case that formed part of the attachment.

Engineering progress caused a change in this part and whole camshafts with all cams forged in place were given to the grinding engineers. To meet this situation the integral cam-grinding attachment, which could be placed on the table of machines already being manufactured for other classes of grinding, was produced, and all the cams on a shaft were ground from the forging to the finished dimensions. This attachment, which is illustrated in Fig. 1 also oscillates in its movements and grinds to very close limits of accuracy all cams from 2 to as many as 24 on a single shaft, in accordance with the generated shape of the master cams.

Camshaft and Piston Grinding

Since this device was developed very little change has been made in its form but its accuracy, alignment and rigidity have been greatly improved so that today a whole camshaft having 12 individual cams integral with it is ground in about the same time as one individual cam by the original method.

Most automobile pistons are relieved around the wristpin hole, while a few makers desire an elliptically shaped piston to allow for heat expansion. This is accomplished with a loose cam or similar form of oscillating attachment. The relief or elliptical shape is reproduced from a master cam within the case at the side of the driving mechanism. By this method reliefs are ground in pistons at the rate of from 125 to 175 pistons per hour, while from 40 to 75 pistons that are elliptical throughout their entire length are produced per hour, depending upon their requirements for accuracy and finish.

Square and other shapes having a flat surface with connecting arcs and radii are now ground in attachments similar to that used for relieving pistons, as well as the attachment for automobile cams illustrated in Fig. 1.

With this method a square end on a transmission shaft measuring 1 in. square and 3 in. long can be ground at the rate of 65 pieces per hour, removing 0.020 in. of stock from the diameter to within a total limit of 0.001 in. for square, diameter and flat on all surfaces, the limit on the flat surface being from flat to 0.001 in. concave. This is a 90 per cent increase in production over the old method when using cup wheels and a hand-operated indexing mechanism. Many automobile companies have adopted this new method for grinding squares on transmission and pinion shafts, as well as brake cams for their rear axles.

The principal development in production grinding during the last few years can be attributed directly to the application of the wide-face grinding-wheel in its many phases. The automotive industry is largely responsible for its introduction and advancement. This method was used widely during the early stages of the World War for form-grinding shrapnel and other shells.

One of the best and most profitable examples is shown in Fig. 2. This is a common rear-axle housing with a long straight bearing on each end, which requires not so much a reflective finish as it does a round and straight bearing. To accomplish the work satisfactorily a new steadyrest has been employed which has overcome many difficulties encountered in holding this class of work round, as well as made it easier to grind heavy and out-of-balance pieces more accurately.

The feature of this rest that distinguishes it from the rest formerly used is the independent control of the horizontal and vertical motions of the work-shoes. The previous rests were fitted with one shoe that had to be discarded when the fixed arc had worn oversize.

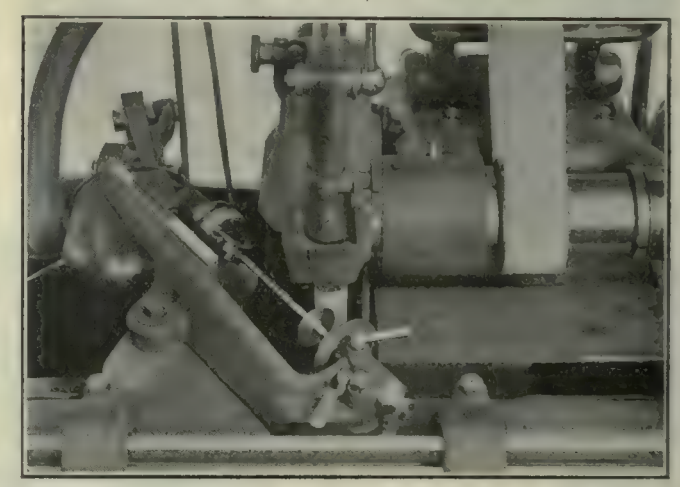
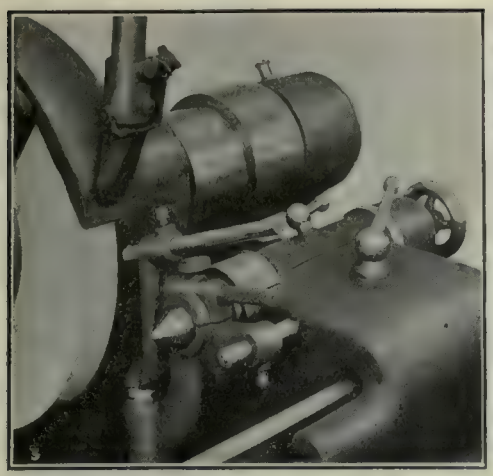


FIG. 4—ATTACHMENT FOR GRINDING SEATS ON VALVES

With independent motions of the work-shoes, as in this rest, the shoes give much longer service by virtue of a generous allowance for wear provided by their adjustability.

Housings such as that shown are now being ground on each end by the full-width wheel method at the rate of 20 and 21 pieces per hour, removing ☆ in. of stock to limits of 0.0010 in. for diameter and 0.0005 in. for roundness. This is done without any previous turning or snagging operation whatsoever.



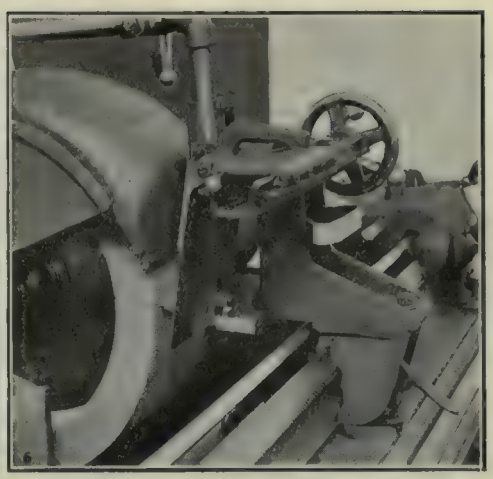


FIG. 5—RADIUS FORMING AND WHEEL TRUING DEVICE. FIG. 6—DEVICE FOR DRESSING THE WHEEL TO A GIVEN FORM

Another good example of the parts produced with a wide-face wheel is the rear-axle shaft. A middle spot was used in the old days as a steadyrest spot to prevent vibration, while the narrow wheel ground each end. Production was 12 ends per hour.

The application of the wide-face wheel removed the necessity for the spotting operation and increased the production obtained in 1913 to 46 ends per hour. Today on the same axle with the introduction of newer types of heavier machine, with the two-bearing independent-shoe steadyrest, the production has reached 800 to 1,000 ends in every 8-hour shift, which is an average of 100 to 125 ends per hour. These two examples of wide-wheel grinding are sufficient to show the advantages when applied to work not wider than 9¾ in. on the ground portion.

During the last year a device known as the wheel-spindle reciprocating attachment has been developed and supplied to automotive plants. When using the wide-wheel method of grinding, before the development of this attachment, it was necessary for operators to move the work table backward and forward by hand to break up the grain lines in the work. This movement of the work across the wheel also served to keep the cutting face wearing evenly. Both of these functions are now performed by this attachment, the use of which has decreased the number of truings required and the manual labor on the part of operators, increased the production and improved the quality of finish.

Great interest has been shown in the grinding of several diameters at one draw-in or straight-in cut, using two or more wheels mounted on a single wheel sleeve. When so equipped the machine is prepared to grind such work as steering knuckles, pinion shafts, some transmission shafts, small differential-case bearings and such work where protrusions separate two or more short diameters.

In the former days when one diameter of a steering knuckle was ground at a time, the hourly production was 50 complete knuckles. By the application of this new double-wheel method the production has been increased to 95 complete knuckles per hour. To accomplish this a special truing ring with positive stops has been applied to the wheel-feed gear and each stop set for truing its own wheel. When both are trued to their respective diameters a third stop is used as a positive in-feed locator for exact sizing. Many automotive plants have adopted this method of double-wheel grinding for work where this method is effective.

Grinding-machine companies have designed and built their machines with special-shaped tables, believing that in their respective particular shapes were to be found great advantages of rigidity and of retaining the correct alignment between the centers of the headstocks and footstocks. This made it difficult for them to design suitable special fixtures for special grinding jobs.

In the last year flat-table machines have been developed that consist of a swivel table made to a height to accommodate a user's special requirement. During the same period the grinding-machine builders have been requested to produce certain other special attachments to enable their customers to secure a larger production of certain kinds of work that can be finished best by grinding. One of these special attachments is an adjustable speed live-spindle headstock that is used for grinding such work as pistons and other open-end pieces and differential cross-members. When grinding pistons on this attachment, as shown in Fig. 3, the faceplate is removed and a special cone driver screwed

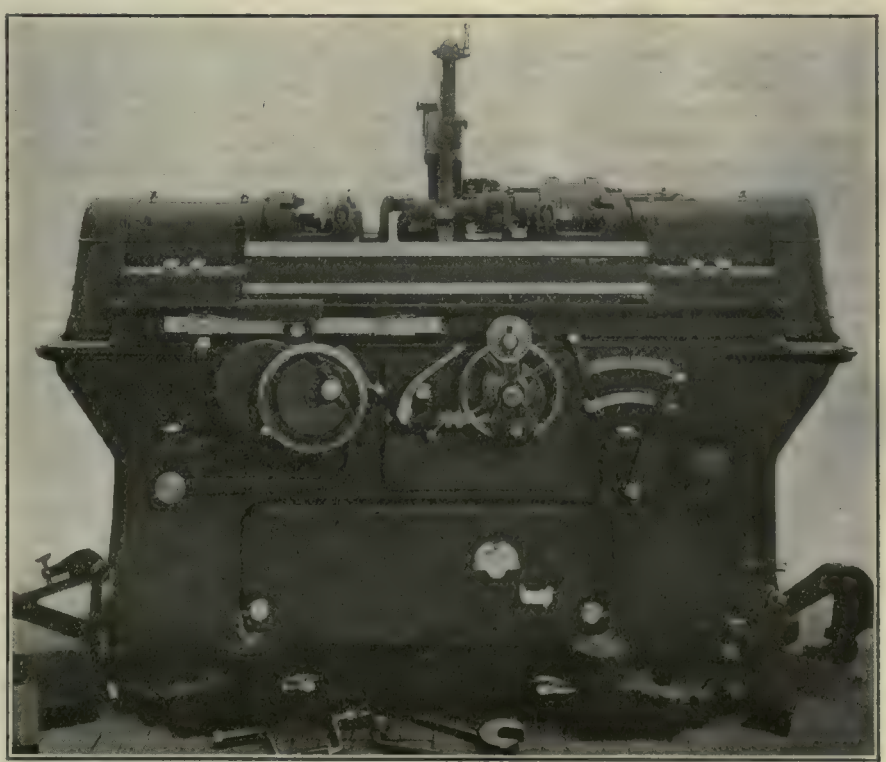


FIG. 7—SELF-CONTAINED CRANKSHAFT GRINDING MACHINE

into its place. The pistons are then ground at the rate of 75 to 90 pistons per hour, depending upon the degree of accuracy and finish required.

The attachment illustrated in Fig. 4 was developed for attachment to regular machines for grinding seats on valves. Adjustments for the length of the stem as well as the degree of taper on the seat are provided. A special feature of the attachment is the provision that has been made for grinding on centers, although other attachments of this same form are fitted with collets to grip the valve-stems.

Many of the makers of crankshafts have insisted upon very accurate round fillets at the ends of crankpins and bearings. A device for forming a radius on the grinding wheel and also for truing the face of the same wheel is shown in Fig. 5.

Certain jobs having a taper and several straight diameters can be ground best with the wide-face wheel. The forming device illustrated in Fig. 6 has been developed to form the wheel for grinding an entire surface, including tapers or straight portions. The form of the wheel face is generated from a form-bar that is located directly in back of the roller. The operator places the attachment on the table in front of the wheel which is brought into contact with the diamond. He then turns the handwheel, moving the diamond across the face of the wheel, following the outline of the form-bar and reproducing it on the wheel face. Since the introduction of this device the production has been increased from 100 to 400 per cent in a great many instances.

In ball- and roller-bearing work special arbors have been made for holding as many rings as can be covered by the wide-face wheel, not over 10 in. wide. By this method production has been increased from 100 to 400 per cent over what was formerly attained with narrow wheels. In addition to this the wheel-spindle reciprocating device has been applied to the machine. This addition improves the quality of the work, increases the production and reduces the wheel cost.

Special Machines

For several years the automobile companies have made a careful study of machine maintenance and have said that the overhead-drive type of machine was very expensive to maintain. Now the demand has changed and requests have been made for machines having self-contained drives and controls. The grinding-machine industry has brought out new types of machines with this thought in mind and also with the purpose of still greater production of good work at less maintenance cost. The very newest self-contained development is arranged for power table-traverse drive for such work as oil-tubes or rocker-arm shafts having a larger ground diameter than could be covered by a wide wheel.

Another special-purpose machine has been developed in which the grinding is done on the extreme right end for such work as axles, drive-shafts, pinion shafts, sleeves and other parts where the wide wheel is the most productive. For all short work a short, stiff, compact machine equipped with the wheel-spindle reciprocating attachment and the power in-feed attachment that is used for automatic straight-in feed of the wide-face wheel that covers the entire surface of the part being ground has been brought out.

All of these new-type heavier machines are equipped with new mechanisms for driving the wheel. The wheel spindle is driven by a belt from the power shaft, inclosed in the base, and running in self-oiling ball-bearings. The wheel-spindle bearings are of a new and improved type and are lubricated by a constant stream of oil, forced through the bearings by a pump. Their adjustment is so simple that the operator can overcome all looseness by simply turning the thumb-screws while the spindle is running.

I have mentioned these features because it is through these new and improved designs on the part of the grinding-machine builders that larger production and improved quality have been brought about.

Crankshaft Grinding Machines

Ever since the very beginning of automobile-engine building, the crankshaft has been a most difficult part to machine. The last operation has been the grinding of the crankpins, and the great difficulty has been to finish these pins round and straight to within small limits of accuracy, practically free from any imperfection. Considerable difficulty has been experienced in obtaining the required accuracy, and it is remarkable how successful the makers of crankshafts have been with the machines given to them for their use. Every grinding-machine builder has done his best to make machines that would produce crankshafts satisfactory to the trade, but more or less trouble in obtaining a satisfactory product has always been experienced. In the last two years still newer types of machine for grinding crankpins have been developed and installed in a number of automobile factories. These employ a new method of driving the work-spindles.

The machine illustrated in Fig. 7 has met the demands of the automotive industry for a complete self-contained unit. The ground product has been greatly improved and the production increased over that from older types of crankpin-grinding machines.

Automatic wheel in-feed mechanisms for semi-automatic crankpin grinding have been introduced in this as well as in other new and heavier machines. As a result, in some places the operator merely clamps a crankshaft into the work-holders, pushes the lever shown at the right of the wheel-feed gear over to the right, and releases the automatic steadyrest-lever. The pins are either rough-ground or finish-ground automatically with from a 15- to 25-per-cent increase in production over previous methods, with less wheel cost and a very satisfactory finished product.

The machine shown in Fig. 7 can be said to meet the demand for smoother running machines for this class of work and the traditional belief that gears produce chatter marks has been considered. The gears have been replaced with a silent-chain running from the lower drive-shaft to the table drive-shaft and other chains from both ends of the table drive-shaft to each revolving spindle. Where these machines have been adopted there have been no complaints of chatter-marks in the crankshaft.

The automotive industry has become so huge that it must be regarded as the chief element of machine-tool business and the principal factor in forcing new developments in machine-tool design and construction. Competition among builders of internal-combustion engines constantly calls for greater production and machines of greater precision. The desire of those most interested in furthering developments along the grinding line is to originate, instead of to copy some of the present achievements. To copy is not progressive; to originate is to progress.



FIG. 1—A BIRD'S EYE VIEW OF PART OF THE RECONSTRUCTED SHIPBUILDING PLANT OF THE CANTIERE-NAVALE-TRIESTINO COMPANY

What Peace Has Meant for the Italian Shipbuilding Industry

BY HENRY OBERMEYER AND ARTHUR L. GREENE

The condition of the industry since the signing of peace — Tiding over inactivity with side production — Inauguration of industrial management in the industry

AN INCREASE of one million tons in Italian ship tonnage since the world war, a decrease of about 80 per cent in cargo rates, greatly increased world competition in the carrying trade, increased costs of ship construction conservatively estimated at five times pre-war costs, under which head come mainly increased costs of raw materials and necessary wage increases for workers in the shipbuilding trades, are the leading items listed by the managing director of the Cantiere-Navale-Triestino of Trieste, Italy, in summing up the marine situation of that country today. To claim that this industry, after four years of peace, presents any glowing picture of a return to normalcy and of peace-time productivity would be quite far from the truth. In view of the above, therefore, the query that follows is perhaps a natural one: What are the causes of present conditions and what will be the ultimate outcome?

To understand the situation existing at the present time in the shipbuilding industry of one of the principal maritime nations of the world, one must necessarily glance backward over the preceding four years and view the industry as it presented itself immediately after the signing of peace. At the beginning of hostilities between Italy and the Central Powers in May, 1915, the former nation had a total tonnage in merchant ships of 1,500,000. During the intensive submarine campaign waged by Germany and Austria in the Mediterranean and Adriatic Seas this tonnage was reduced, despite over-time production of the many Italian shipyards, to less than one-half. It might be said, therefore, that Italy emerged from the war with the cream of her shipping fleet destroyed. Under the terms of the Treaty of Versailles, Italy received from the enemy states, but chiefly from Austria, about 800,000 tons of shipping and with this as a nucleus, proceeded to reestablish her merchant marine on a bigger and even more pretentious scale than before the war. Encouraged by the then prevailing high cargo rates, she succeeded in increasing her tonnage within two years to 2,500,000 tons, partly through new construction and partly through purchase of United States Shipping Board vessels. What followed in 1920 is perhaps still too vivid in the memories of our own shipping interests to need repetition here. Sufficient to say that Italy, as well as the rest of the maritime powers of the world, found itself with an over supply of bottoms, international trade and commerce received a severe set-back and universal stagnation settled over the industry.

This situation has not been bettered with succeeding years. If anything the impasse hovering over the entire shipping industry of Italy is steadily growing more acute. The two largest shipyards of the country, the Cantiere-Navale-Triestino, which is shown in Fig. 1,



FIG. 2—ELECTRIC MOTOR AND TRANSFORMER DEPARTMENT

and the Establimento-Technico of Trieste, the latter of which was the largest naval construction and marine engine plant of Austria before the war, are working at less than 40 per cent of peace-time production.

To what extent the hopes of the shipbuilding industry have been fulfilled with respect to a continuation of the shipping boom of the war years and those immediately following, is shown by figures supplied the writers on the number of new ships constructed at these yards during the past three years. During this time only eleven new ships of comparatively small tonnage have been laid down, the majority of this number, however, having been started in 1918 and the early months of 1919. Only one of this number was started in 1920. During the past two years no new ships have been laid down. Six of the eleven ships started in 1918 and 1919 were of 8,500 gross tons, while the remaining five were of considerably smaller tonnage. At the plant of the Establimento-Technico, the lull in the shipbuilding industry has been, if anything, even more accentuated. This plant, which has specialized in the fighting type of ship as differentiated from the cargo and passenger boat, has been without any orders for new construction during the past three years. One of the many reasons, among others, given by officials of this company for the present lull in the naval program, has been because of the Washington Disarmament Conference Treaty which Italy recently ratified. Shipbuilding for foreign countries, which has always been one of the mainstays of the Italian industry, has completely stopped and no orders of this kind are in sight.

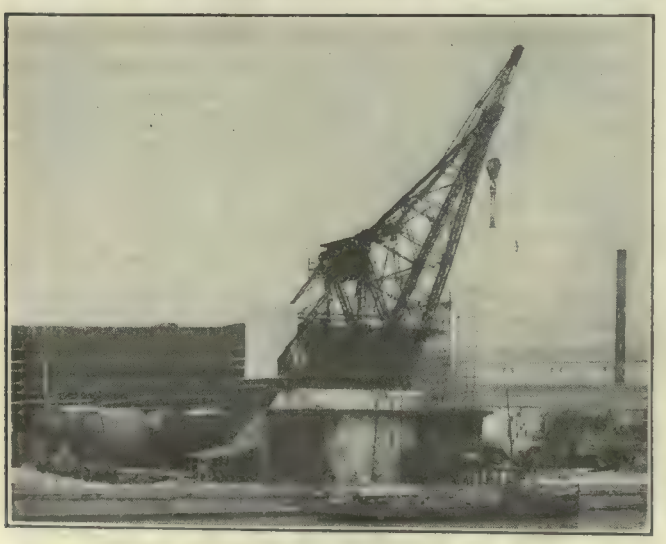


FIG. 3—100-TON ELECTRIC CRANE FOR SHIPPING PURPOSES

But while the surplus of ships existing in the Italian mercantile marine since 1920 goes a long way toward explaining why its shipyards have been without orders for new construction from Italian shipping companies, it does not explain entirely why foreign orders have fallen away. In reply to this question asked a director of the Cantiere-Navale-Triestino Co., as to why this had occurred, he referred to his earlier remark concerning the great increase in cost of construction in Italy, mainly due as stated before to increased prices for raw material. Advanced prices for iron and steel, it was said, have greatly increased competitive difficulties with other nations, particularly with such countries as maintain their own ore fields. Together with this factor, as was pointed out previously, is that of wages of workmen in Italian shipyards, which while still below many other European countries, have risen very considerably over pre-war figures—in some cases estimated at three times the schedule for 1914.

At the same time rates for freight transportation have fallen as much as 30 to 40 per cent since the war. Intensified competition by nationals left with huge ship tonnage after the war is given as the main reason for present low carrying rates and while such surpluses exist, the outlook for the shipping companies themselves looks exceedingly dreary. Loss of emigration to the United States has been another severe blow to Italian shipping interests. As an instance of what has happened to many of the larger companies of the country, it is worth noting that the Cosulich Line, which before the war operated 40 ships in coastwise and trans-Atlantic service, today has only 25 ships operating at part time.

Tiding Over Inactivity

In view of this widespread slump in the shipping industry, it is perhaps surprising that the plants have not been forced to completely suspend operations. As has been the case with industries of other countries, the shipbuilding plants of Italy have had to resort to many varied lines of side production to tide them over the widespread inactivity of the past three years. The many phases of electrical development which have been noted in such countries as Germany, France, the Scandinavian countries and Switzerland, have received like impetus in Italy since the war and therein has lain the salvation of the industry. According to an official of the Cantiere-Navale-Triestino Co., the demand for electrical motors and electrical equipment of all kinds, both large and small, has been unprecedented in the history of the country and with the inauguration of the many electrical development projects, this particular field of industry has become the one great prosperous industry of the country.

The after-war condition of the State railroads, as well as the many repairs made necessary on rolling stock, has also been a factor in helping to keep other lines of production employed at full or part time during the past four years. Much of the repair of State locomotives and State railroad equipment was formerly done in Austria. Much in line with the same policy that the French have pursued, of French reconstruction for French labor, the Italian Government has attempted to make itself independent of the help of its former enemy and in pursuance of this policy, it has made special inducements to other lines of industry to take over such repair and construction work.

In the neighborhood of Trieste particularly, the Italian government has been anxious to keep the repair work of its newly acquired railroad systems and rolling stock out of the hands of the Austrians. With the idea in mind of helping to solidify the union of this old Austrian section to Italy, the Government has distributed railroad reconstruction work to the industries in this section and in the case of the Cantiere-Navale-Triestino Co., such action has been of material help in the present crisis in the shipbuilding trades. But by far the greatest boon to the industry has been the demand for electrical equipment. This company started the building of stationary electric motors and transformers as illustrated in Fig. 2, about six months past, and some idea can be had of the strides made in production when it is mentioned that the business done during that time has amounted to more than three million lire.

Much the same line of side production has been followed in the Establimento-Technico shipyards. In the St. Andree plant of this company practically the total number of employees are engaged in the manufacture of stationary engines and small Diesel engines of 100 to 800 hp. each, while but a few turbines and marine engines of four cycles are manufactured. As in the case of the Cantiere-Navale-Triestino Co., this marine engine plant has only been engaged in its new line of production for the past six months.

With respect to the aid given the unemployed by the State, the situation is perhaps one of the most deplorable to be found in any of the countries on the continent of Europe. There is found no such system as is prevalent in such countries as Germany, France and even Czecho-Slovakia, where both the Government and the industrials join forces in giving financial aid to the unemployed. The Government assists the unemployed worker to the extent of giving him 5 lire per day, but with the payment of this sum all other Government aid ceases. In such sections of the country, as in the neighborhood of Trieste, where much of the fighting between the Italians and Austrians took place, many of the unemployed eke out a meager existence by collecting bits of scrap iron and other metals not already salvaged and selling it to industrials for which they are payed about 100 lire per ton.

While peace may be said to have placed the Italian shipping industry in the lowest depths of a national industrial depression, it has had one inestimable advantage in making for better working conditions of the shipyard employees and of inaugurating a new system of industrial management in the industry. What has taken place in but one or two of the principal shipyards up to the present, is forecasted to extend not only throughout other industries of the same kind, but to extend as well to all the other major industries of the country. The Cantiere-Navale-Triestino Co. has been the first of several to introduce a system which before the war was totally unknown in practice among the industrial institutions of Italy. We refer to the American system of establishing welfare work for the bettering of the physical and moral surroundings of the worker and his family. The introduction of these humanitarian aids by the Cantiere-Navale-Triestino Co. has been certainly the most extensive and most admirable yet adopted in any of the industries of the country and seems likely to bring about radical changes in Italian labor conditions within the next few years. For this reason alone some of the methods introduced are worth noting more in detail.

The actual reconstruction of this plant in 1918 with new equipment such as the electric crane illustrated in Fig. 3 and new foundries similar to the one shown in part in Fig. 4, was accompanied by the erection of workingmen's homes, a worker's and employer's hotel for unmarried men, a theater, a trade and elementary



FIG. 4—ONE OF THE NEW WELL EQUIPPED FOUNDRIES

school, a company restaurant, the establishment of a water supply station and central power plant for the furnishing of running water and lighting for the homes and hotels, a swimming pool and bathing beach, the erection of a central post office and finally and not least important, was the segregation of a large tract of land for a company farm.

Most important, perhaps, was the establishment of workingmen's homes. Situated just outside the main buildings of the plant, the newly constructed homes shown in Fig. 5 are layed out on parallel streets and are generally two-and-a-half stories in height and made of concrete or stucco. Each house is supplied with electricity and running water from the company plant. Rental for one of these houses costs the worker a total of 70 lire per month (about $3.50 at the present rates of exchange) while a charge of five lire per month is made for electricity. Water is supplied free of charge. At the present time there are some 200 of these houses already constructed and occupied, while plans are being made for an extension of this number as soon as conditions warrant an increase in the number of employees and workers. For the unmarried worker the



Fig. 6 - Workingmen's dining room during lunch hour



Fig. 7 - Main worker's dining room



Fig. 8 - Entrance hall of staff hotel



Fig. 9 - Recreation room and bar at staff hotel





Fig. 11 - Workingmen's swimming pool

Fig. 10 - Company theatre for employees

company maintains a large hotel, interior views of which are seen in Figs. 6 and 7, with a capacity of 700 persons, where the worker may live by paying the same rental as the married employee or worker is charged for one of the homes. A special hotel, illustrated in part in Figs. 8 and 9, having a capacity of about 150 is maintained for the exclusive use of the administrative force and clerical staff.

A restaurant is maintained in each of the hotels for use of the workers and employees of the company. The charge for meals in these restaurants is virtually at cost, the worker paying six lire a day for breakfast, lunch and dinner and the staff employee paying slightly more, about 9 lire per day. No attempt at profit is made either on the rentals or on the food.

For recreational purposes the officials of the Cantiere-Navale-Triestino Co. have constructed a large theater, the interior of which is seen in Fig. 10, costing 500,000 lire, and capable of seating 1,000 persons in which is given a "movie" show every night during the summer months and at which the entrance is free of charge. In the winter the company engages operatic stars and musical talent from the principal theaters of Italy to give plays and concerts at stated intervals, to attend which the worker pays but a nominal entrance fee. A theatrical organization and orchestra is maintained by the workers and several times each season a play or concert is given by the local organizations. In other lines of recreation the company maintains an indoor swimming pool, a view of which is shown in Fig. 11, open to all workers and their families, while in the summer months the adjoining beach is used for water sports where bath houses have been built at the company's expense.

One of the new innovations in Italian industrial life is the trade and elementary school maintained on the company's premises. Both of these schools were built by the company when the plant was reconstructed and both were originally maintained and operated under its jurisdiction. Recently, however, the Government has taken over the elementary school but the company still operates and finances the trade school. All children of the company village are obliged to attend the elementary school up to a certain age and afterward they may attend the trade school free of charge until they have reached the age of fifteen years. Upon reaching this age they may enter the employ of the company. Instruction in the shipbuilding trade and allied lines is given the workers in the evening.



FIG. 5—MODEL VILLAGE BUILT FOR THE WORKMEN

While this brief résumé of fundamental conditions as found in the shipbuilding and mercantile industry of Italy today helps but little in solving the difficulties confronting the industry, it does present a view of conditions that throw some light on what the future holds in store. Most important is the view held by leaders in the industry, much the same as in our own country, that many of the existing yards in the country will have to be diverted to other lines of production. Much of the wholesale desertion of the industry now taking place will be definitely lost and never will return. To what extent this loss will be detrimental in establishing a larger Italian mercantile marine when world trade conditions return to normalcy, only the future can tell. Italy came out of the World War with a huge national debt, a debt owing our country alone of almost two billion dollars. Such is the financial and economic condition of the country that it cannot even hope to begin interest payments on this debt for some years to come, while many maintain that it will never be in a position to pay off the capital.

How these financial difficulties have reacted on the shipping industry is evident when it is stated that the Government, because of them, has been unable to grant that which is most needed to keep the industry on a productive basis—namely a state subsidy.

For the Italian shipbuilding and mercantile industry, however, the lessons taught in the last several years, have brought out some serious consequences. Practically dependent on outside sources for all raw materials which go into the building of the modern liner and cargo boat, she has seen prices for iron and steel advance to undreamt of levels, prices which an official of the Establimento-Technico estimated at seven or eight times that of pre-war prices.

That the Government can do anything to relieve the situation is beyond the hope of those in the industry. What the shipbuilders themselves will do under the circumstances is steadily becoming more apparent. The trend is being shown in what has already taken place in two of the principal shipbuilding yards of the country, namely the dismantling of parts of the yards and the turning of their facilities over to more lucrative lines of work.

Book Reviews

Blueprint Reading. By Joseph Brahdy. Published by D. Van Nostrand Co., 8 Warren St., New York, N. Y. Clothboard binding, 108 pages, 11x8 in., 100 illustrations, price $2.50.

The aim of this elementary textbook on the subject of blueprint reading, as stated by the author in his preface, is to enable the student with elementary school training, and with little or no knowledge of mechanical drawing, to read commercial blueprints. The methods for making blueprints are first described and, although it is stated that the student does not have to learn mechanical drawing to read blueprints, several rules and suggestions for making drawings are given to familiarize the student with the principles underlying the work.

The elementary conception of a working drawing as the representation of an object is explained with diagrams and isometric views and several methods to help in the visualization of the object represented on the drawing are given. Particular stress is laid throughout the book upon this matter of gaining a clear mental picture of the object drawn. The dimensioning of drawings and the use of the scale is well covered together with the reading of blueprints which show more or less than three views.

A chapter on orthographic projection is followed by one on conventional practice, and finally the drawings for several machine parts and a complete standard grinder are considered in detail.

The book is well arranged and should serve the purpose for which it is intended. The reproductions of blueprints are colored blue, a procedure which adds to the attractiveness of the book as well as familiarizing the student with the actual appearance of shop prints. A number of questions which can be answered from the drawing are given after each, and are arranged to call the attention of the student to all the details.

The Welding Encyclopedia. Third Edition. Compiled and edited by L. B. Mackenzie and H. S. Card. Flexible leather grain covers, 6x9 in., 437 pages, gilt edges, about 600 illustrations. Published by the Welding Engineer Publishing Co., 608 South Dearborn St., Chicago, Ill. Price, $5.

In the main the volume is the same as the second-edition encyclopedia announced on page 172d, Vol. 58, of the *American Machinist*. The first 160 pages of the book make up the actual encyclopedia or dictionary, where words encountered in welding practice are defined and explained. After this section are a number of chapters devoted to the different types of welding and to its chief applications. The aim has been to make the treatment complete, to cover the whole field of welding and to adapt the book to the needs of students and instructors as well as of shop men and engineers.

The latter object is accomplished by the addition to this volume of a chapter on the training of operators for both oxy-acetylene and electric arc welding. Courses of instruction are outlined. Other additions have been made in the present edition to make the treatment more complete, particularly on the subject of welding tanks and pipe. In the back of the volume are useful charts and tables, followed by a catalog or advertising section of about 75 pages.

Fundamentals of Welding. By James W. Owens. 659 pages 6x9 in., 279 illustrations. Published by the Penton Publishing Co., Cleveland, Ohio. Price in red cloth boards, $10.

The author of this book is U. S. Navy Welding Aide, and has been in direct charge of the welding work and instruction at the Norfolk Navy Yard for several years. He has gathered from his own experience and from other sources, a large amount of information of value to those interested in gas-torch, arc, or thermit welding. While the book touches lightly on mechanical, or machine welding and cutting, the instructions for the manual use of the gas-torch and arc are very complete, and numerous illustrated examples and tables are given to aid the beginner, student and advanced welder.

There are 25 chapters, headed as follows: Classification and Nomenclature; Preparation and Finish; The Gas Weld; The Arc Weld; Technic of the Arc Weld; The Thermit Weld; Gas and Arc Cutting; Metallography of the Weld; Residual Stresses; Speed and Cost of Welding and Cutting; Choice of Methods; Design; Inspection and Tests; Production and Distribution of Oxygen, Hydrogen and Acetylene; Arc Welding Generators and Transformers; Welding and Cutting Machines; Welding Rods, Electrodes and Fluxes; Protectors and Safety Precautions; Organization, Shop and School Layouts; Training; A Practical Gas Welding and Cutting Course; A Practical Arc Welding Course; Standard Specifications; Practical Applications; Summary and Conclusions.

Tentative Standards of the A.S.T.M. 859 pages, 6x9 in. Published by the American Society for Testing Materials, 1315 Spruce St., Philadelphia, Pa. Price $7 in paper, $8 in cloth.

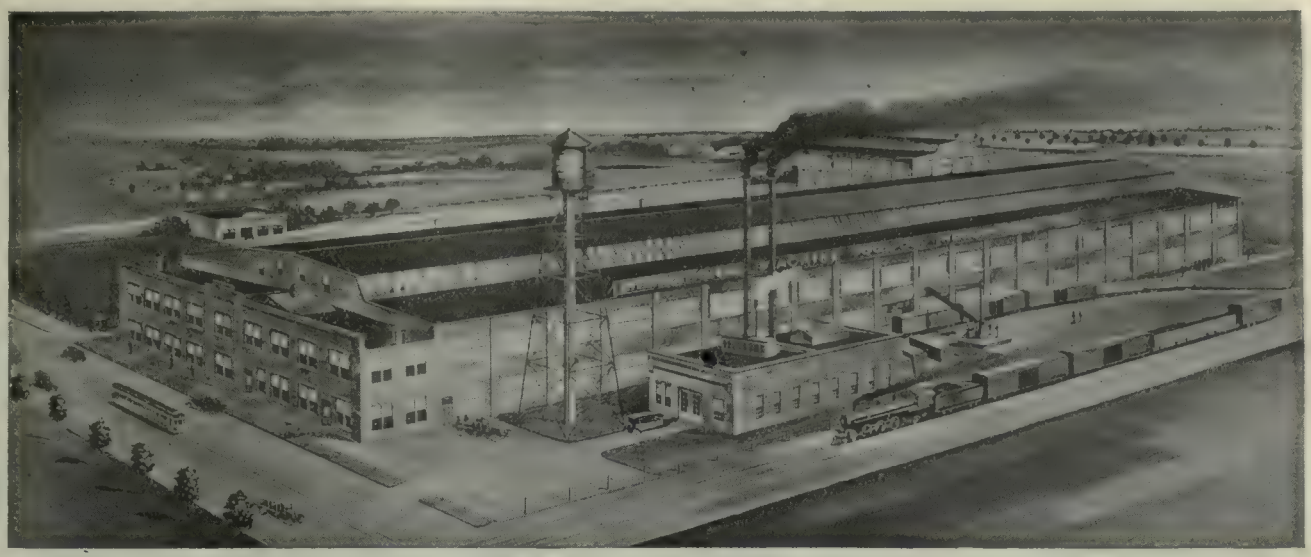
This volume is a very encouraging sign of the growth of standardization in this country. And though the standards given are called tentative, it is likely that most of them will be approved. The society calls a standard "tentative" until, after being published for one or more years to elicit criticism, it is finally adopted.

There are 170 tentative standards, varying from road material, which leads the list with 33 standards, to thermometers with but 3. Steel, wrought and cast iron have 23 standards while non-ferrous metals have 12, these being of most use to our readers. Three of the standards, for carbon tool steel, steel castings and heat-treatment of carbon-steel castings, are of particular interest to machine builders and users.

The book gives gratifying evidence that standardization is progressing. Users of the materials considered should study the standards proposed and either adopt them or point out to the A.S.T.M. where they should be changed.

1923 Year Book and Export Register of the Federation of British Industries. Industrial Publicity Service, Ltd., 4-7 Red Lion Court, Fleet St., London, E.C.4. Three hundred and ninety-two 7x9½ pages of articles and manufacturers and three hundred and two pages of advertisements. Bound in cloth boards.

This book is well gotten up and while it is intended for such use as are the various commercial registers in the United States, its lists are apparently limited to the products of the Federation of British Industries, the members thereof and their advertisements.

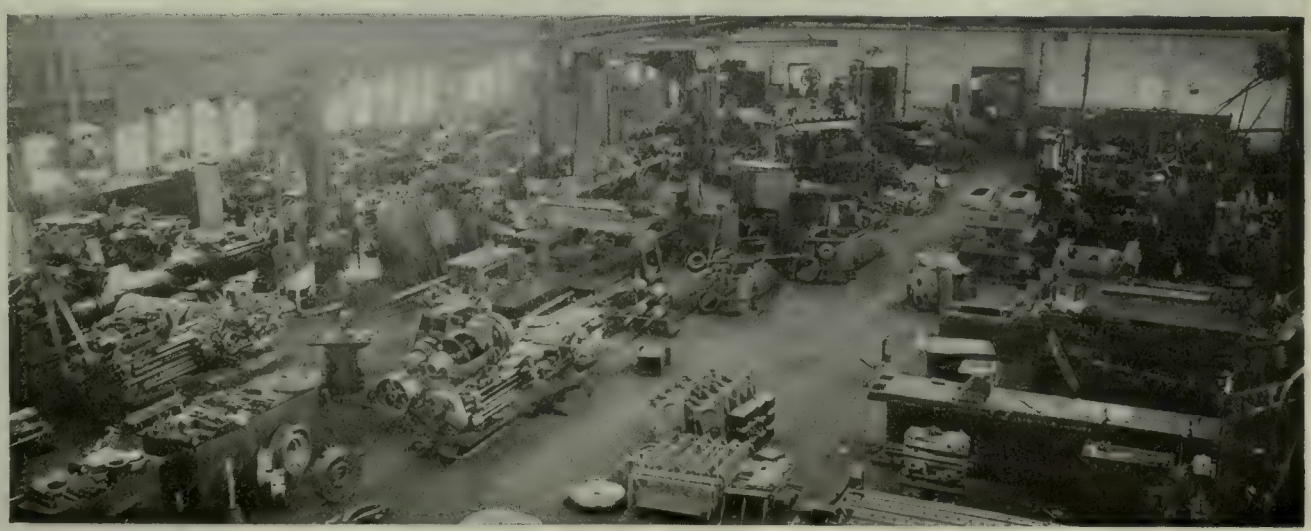


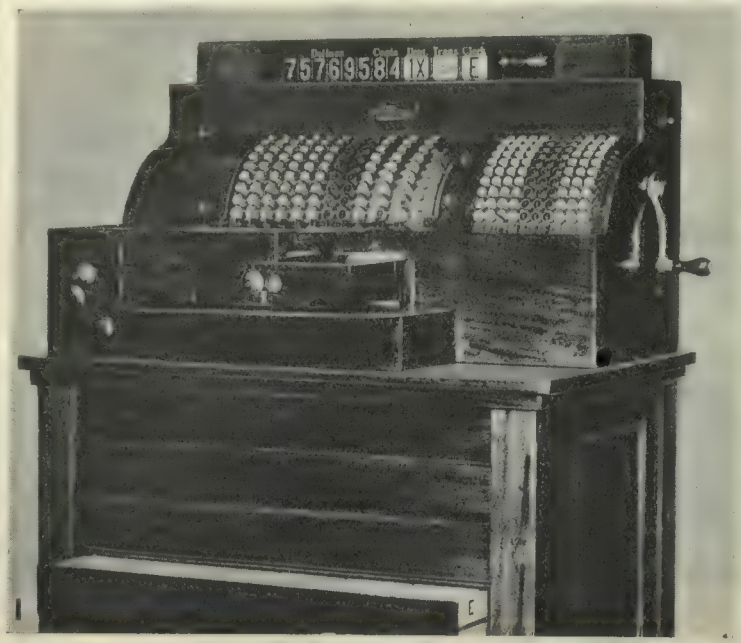
Where Machine Tools Are Made

The International Machine Tool Company

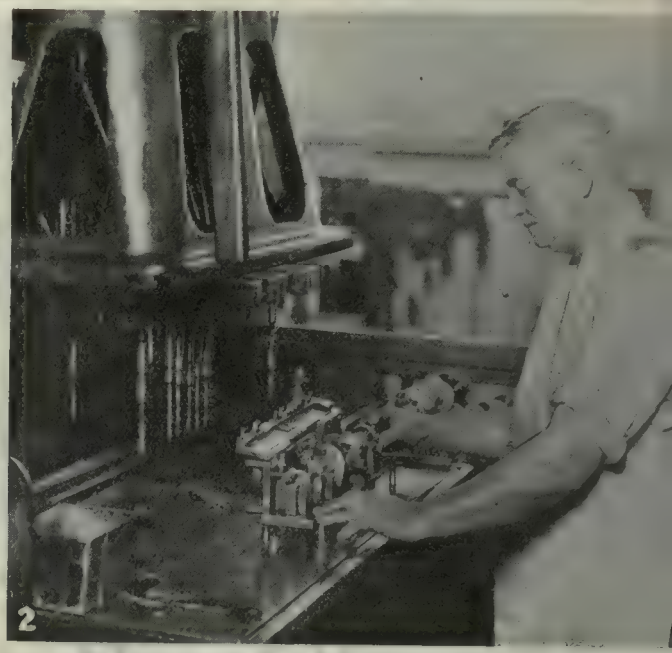
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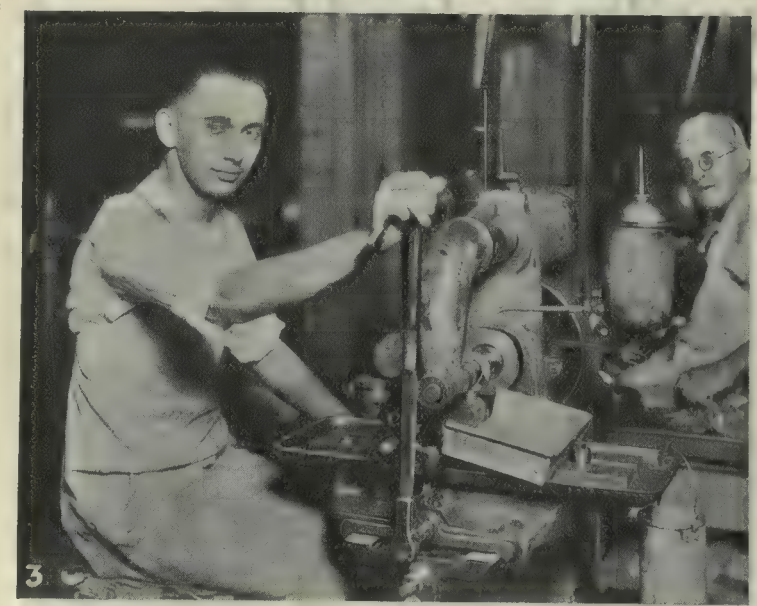




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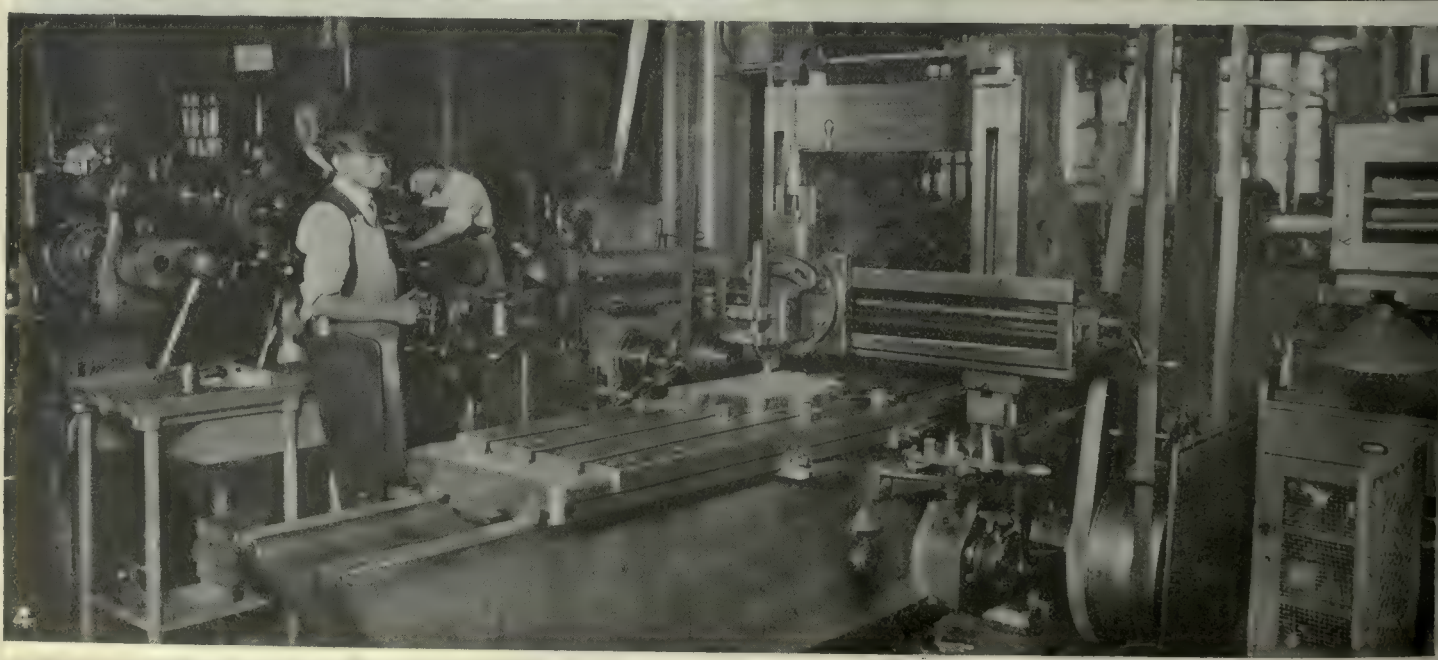
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Machine Tools for the Cash Register

National Cash Register Co.
Dayton, Ohio



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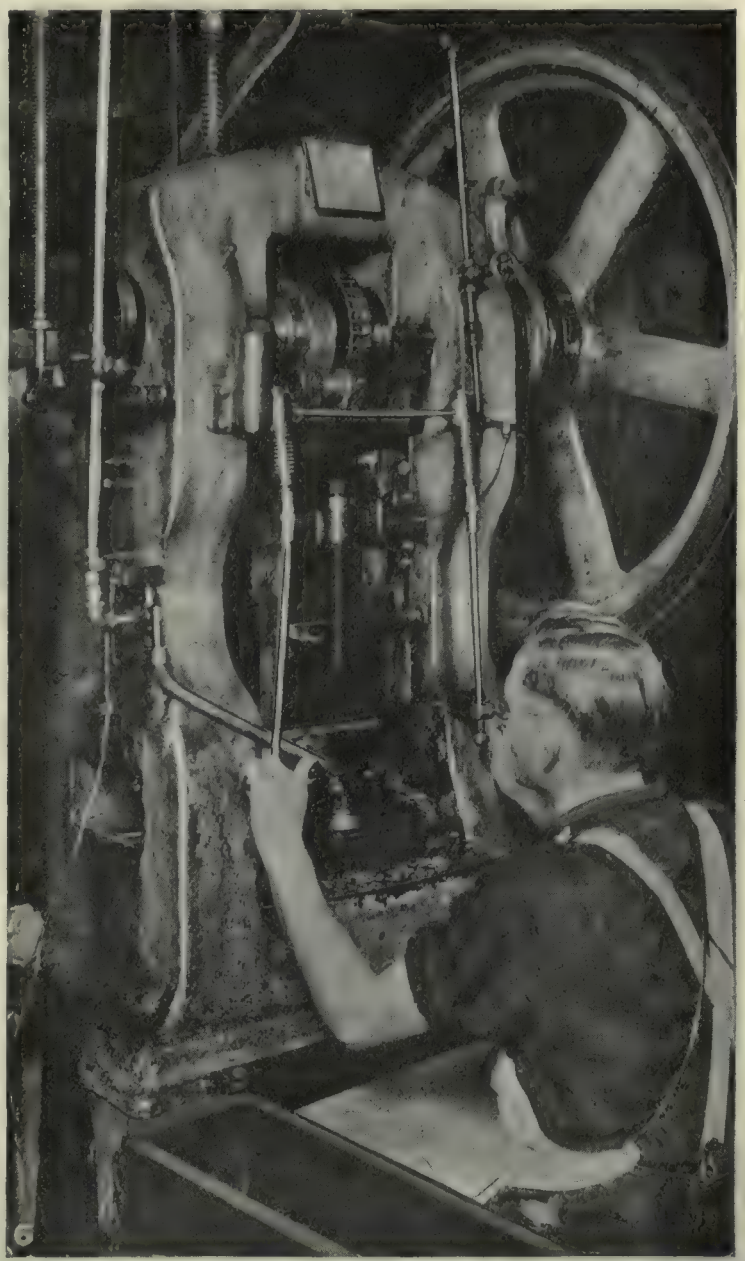


Fig. 1—The National Cash Register

Fig. 2—Multiple Drill on Sub-Assembly

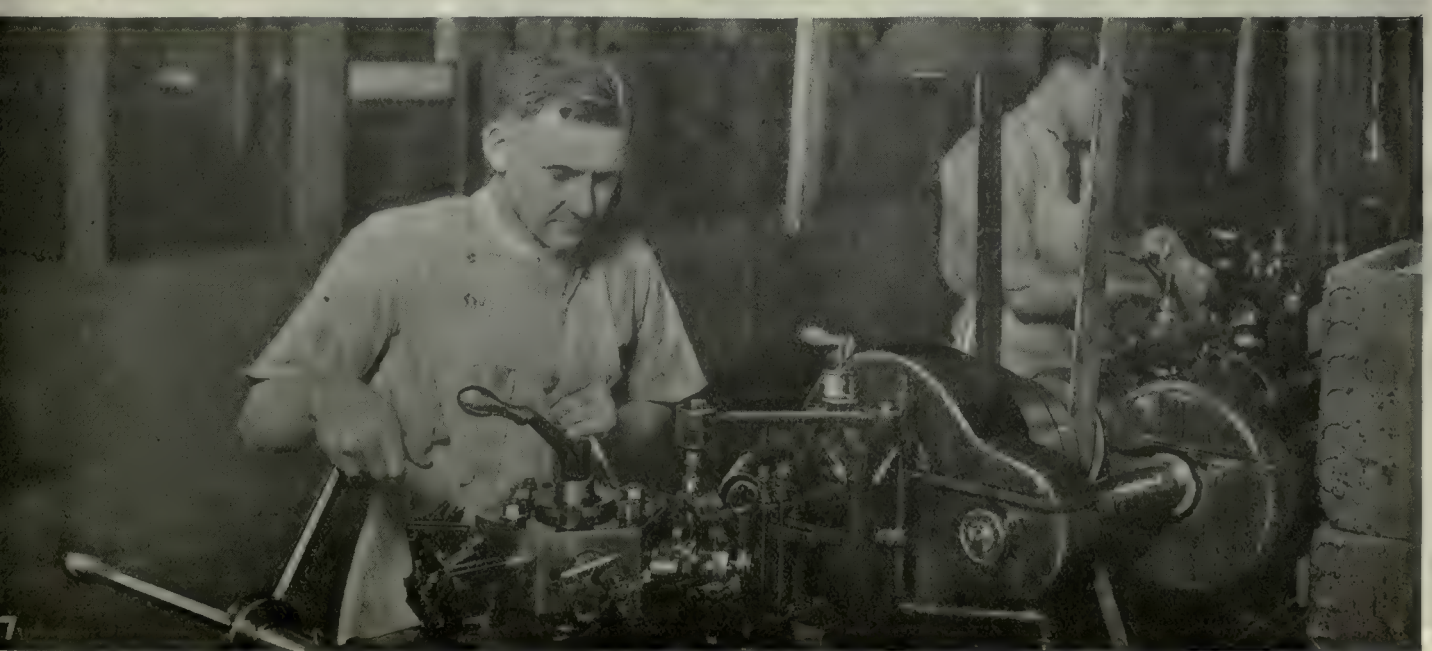
Fig. 3—Hand Milling Machine

Fig. 4—General Machine Department

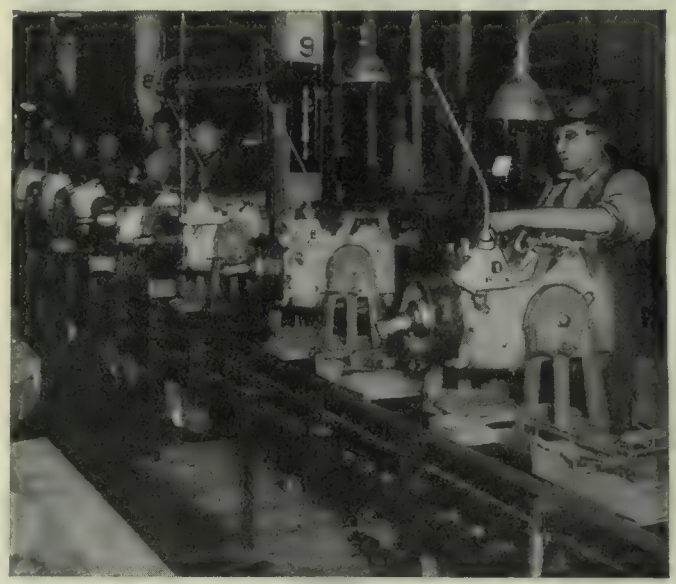
Fig. 5—Multiple Drill on Wooden Cabinet

Fig. 6—Jigger Punch Press

Fig. 7—Hand Screw Machine







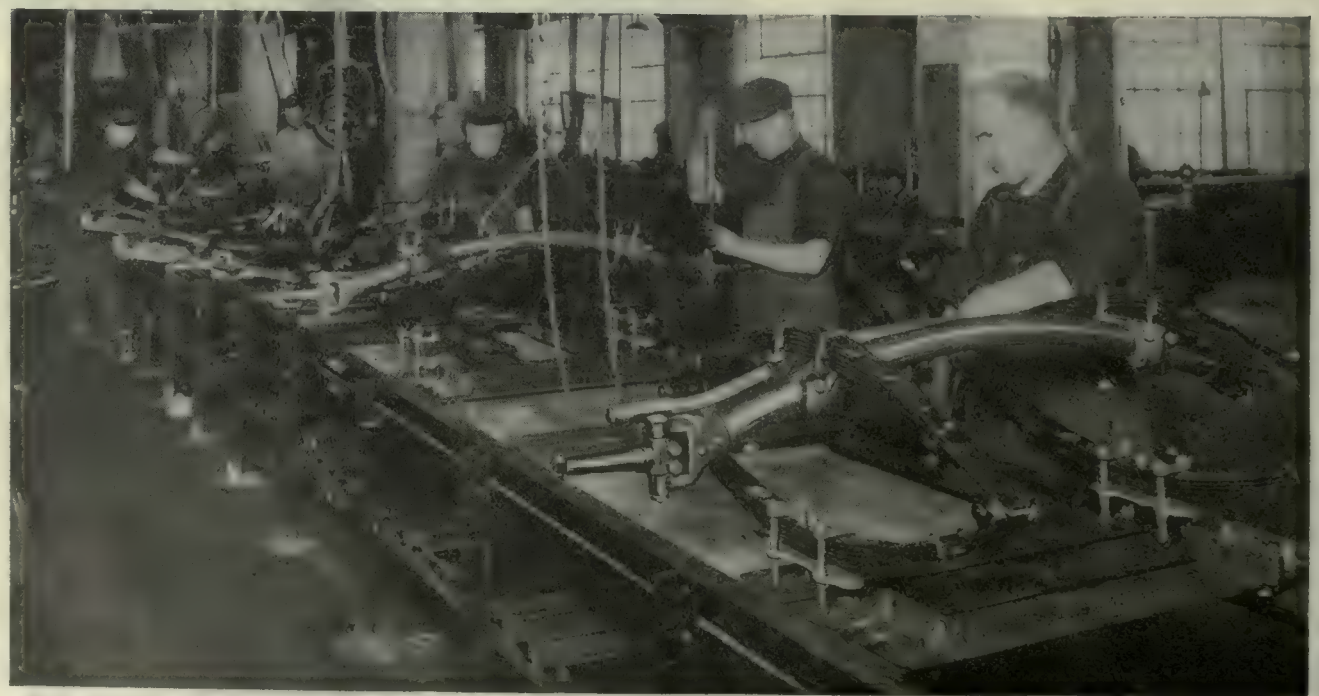
How the Franklin Rides to Completion

Above—Motor Assembly

Left—Transmission Assembly

Below—Front Axle Assembly

Photographs by courtesy of the Alvey-Ferguson Co.



Proposed Standard Nomenclature for Gearing

Terms proposed by the Sectional Committee* on Standardization of Gears—Have not been submitted as recommended practice—Now offered for study and criticism at large

THE nomenclature included in the following report of the Nomenclature Committee of the American Gear Manufacturers Association is published with the object of creating discussion and obtaining thereby helpful suggestions from everyone interested in gears. Communications may be sent to the secretary of the Association, T. W. Owen, 2443 Prospect Ave., Cleveland, Ohio, or to the editor of the *American Machinist.*

"Your committee, in co-operation with the various standards committees of our association, has been working right along on the simplification of the nomenclature of gearing. We already have submitted the report of the nomenclature as prepared by the bevel and spiral bevel gear committee, and as prepared by the spur gear committee. We will have to add the necessary classifications as required by helical gears, worm gears, racks, etc., as the work progresses.

"At the same time as this work has been progressing, the sectional committee of the American Engineering Standards Committee, has had this subject actively in hand, and acting under the sponsorship of the A.G.M.A. and the A.S.M.E., has thus worked hand in hand with your own committee. In the simplification and improving of the various gearing definitions, your committee herewith submits to the membership, the gearing definitions as accepted to date, by the sectional committee.

"These definitions have been determined upon as the result of considerable labor and consultation, and yet they are not submitted for recommended practice at this time, because it is thought best that the members have time for study and for criticism, because in actual use of these definitions, improvements may well be suggested."

*The Sectional Committee on the Standardization of Gears is under the sponsorship of the A.G.M.A. and the A.S.M.E. After the suggestions obtained by publicity have been considered, the accompanying nomenclature, evolved by the Sectional Committee, will be revised and offered to the sponsor bodies for approval.

When a dimensional value is given to any of the following terms, it is understood that they are taken from dimensions based on theoretical conditions and proportions.

Active face is the length of the working surface of the teeth in the axial plane.

Addendum is the distance, normal to the pitch surface, from the pitch surface to the top of the tooth.

Addendum angle is the angle between the pitch cone and the face cone in a plane containing the axis. (Also called the increment angle.)

Angular bevels are bevel gears which are to operate on shafts having an included angle other than 90 degrees.

Arc of action. The arc of action is the angular distance a tooth travels from the point where it first makes contact with its mating tooth until it leaves contact. (Sometimes called angle of action.)

Arc of approach is the angular distance from the point where tooth contact begins to the pitch point.

Arc of recess is the angular distance from the pitch point to the point where tooth contact ceases.

Back angle is the angle included between the plane of the pitch circle and a plane tangent to the large end of the tooth. (Sometimes called the edge angle.)

Back cone is the cone generated by swinging the back cone radius about the axis of the gear.

Back cone radius is the distance perpendicular to the pitch surface from the pitch line to the axis. (This distance is also called virtual pitch radius.)

Backing is the distance parallel to the axis from the crown to a shoulder or hub extension.

Backlash is play between teeth of mating gears.

Base circle is that circle from which a line is unwound to generate the involute curve.

Bottom land is the surface of the gear body between adjacent teeth.

Center distance is the shortest distance between the axes of mating gears.

Chordal addendum is the greatest perpendicular distance from the top of the tooth to the chord subtended by the circular thickness arc. (Sometimes referred to as corrected addendum.)

Chordal thickness is the length of chord subtended by the circular thickness arc.

Circular pitch is the distance on the circumference of the pitch circle between corresponding points of adjacent teeth.

Circular thickness is the thickness of a tooth along the pitch line.

Clearance is the shortest distance between the top of a tooth and the bottom of its mating space.

Cone center is the apex of the pitch cone.

Cone center to crown is the distance parallel to the axis from the cone center to the crown of the gear.

Cone distance is the shortest distance from cone center to any point on the pitch circle. (Sometimes called apex distance.)

Crown is the edge formed by the intersection of the face cone and the back cone.

Dedendum is the distance, normal to the pitch surface, from the pitch surface to the bottom of the tooth space.

Dedendum angle is the angle between the pitch cone and the root cone in a plane containing the axis. (Also called the angle of decrement.)

Diameter increment for bevel gears is the amount added to the pitch diameter to obtain the outside diameter.

Diametral pitch is the number of teeth divided by the pitch diameter in inches.

Face angle is the angle between a plane tangent to the top of a tooth and the axis.

Gear ratio is the number of teeth in gear divided by the number of teeth in pinion, or number of threads in worm.

Helical gear is one in which the teeth are formed along a helix. (Helical gears may run on parallel axes, in which case one gear has a right hand helix while its mating gear has a left hand helix. Helical gears may also run on axes which are not parallel. In these cases

the helices of both gears may be of the same hand. Such gears are commonly miscalled "Spiral Gears.")

Helix angle of a helical gear is the angle between the helix at the pitch line and the axis of the gear.

Herringbone gear is a gear composed of two helical sections, one right hand and the other left hand.

Interchangeable gear system is one which permits gears of any tooth numbers of the same pitch to run together.

Interference means contact between mating teeth at some other point than along the line of action.

Line of action is the line along which all contact between mating teeth occurs. (On correct involute gears this line of action is the common tangent to the base circles of mating gears. This line is also called the path of contact.)

Long and short addendum teeth have a longer addendum on the teeth of one member than on those of the mating gear.

Normal circular pitch is the distance on the pitch surface along a helix perpendicular to the helix angle of a helical gear from one tooth to the corresponding point of the adjacent tooth. (It is commonly miscalled the normal pitch.)

Normal diametral pitch is that which corresponds to the normal circular pitch.

Normal pitch. The involute normal pitch is the normal distance between two successive and corresponding involute tooth surfaces. (It is equal to the circular pitch multiplied by the cosine of the pressure angle.)

Normal pressure angle is the angle included between a line perpendicular to a normal tooth profile at a point on the pitch surface and a plane tangent to the pitch surface at that point.

Outside diameter is the diameter of the greatest circle which contains the tops of the teeth.

Pitch angle is the angle between a plane tangent to the pitch cone and its axis.

Pitch circle is the circle formed by the intersection of the pitch surface and a plane perpendicular to the axis.

Pitch diameter is the diameter of the pitch circle.

Pitch line element is a line, curved or straight, on the pitch surface, formed by the intersection of the tooth and pitch surfaces.

Pitch point is the point of tangency of the pitch lines of two mating gears.

Pressure angle is the angle between the line of action and a line tangent to the pitch surface at the pitch point.

Root angle is the angle between a plane tangent to the bottom of the tooth space and the axis.

Shaft angle is the included angle between the shafts upon which a pair of bevel gears operates.

Straight bevel gear is a bevel gear whose pitch line element is a straight line.

Throat increment for worm gears is the amount added to the throat diameter to obtain the outside diameter.

Tooth bearing is the area of the working surface of a tooth which has contact with its mating tooth.

Tooth bottom is a line in the bottom land joining the tooth flanks.

Tooth face is the surface between the pitch line and the top of the tooth.

Tooth fillet is the fillet at the bottom of the tooth flank joining the bottom of the tooth space.

Tooth flank is the surface between the pitch line and the bottom of the tooth space.

Tooth top is a line in the top land joining the tooth faces.

Top land is the surface of the tooth which is farthest from its supporting body.

Undercut refers to that condition where part of the conjugate surface of the flank has been cut away.

Whole depth is the greatest depth of tooth space perpendicular to the pitch surface.

Working depth is equal to the sum of the addenda of mating gears. (It is also equal to the whole depth minus the clearance.)

The New Screw Thread Standard—Discussion

By J. E. Winter
Winter Bros. Co., Wrentham, Mass.

After looking over the article by Mr. Flanders on "The New Screw Thread Standard" on page 167 of the *American Machinist*, it seems to the writer that one point under the subject of "symbols" requires straightening out.

My attention was called to the fact that there would still be quite a chance for confusion in regard to the lead and pitch of multiple-thread taps or screws if we use the capital "*P*" to represent the lead and the small "*p*" to represent the thread interval, unless the small "*p*" is made in the form used in writing rather than in the printed form as in the article in the *American Machinist*.

A great many specifications for taps come to us in the form of rough sketches. In cases of this kind it seems that there would be quite a chance that we would not know whether a customer was referring to lead or thread interval.

As it is now, we scarcely ever receive an order for multiple-thread taps without writing to the customer and asking that he specify both the lead and the pitch, so that there will be no chance for a mistake.

We find that most of the multiple-thread taps in use are marked to indicate the lead only. Thus a tap that is marked "6 double" we would understand to have a lead of $\frac{1}{6}$ in. Some of our customers would order such a tap by specifying "12 P double." In that case we would understand that they wanted a tap with $\frac{1}{12}$-in. lead, just the same as the one just referred to and marked "6 double."

It seems that standard practice in regard to marking should be developed so there would be less chance for misunderstanding than at the present. Nothing in the new standard as given in Mr. Flanders' article helps to straighten this matter out any. In fact, we think that it has increased the chances for a mistake, because before this the letter "*P*" has been used in connection with pitch diameter or pitch, but never with lead.

Casting Crown Brasses and Hub Plates in Place—Discussion

By Henry C. Francis

From the letters published on pages 729 to 731, Vol. 59, of the *American Machinist*, under the title given above, it appears that on the average railroad, the lateral wear between wheels and driving boxes becomes too great before the crown brasses need attention. This would indicate that we have not paid enough attention to the question of hub liners and their wearing qualities.

Have we overlooked the fact that one of the greatest, if not *the* greatest, item of cost in locomotive repair, is the loss of earning power while the locomotive is idle?

On the D., T. & I.. or, as it is now generally known, the "Ford" railway, hardened and ground vanadium-steel hub liners are used. The wear plates on the boxes are of hard bronze having excellent wearing qualities. It naturally costs more to apply these plates than where boiler plate or cast iron is used on the wheel hubs, and scrap brass or babbitt on the driving boxes. But the locomotives never have to be taken out of service because of lateral wear and the earnings during the period when they would otherwise be out of commission, pay the cost many times

Babbitting Crossheads to Finish Dimensions

By FRED H. COLVIN
Editor, *American Machinist*

Two efficient fixtures that have materially cut the cost of babbitting crossheads—The method described saves babbitt and releases a planer and operator for other work

ONE of the time-saving methods in use at the Scranton shops of the Delaware, Lackawanna & Western R.R. is that by which crossheads and crosshead shoes are handled in the babbitting process. The accompanying illustrations show both the method of doing the work and the details of the apparatus in which it is done.

Two types of crossheads are in use, one type being solid, as shown in Figs. 1 and 2, has the babbitt metal cast directly on the crosshead itself, eliminating the use of crosshead shoes. In Fig. 1 the operator has just removed the crosshead from the babbitt furnace, where it was immersed in the melted babbitt, for the double purpose of removing the old metal and for preheating it for retinning.

The operator is shown cleaning the crosshead with sal ammoniac, having previously swabbed the surface with muriatic acid so that the solder he is holding in his right hand will "take" and cover the surface with a uniform coating of solder, or "tin" as it is called in the language of the shop. This operation requires considerable care, as in order to have the babbitt adhere thoroughly, the whole surface must be carefully tinned before the crosshead is placed in the babbitting fixture, as shown in Fig. 2, for pouring the metal.

The babbitting fixture is also shown at the right of Fig. 1 with a crosshead in place and the molds adjusted ready for pouring the babbitt. Fig. 2 shows a closer view of the fixture with a crosshead in place and the babbitt being poured on one side.

The Lackawanna does not use an oil torch or a furnace of any kind for preheating crossheads or crosshead shoes for the babbitting operation. The crosshead and shoes are placed in molten babbitt so that the heat will remove any old metal which is still in place and at the same time they will be properly preheated for the babbitting operation which follows immediately. This method saves large quantities of babbitt and makes a very satisfactory job in every way.

Details of the fixture are shown in Figs. 3, 4 and 5, and will, perhaps, be more readily understood by referring to Figs. 1 and 2 from time to time. The crosshead





FIG. 1—PREPARING CROSSHEAD FOR BABBITTING. FIG. 2—BABBITTING CROSSHEAD IN SPECIAL FIXTURE

is located by the piston-rod hole on the plunger *A*, which is turned to the standard taper of ¾ in. per foot. The uprights *B* and *C* carry the adjustable molds for the babbitt and are moved by a right- and left-hand screw so as to maintain an equal distance from the center of the crosshead. The width of the guide bar, which the babbitt lining must fit, is specified by the round house or the erecting floor foreman. The wedges which form the mold, or in other words, which represent the guide bar, are then adjusted to the proper width.

The arrangement and operation of the wedges can be seen by referring to Figs. 3 and 4. The taper of the adjusting wedges is 0.0902 in. per in. on both sides, which gives 3¼ in. taper on each side or 6½ in. taper on both sides in the length of 36 in. The wedges have a 10 pitch rack cut for a distance of 12 in. on the back side, as shown in Fig. 4. This rack is not square with the surface of the wedge on which it is cut, as can be seen, but is cut at the angle of the wedge movement.

from the wedges which form the mold. In the original machine this was done by a rack and pinion below the locating bushing *A*, Fig. 3. This method, however, did not prove entirely satisfactory and the ball-bearing screw jack, shown in Fig. 3, was substituted with entire success.

The other type of crosshead referred to has the shoes separate from the center. The shoes are made standard so as to be readily supplied from a small stock which is kept on hand. When the engine house foreman calls for crosshead shoes, he furnishes the shop with the width of the guides only, the distance between the guides as well as the size of the bolt holes, being standard.

Then the machine shown in Fig. 5 is brought into play, the crosshead shoe placed in position and the wedges adjusted to the proper width as in the other fixture. The crosshead shoe has been previously immersed in molten babbitt so as to melt out the old metal and also to preheat it for the casting of the new lining.

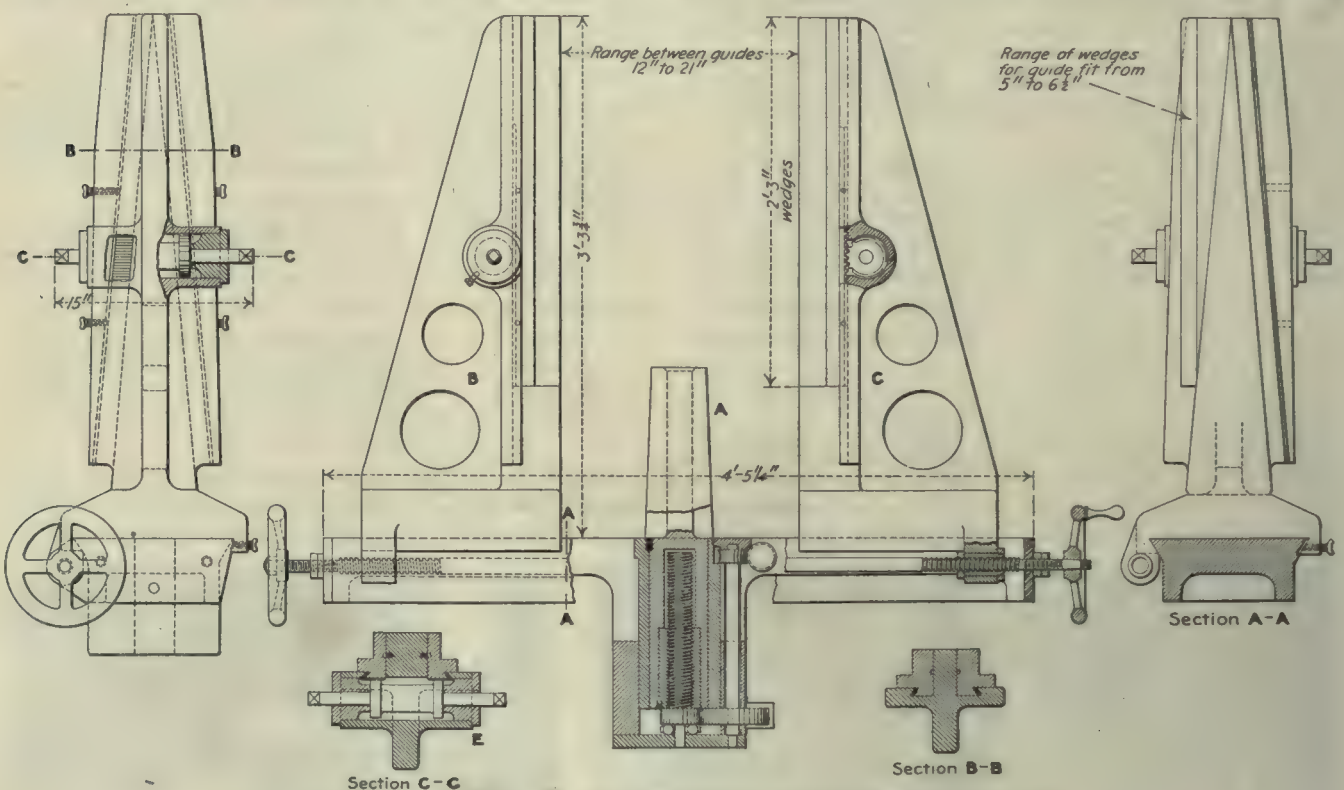


FIG. 3—CONSTRUCTION OF THE CROSSHEAD BABBITTING MACHINE

The operation of the wedges will be made clear by referring to *E*, Fig. 3, which shows how the narrow-faced pinions mesh into the rack on each wedge, so that by turning the square-ended shafts on which the gears are cut, both wedges are moved up or down and made wide or narrow as required. The wedge rack moves across the face of the gear as it goes up or down.

After the crosshead has been put in place in the fixture, the two uprights are moved together by the right- and left-hand screw, until the space between the wedges is the same as the distance between the guides on the locomotive. The wedges are then adjusted by means of the square-ended shaft, until they are set to the same width as that of the guides of the locomotive to which the crosshead belongs.

After the crosshead has been babbitted and the metal cooled, it is necessary to work the babbitt loose It is cleaned and tinned in the same way as the crosshead itself, which was shown in Fig. 1. Fig. 5 shows the metal being poured.

The shoe-babbitting fixture is shown in Fig. 6 and by comparing this illustration with Fig. 5, it will be easy to follow the operation. Similar parts are marked with the same letters in both figures so far as possible.

The crosshead shoe is laid in position between the four pins at *A* and *B*. Loose bushings of various diameters can be slipped over these pins to accommodate shoes of different sizes with a minimum of movement of the toggles which are moved by the screw *S*. Movement of the toggles centers the shoe between the four pins and enables the wedges, which represent the crosshead guide, to be centered with relation to the shoe. In this way the babbitt metal will have a uniform thickness on each side.

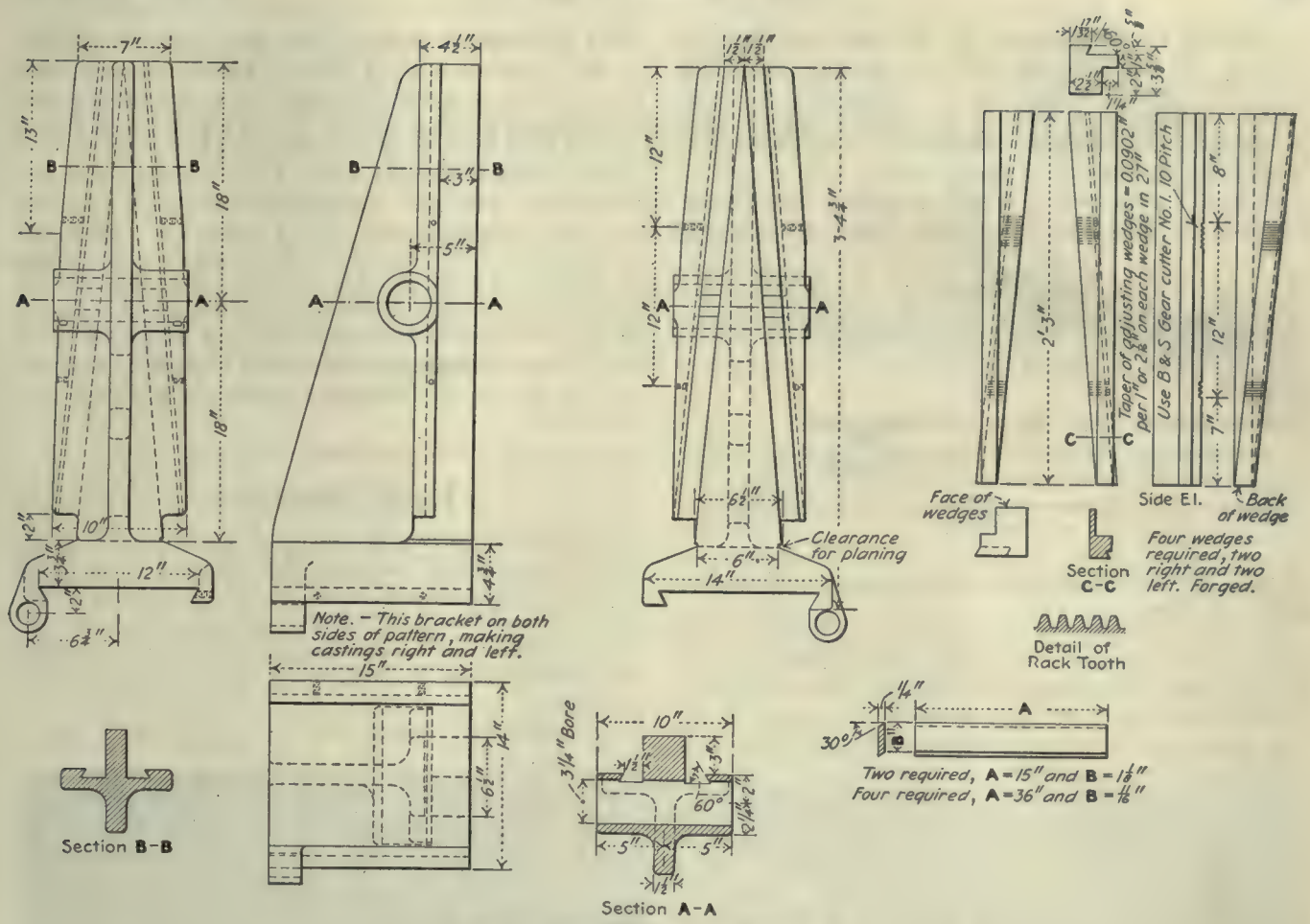


FIG. 4—DETAILS OF THE WEDGES



FIG. 5—BABBITTING CROSSHEAD SHOE

After the crosshead shoe is in place, the wedges are laid in position on supports *C* and *D*, and between the pins shown on the arms *E* and *F*. The supports *C* and *D* hold the wedges at the proper height to give the desired thickness of metal between the crosshead and the guide. The arms *E* and *F*, center the wedges with relation to the crosshead shoe in much the same

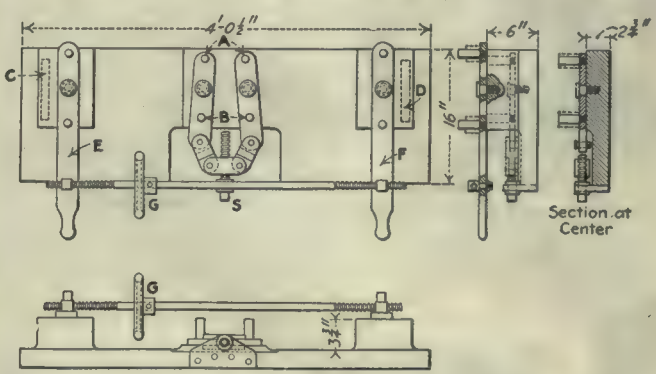


FIG. 6—DETAILS OF THE CROSSHEAD-SHOE BABBITTING FIXTURE

manner as the shoe itself is centered by the toggle in the middle. The handwheel *G* moves the levers *E* and *F* by means of a right- and left-hand screw and positions the wedges with reference to the crosshead shoe itself.

Details of the wedges are shown in Fig. 7 which also gives the principle dimensions. The wedges are dovetailed together, as shown at *A*, so as to present a smooth surface to the babbitt. Sufficient adjustment

is provided to accommodate all the crosshead shoes in use on the Lackawanna and presumably the same dimensions would answer most requirements of other roads. As shown in Fig. 7, the wedges are adjusted by a right- and left-hand screw but as shown in Fig. 5, this adjustment is not always used.

In both Figs. 2 and 5, it will be noticed that wedges are used to hold asbestos boards which are used to

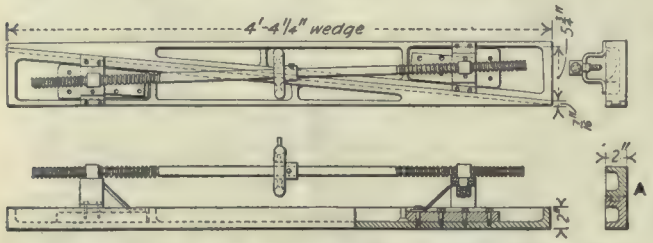


FIG. 7—DETAILS OF WEDGES FOR CROSSHEAD-SHOE FIXTURE

prevent the molten babbitt from running out at the ends and sides.

Economic features of this work are that the use of metal molds makes practically die-cast guides and bearings and that all machine work has been eliminated. The two fixtures shown have released one planer which was constantly used for planing the crossheads and shoes under the old system of babbitting and planing. This method also saves enormous quantities of babbitt. It is believed that crossheads and shoes babbitted in this way give better service than by the old method.

Who Is Liable for Loss After Car Is Placed on a Private Siding?

(Business Research Bureau, LaSalle Extension University)

During the night a car full of canned foods was placed on the private siding of a Chicago concern. Upon arriving at the plant the following morning, the head of the shipping department for this concern found the door of the car open and part of the contents missing. The concern filed a claim to recover the loss from the railroad. The carrier rejected the claim. The point at issue is: To what extent is the carrier liable for loss or damage of goods after the car is placed on private industrial tracks?

One of the clauses of the commonly called "old bill of lading" provided that property received or delivered on private sidings should be entirely at the risk of the owner until the cars were attached to, or after they were detached from, trains. In several cases it has been held, under this provision of the bill of lading, that the carrier is not liable for loss or damage to the goods except while the cars are attached to a train. This point was illustrated in the case of the Kingman St. Louis Implement Co. vs. the Southern Railway Co. It was held in this case that the carrier is not liable for loss of goods after delivery at the switch of the consignee. It was considered that the responsibility of the railway company ended as soon as the transportation of the goods was completed.

This clause of the old bill of lading has been changed so as to omit mention of private or other sidings, and refers only to stations, wharfs, or landings at which there is no regularly appointed agent. Since this modification has been made, we are unable to discover any decisions which bear upon the extent of the carrier's liability in placing cars upon private sidings. In any conjecture as to what a future decision of a court will be in a case similar to this, one should consider the general principles of liability as they are already laid down in previous findings.

The courts in several states have held that delivery of car in a safe and convenient position on the side track for unloading, and in the usual and customary place, together with notice to the consignee, terminates the liability of the carrier as such, although it still continues liable as warehouseman. As warehouseman, the duty is that of ordinary care and diligence—such care as men of reasonable prudence ordinarily exercise for the safety of their own goods under such circumstances.

A Large Micrometer

Micrometers of 1-, 2- and 3-in. capacity are quite common, and every toolmaker is supposed to have at least one concealed about his person. Micrometers to measure 6, and even 12 in. are by no means rare, and the tool-crib of any plant doing accurate interchangeable work is likely to have one or more such tools upon its shelves.

Micrometers to measure 48 in. are, however, quite



A 48-IN. MICROMETER

another story. The one shown in the accompanying engraving was made by the J. T. Slocomb Co., of Providence, R. I., to fill a special order and had to be built "from the ground up." The measuring spindle, barrel and thimble are standard parts, the same as used upon all Slocomb micrometers of whatever size. The frame is a casting for which a special pattern was required, as nothing that large had been previously made.

The weight of the tool is 32 lb. In use it will be suspended from a special holding device that will counteract any tendency toward distortion by reason of its weight, and also make it unnecessary for the operator to grasp the frame with the hands, the natural heat of which would cause a noticeable distortion from expansion.

Recent Developments in Steel Forgings[1]

By JOHN L. COX

Forgings replacing castings for parts of great size and weight—Alloy steel forgings—Hardened steel rolls—Hollow expanded and drawn forgings—Machine parts

THE engineer designing a machine requiring parts of unusual size, or operating under unusual stresses, is often confronted with the question whether or not such parts are practically obtainable. If there be a doubt in his mind, he is hardly at liberty to proceed along his chosen lines until after consultation with the makers, for should the parts require the construction of special plant or the development of special materials for their production, their cost would ordinarily be prohibitive.

Within the past few years, there has been a revolution in the construction of power plants. The reciprocating engine of 10,000 hp. has given way to the steam turbine of 87,000 hp. The Public Service steam boiler of 350 lb. pressure, of which a few were built in 1922, is succeeded in 1923 by the boiler of 1,200 lb. pressure. The 1,500-lb. boiler is under consideration here, and an experimental boiler for 3,200 lb. pressure is building in England. Such changes have required much consultation.

In many other directions units are being designed with parts exceptional in size or quality, which must be submitted to the steel manufacturer before confidence can be felt that they are procurable. A knowledge of the obtainable may make possible designs employing to advantage steel forgings in place of the more commonly used steel castings in parts of great size and weight, or encourage the growing tendency to employ the alloy steels in place of carbon steel in highly stressed forgings much larger than those in which their use has been customary, or influence a decision in favor of substituting hardened and ground forged alloy steel for chilled cast iron in rolls for cold rolling metals.

By the companies manufacturing armor, chrome-nickel steel has for many years been made into plates of great size, and most elaborate heat treatments have been devised to produce in them the qualities necessary for successful ballistic test. For this use, advantage has been taken of the exceptional toughness of this alloy steel rather than its possibilities for high-tension test figures, which are those largely employed in the manufacture of parts for automotive engines. Today, industry is availing itself of the widely variable properties of this alloy, or similar alloys, in forgings of considerable size. A notable instance of this is in the recent introduction of the use of chrome-nickel steel for columns of hydraulic presses, where carbon steel

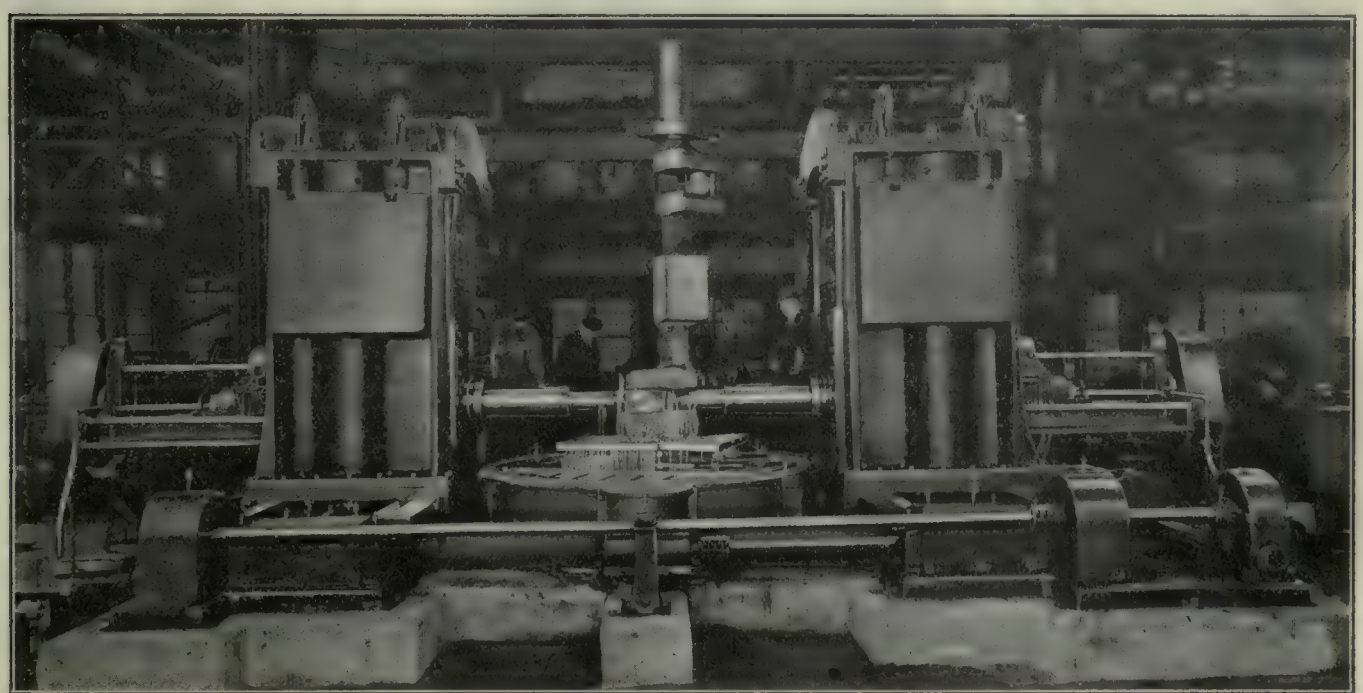


FIG. 1—OVERGAARD CRANKSHAFT MILLING MACHINE

[1] Abstract of a paper read before the American Iron and Steel Institute, New York City, Oct. 25, 1923.

proved too weak and it was impossible to increase the diameters. Such columns are in successful operation today as large as 24 in. in diameter and over 36 ft. long. A treatment giving about 115,000 lb. per square inch tensile strength, 85,000 lb. per square inch yield point, 21 per cent extension in 2 in. and 55 per cent reduction of area, has answered well.

A very interesting use of the possibilities of chrome-nickel steel in pieces of considerable size is a hydraulic intensifier built to operate under a working pressure of 40,000 lb. per sq.in., and tested to 48,600 lb., which is well beyond the 21 tons per sq.in. maximum test pressure of a modern high power gun. Its components include the main vessel (showing tensile strength 143,500 lb. per sq.in., yield point 110,000 lb. sq.in., extension in 2-in. tangential bar 15.2 per cent, contraction of area 50 per cent) and subsidiary parts of various requirements, in one case showing tensile strength 173,000 lb. per sq.in., yield point 137,000 lb. per sq.in., extension in 2-in. longitudinal bar 15 per cent, contraction of area 53.9 per cent.

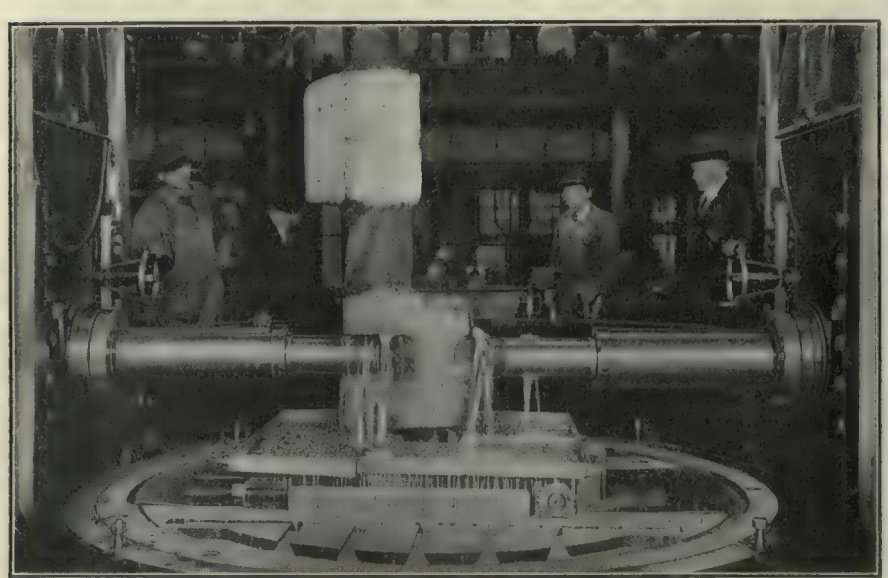


FIG. 2—CLOSER VIEW OF CUTTING TOOLS OF OVERGAARD MACHINE

Another interesting field in an active stage of development is the manufacture of hardened steel rolls. Formerly, nearly all cold rolling of strip and sheet metal was done with chilled iron rolls. In steadily increasing volume these are being replaced by heat-treated, hardened, slightly drawn, ground and polished rolls of alloy steel, usually chromium, chrome-vanadium, chrome-molybdenum, chrome-vanadium-molybdenum, or chrome-tungsten-vanadium. Fully hardened rolls of these alloys may be made much harder than chilled iron rolls, the hardness running in the neighborhood of 110 to 115 scleroscope. They take a much higher finish, produce a correspondingly better surface on the product, and are reasonably long lived if treated properly, as they deserve to be, for they are among the highest expressions of the steel-maker's art. They must not be allowed to run hot on the journals, or they may crack there; must not be struck on the working surfaces, or they will indent in spite of their hardness; must not be allowed to slip on the work, or local heating may cause spawls; must be kept slushed, or rust will ruin their mirror finish. Small rolls of this type have been on the market for many years, but as experience in their manufacture is being acquired and their merits are becoming appreciated, the sizes are increasing. Today, rolls about 25 in. in diam. by 40 in. in length of body are readily supplied in the hardest grades, and rolls as large as 28 in. by 120 in. can be furnished with scleroscope readings of about 80, or over. No doubt, in time, skill and equipment will be available to produce these large rolls with a scleroscope hardness of over 100.

While no new principles have been developed in the manufacture of crankshafts of which I am aware, their production has been much facilitated by a new machine tool invented in Denmark. It consists of two opposed milling heads on horizontal shafts carried by housings, each with three adjustments and feeds at right angles to each other. Between them, over a pit, is a driven table provided with vise jaws adjustable towards each other and with reference to the axis of the table. Clamped between these jaws in a vertical position, adjusted properly with reference to their axes, the pins and webs of a crankshaft can be machined all over by the revolving cutters controlled by the feeds provided by the housings or by the revolution of the table. There results a great economy of time in the machining. Fig. 1 gives a general view of this machine and Fig. 2 more clearly shows its mode of operation.

In the production of hollow forgings of great diameter and short length, there has been little change for many years, but it may be of interest to know what has been done in this line. One particular ring is 137 in. in outside diameter, 109 in. inside diameter and 45 in. long, weighing 85,000 lb. Somewhat similar is the gear reduction ring for a turbine-driven steamship, the machined dimensions being 136 in. outside diameter, 124 in. inside diameter and 50 in. long. Such rings can be manufactured up to about 120 in. in length.

In the field of large hollow drawn forgings there have been very interesting developments both as regards size and character of forgings.

Recently there have been devised means for increasing the yield of gasoline from crude oil by the application of cracking methods. Depending upon the original character of the oil, this increase may be as much as 13 fold. The oil is heated to about 875 deg. F. under 500 to 600 lb. pressure while circulating through tubes in a furnace, and flows to a large insulated cylinder where the completion of the cracking operation takes place. This cylinder, or reaction chamber must stand heat, pressure, corrosion by sulphur in the oil, and be absolutely leak proof, for the gasoline under high pressure is well above its ignition point. The use of forged steel cylinders for this purpose has met with signal success. One of these was 46 in. outside diameter, 38 in. inside diameter and 36 ft. 11¾ in. long on the body, weighing 52,000 lb. in the rough. The ends were closed by heads and covers of cast steel, secured by heat-treated nickel-steel bolts and nuts. There was no leak under 2,000 lb. hydrostatic pressure applied for eight hours.

The disadvantages of a separate head were so evident, however, that it was next sought to make the head

integral with the body and this was successfully accomplished. The cylinder is now 41 ft. 2½ in. in length over all, weighing 79,000 lb. in the rough and requiring in ingot of 156,000 lb. in weight.

The cross drum of a new B. & W. boiler, designed for a maximum pressure of 1,200 lb. per sq.in., is a forged steel cylinder 48 in. inside diameter, 56½ in. outside diameter, and 34 ft. total length over the ends, which are closed in to take a 12x16-in. manhole cover. This is one of the largest hollow forgings ever made; the forged weight being 162,000 lb., requiring an ingot of 262,000 lb. to allow for scrap and losses. The billet was cut hot from a 78-in. octagon ingot, was stood on end and upset to about 96 in. in diameter, had a 23½-in. core removed with a hollow punch, was expanded to about 50 in. in inside diameter, drawn on a mandrel to 45 in. inside diameter, 58½ in. outside diameter, annealed, tested, machined inside and out, and after closing-in is to be reannealed, have the throat machined to 11¾ in. inside diameter and the exterior of the head trued up.

Shortly before the World War began, the Midvale Steel Co. began construction of a 20,000-ton forging press. The entablature was to consist of two main steel castings bolted together. After the first half of the entablature had been cast, various considerations led to a decision to substitute nickel-steel forgings for the carbon-steel castings first planned. No such design could have been confidently elaborated without knowledge that its main components were procurable and available for use.

The forging was 12 ft. wide in the center, about 9 ft. wide at the ends, 4 ft. thick at the column bosses, decreasing to 1½ ft. thick at the center, and about 28 ft. over all. This forging weighed 289,000 lb. and was produced from an ingot weighing 458,000 pounds.

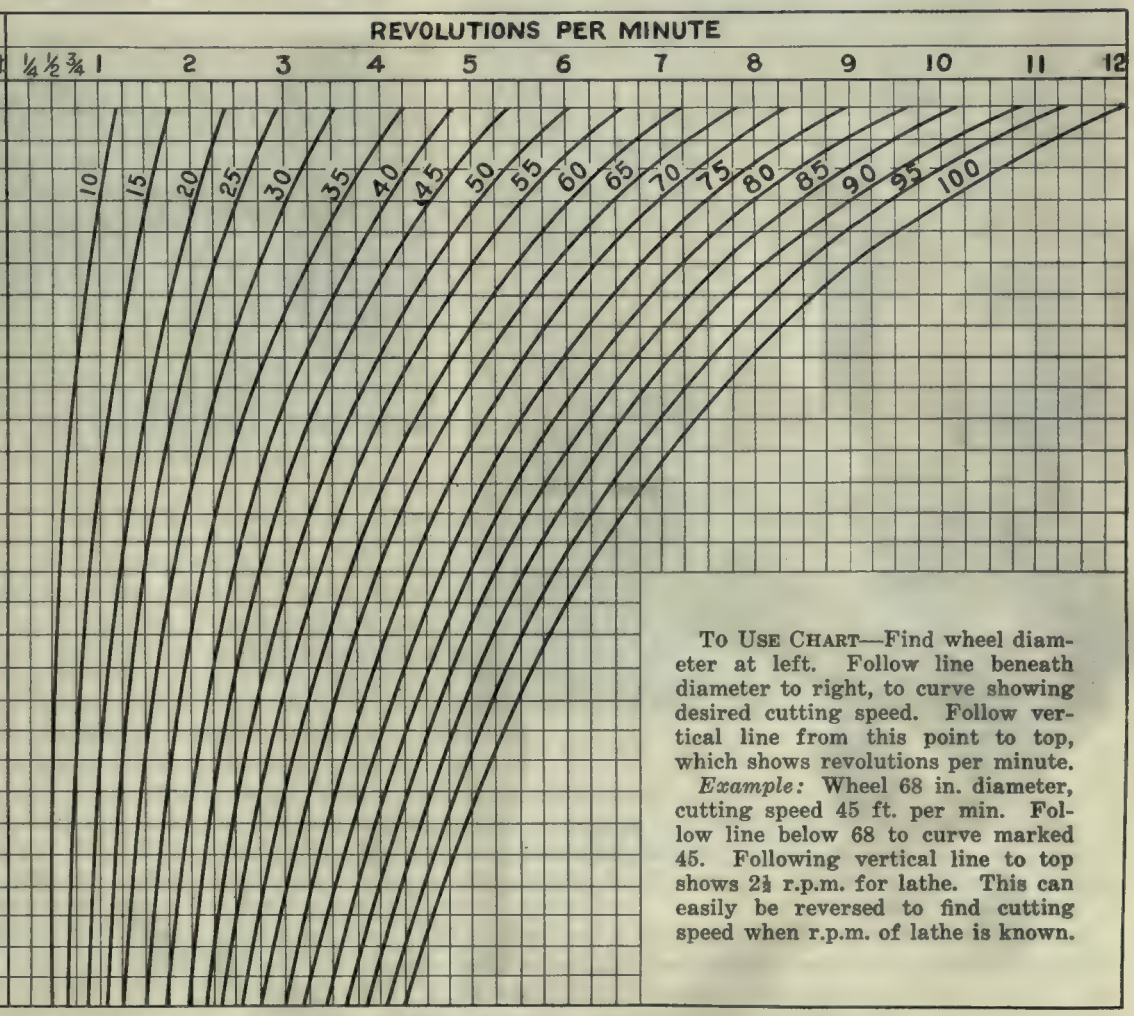
The press of which this forging is to form a part has not been completed. It awaits a call from engineers of the country for forgings larger than those entering into its own construction, since the treaty for the limitation of armament has for the present ended the work for which it was originally designed.

Cutting Speeds for Turning Wheels and Tires

In order to get the best results from high powered machines or high speed steel, it is necessary to know how fast the work must be run to secure the desired cutting speed. It is a long way around a large locomotive tire and it is not always easy to realize that it only takes two and a half revolutions of a 68-in. tire to give 45 ft. a minute. To make it easy to know just what is being done, the accompanying chart has been made. This shows wheel diameters from 32 to 90 in. together with circumferences and cutting speeds up to 100 ft. per minute.

Larger diagrams on heavy paper can be had on application to the *American Machinist.*

WHEEL	
Dia.	Circumference Ft
32	8.38
34	8.90
36	9.42
38	9.94
40	10.46
42	10.99
44	11.25
46	12.05
48	12.57
50	13.09
52	13.60
54	14.12
56	14.63
58	15.16
60	15.69
62	16.22
64	16.75
66	17.28
68	17.80
70	18.32
72	1885
74	19.37
76	1990
78	20.42
80	20.95
82	21.47
84	21.99
86	22.52
88	23.04
90	23.57



To Use Chart—Find wheel diameter at left. Follow line beneath diameter to right, to curve showing desired cutting speed. Follow vertical line from this point to top, which shows revolutions per minute.

Example: Wheel 68 in. diameter, cutting speed 45 ft. per min. Follow line below 68 to curve marked 45. Following vertical line to top shows 2½ r.p.m. for lathe. This can easily be reversed to find cutting speed when r.p.m. of lathe is known.

DIAGRAM FOR CUTTING SPEEDS IN TIRE AND WHEEL TURNING

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Shrink-Fitting a Heavy Shaft Assembly

By A. T. Parsons

When installing the equipment for the hydro-electric plant of the Andhra Valley Power Supply Co., near Bombay, India, C. V. Foulds, field engineer for the Pelton Water Wheel Co. of San San Francisco, developed a novel method of assembling the shaft, rotor and water wheel runner. For the particular conditions of the job, this method proved much superior to the conventional press fit.

The plant comprises six 10,000-kva. General Electric

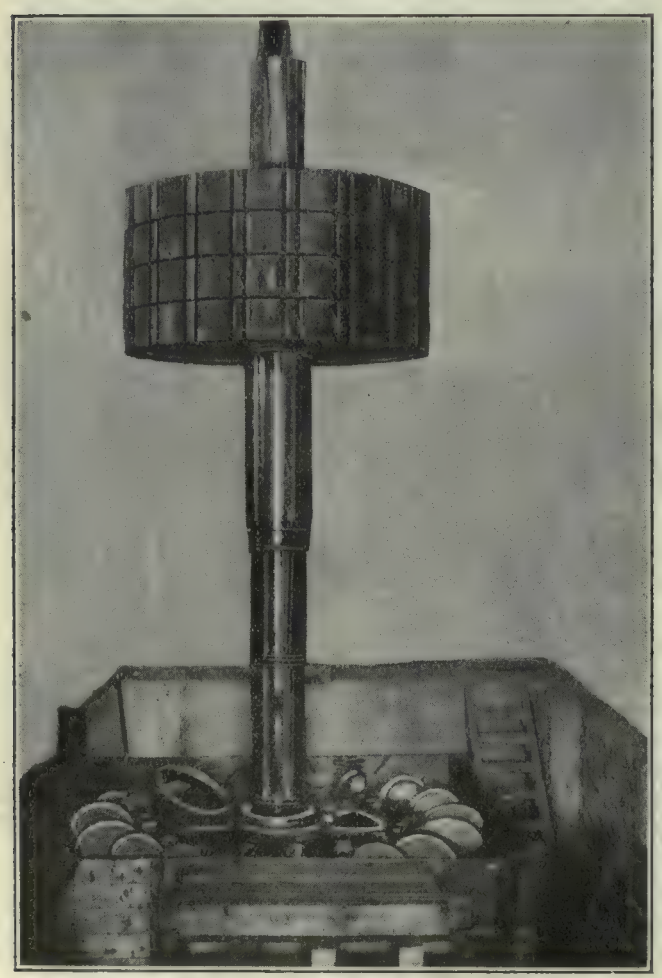


FIG. 1—SHRINKING RUNNER ON TO SHAFT

generators, each driven by a single overhung Pelton impulse turbine. Besides the hydraulic equipment, Mr. Foulds and his assistant, W. L. Parker, installed the generators as well. The only labor available was native and was mainly unskilled.

Each shaft assembly comprised four rotor spiders weighing 8 tons apiece, the water wheel runner weighing 12 tons, and the shaft itself weighing 9 tons—a total of 53 tons. The final assembly weighed 73 tons, but the twenty field poles for the rotor, weighing a ton apiece, were naturally not added until the rest of the assembly was completed. The bore of runner and spider hubs was 0.003 in. smaller than the shaft diameter, which was 22 inches.

Largely on account of the lack of skilled labor, it was decided to heat the spiders and runner by steam and shrink them on rather than employ the usual press-fitting methods. However, events proved that shrink-fitting would have been advantageous irrespective of the character of the labor supply.

A "steam box" large enough for one of the rotor spiders was constructed, and a spider lowered into it. Steam was then supplied by a 1-in. pipe from a donkey boiler outside the building. Four or five hours of steaming was required, which increased the diameter of the bore from 0.003 in. less than the shaft to 0.012 in. more. Further steaming made only a slight additional increase, the time allowed being apparently sufficient to bring the spider up to approximately the temperature of the steam.

The first spider to be applied was necessarily the one

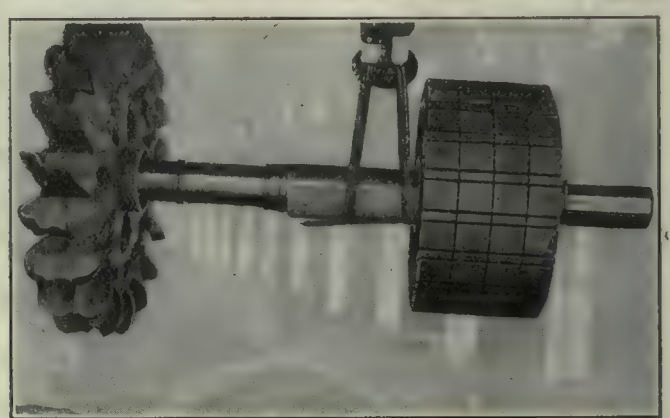


FIG. 2—THE COMPLETED SHAFT ASSEMBLY

next to the outboard bearing, so that in up-ending the shaft for insertion, it was necessary to grip it by a friction clamp over the journal itself, as there was no collar to keep the clamp from slipping off. The clamp used was composed of two 12x12-in. teak timbers fitted to the curvature of the journal, and held together by two pieces of 12-in. I-beam 3 ft. long with three 1½-in. bolts at each end. Forged links of 1½-in. steel were looped over the double hook of the crane.

At the conclusion of the required steaming period, the steam was shut off and the box opened. The bore was then wiped out and its diameter checked before inserting the shaft, which went in easily. For the first spider on each shaft a stop was attached to prevent the shaft going too far. The other spiders stopped against the ones already in place. After the first spider had shrunk in place, the lifting clamp was removed and subsequent hoisting done with slings through the spider.

To guard against looseness in the main key and to insure alignment of the pole slots of the four spiders, a long key with one end tapered was made to fit the slots, and as each pair of spiders came together it was inserted and left in place until the last spider to be added had cooled and gripped the shaft. The time of cooling was prolonged as much as possible, 12 hr. being usually allowed, although the hub commenced to grip the shaft after one hour.

Aside from the cleaning and preparation of hubs and shaft that would be required whatever the method of assembly employed, the actual work for each hub required one man for 8 hr. to tend the boiler and the crane, and four men for 2 hr. to make the insertion and later to withdraw the assembly and place another spider in the box. The same procedure was followed for the turbine runner except that a slightly larger steam box was required and 7 hr. steaming instead of five. The steam box is shown in Fig. 1. In one instance all five hubs were set on a shaft in as many days.

When the shaft assembly, weighing 53 tons, had been completed and was hanging from the crane with the turbine runner down, an overhanging step was provided on one of the pit walls, on which was rested the outer hub of the runner, permitting the entire assembly to be lowered to a horizontal position without placing any weight on the buckets. The assembly was then lifted, as shown in Fig. 2, and placed in its bearings.

An Ancient Thread Milling Machine

By Jack Williams

That the principle of thread milling is not exactly new is attested by the existence of the device shown in the accompanying cut, which was built more than fifty —and probably more than sixty—years ago and is still doing business whenever its services are required.

This machine was never "designed," but was built in the shop where it is used from old parts such as can be found in most any machine shop. The legs may have been cast for the purpose, but it is more likely that they were originally intended for pedestal bearings for some other mechanism; such as a tumbling barrel or a polishing jack. The tie-bar that holds them together is a piece of wrought-iron pipe, to which all the other parts are fastened by clamps or collars that surround the pipe and are drawn snug by clamping bolts or held by setscrews.

Part *A* is the master screw, at the farther end of which is a plain collet, or chuck, in which the piece to be milled is fastened by means of setscrews in lieu of chuck jaws. It will be observed that the axis of the master screw lies at an angle across the tiebar and that the work piece, when attached to the screw, becomes in effect an extension of the latter and rests in the ring *B* of a bracket that is clamped to the tiebar at a point beyond the milling cutter and upon the other side of the center line. The milling cutter is directly under the bracket *C* and at the point where the axis of the combined master screw and work piece intersects the center line of the machine.

The angle at which the axis of the master screw and work piece crosses the tiebar is equivalent to the helix angle of the screw to be cut. In this machine the angle is fixed, as it is never called upon to produce other than the one thread for which it was built.

The milling cutter is at the end of a long arbor, or spindle, which extends from the far end of the machine, where it receives its driving power through a small belt and gear train. The "ring" of the bracket *C* is cut away at the lower part of its periphery and is fitted with a segmental bronze bushing in which the work takes a bearing. The work also passes through a ring suspended from the coil spring *D*, which holds it to a bearing against the upper side of the open bearing ring to prevent chatter. The work is exposed to the milling cutter at the point where the bearing ring is cut away.

The master screw is splined over its whole length and passes through the hollow spindle of the "headstock," which rotates it by means of the spline. It also passes through a stationary nut at the end of the headstock so that as it is rotated by the latter it is drawn endwise by the action of its own threads in the nut. When a cut is completed the screw extends for nearly its length from the rear end (nearest the observer) of the hollow spindle.

The action of the machine is obvious. As the master



A PIONEER THREAD MILLING MACHINE

screw is rotated by the headstock and drawn back by the action of its threads in the stationary nut, the work piece is passing with a corresponding movement over the milling cutter, which has no movement other than that of rotation. To adapt the machine to cut other diameters of thread, it would be necessary to provide means of swiveling the master-screw and work holder in relation to the center line of the machine. Any *diameter* of thread could then be cut, but it would still be necessary to furnish a complete master screw and nut to cut other leads.

The machine was built by the proprietors of the Higley Machine Co., South Norwalk, Conn., to cut the feed screw for the large size Higley cold sawing machine. As it was apparently more desirable to built another machine than to make this one adjustable, the shop has other machines of the same type to handle other sizes and leads of screws.

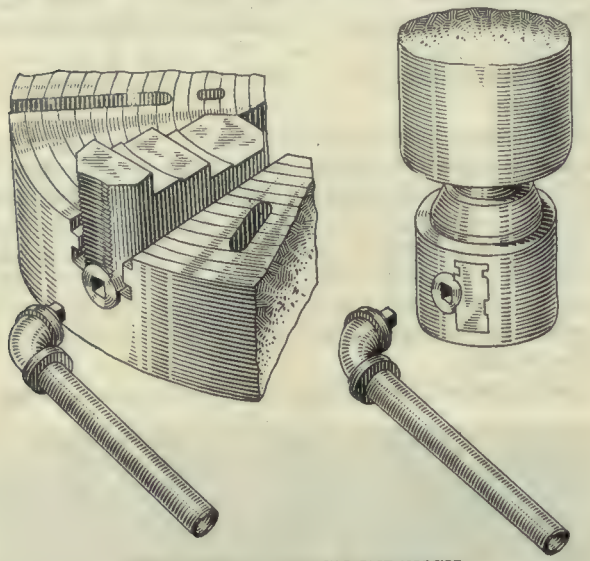
Notwithstanding its crude appearance the machine is quite efficient; doing its work so well and so quickly that the expense of a modern thread miller would not be warranted by any saving that the latter might accomplish as a single purpose machine, and it was on the job when the modern thread miller was but an inventor's dream.

Emergency Chuck Wrench

By Frank W. Bentley, Jr.

In spite of all that efficiency can accomplish, chuck wrenches will become misplaced, and until one can be found or another made, work is sometimes held up.

The sketch shows how an emergency wrench can be



EMERGENCY CHUCK WRENCH

made of pipe fittings in a hurry. The squares on the heads of the plugs are of various sizes from $\frac{3}{8}$ in. on the $\frac{1}{4}$-in. plug to any other size as the plug size is increased. The squares are hard and, with the plug firmly screwed into the elbow, a very satisfactory wrench is afforded. The pipe-stock racks can always fix you out when the blacksmith or the toolmaker can not.

Designing Cams for Automatic Screw Machines

By Ivan Svidlo

In designing cams for B. & S. automatic screw machines the following steps should be taken:

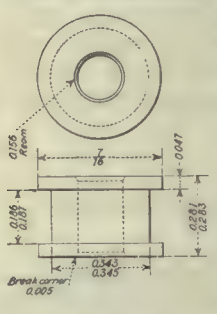
1. Determine the method to be used, in regard to tools and their respective location.
2. Determine the surface speed to be used.
3. Determine the revolutions per minute for spindle.
4. Calculate the throw for each tool.
5. Determine what feed per revolution should be used for each tool.
6. Calculate the number of revolutions for each actual working operation, such as turning, drilling, reaming, forming, etc.
7. Find total number of actual working revolutions to make one piece.
8. Find total number of lost hundredths of cam surface for feeding stock, indexing turret, clearance, etc.
9. Find total number of actual working hundredths of cam surface to make one piece.
10. Find total number of revolutions of a spindle to make one piece.
11. Find the time in seconds to make one piece.
12. Calculate the number of hundredths of cam surface for each operation.

I will explain only the method used to calculate items 7, 8, 9 and 10, as the balance of the information can be found in Brown & Sharpe's book entitled "Construction and Use of Automatic Screw Machine."

I recently had occasion to design a number of sets of cams, using the old method, which is to allow so many revolutions for feeding stock, indexing turret, clearance, dwell, etc. In order to find the total number of revolutions to make one piece, I had to add the number of revolutions for each operation, and in calculating hundredths of cam surface for each operation, I found that for feeding stock, indexing turret or clearance, etc., I had more or less than was necessary. In order to balance, I was obliged to add or subtract a few revolutions and then start my adding all over again. This was a very slow process, and I endeavored to find a more simple method of doing the job. I finally evolved the following rule:

Find total actual working revolutions to make one piece, that is, add the number of revolutions necessary for each actual working operation, such as turning, drilling, reaming, threading, etc., and let this total be represented by A.

Find total number of lost hundredths of cam surface for feeding stock, indexing turret, clearance, etc. The number of hundredths necessary for feeding stock or indexing turret can be found in the table for laying out cams in the book before referred to. Add these together, and let the total equal B. With this information at hand the total number of actual working hundredths of cam surface to make can be



PIECE TO BE MADE AND OPERATIONS PERFORMED BY THE MACHINE

		Rev.	Rise	Feed	Hundredths
Lead cam	Feed stock	....	.....	.....	4
	Index	....	.....	.....	4
	Center	20	0.060	0.003	5
	Dwell	...	.....	.....	2
	Index	...	.....	.....	4
	Drill	150	0.375	0.0025	36
	Index	...	.....	.....	4
	Dwell for recess	...	.....	.....	11
	Index	...	.....	.....	4
	Ream	43	0.344	0.008	10
	Cut off	61	.....	.....	14
	Clear	...	.....	.....	2
Front slide cam	Start at 19 hundred				
	Form	93	0.056	0.0006	22
	Dwell	...	.....	.....	2
	Clear	...	.....	.....	20
	Recess	20	0.040	0.002	5
	Dwell	...	.....	.....	2
Back slide	Start at 54 hundred				
	Cut off	185	0.185	0.001	44
	Clear	...	.....	.....	2

found by subtracting B from 100. This is corresponding to A in revolutions.

$$X:100::A:(100-B), \text{ or } X=\frac{100A}{100-B}$$

To make this more clear, let us take an example: Suppose we wish to make a piece as shown in the illustration. To make this part the machine will perform operations as shown on the table accompanying the illustration, forming being done during the drilling operation. Assuming that the first six items have

already been calculated, we will start with Item 7. To find the total number of actual working revolutions to make one piece, or A, we will add the number of revolutions necessary for centering, drilling, recessing, reaming and partially cutting-off. The reason we do not allow the full amount for cutting off is because this tool is operating at the same time as the other tools, but overlaps the reaming tool by 61 revolutions. Therefore:

$$A = 20 + 150 + 20 \times 43 + 61 = 294$$

To find total number of lost hundredths of cam surface: On Page 82 of Brown & Sharpe's "Construction and Use of Automatic Screw Machines," we find the hundredths of cam surface to feed stock or index turret for this job is 4; we allow 2 hundredths for dwell in centering, 2 in recessing, and 2 to clear cutting off, also allow 4 hundredths for dwell for recess over actual need. This gives us:

$$B = 4 + 4 + 2 + 4 + 4 + 4 + 2 + 4 + 2 = 30 \text{ hundredths}$$

To find the total number of actual working hundredths of cam surface to make one piece, we have to subtract B from 100, or $100 - 30 = 70$, which will correspond to 294 in revolutions of the spindle.

Then X, or the total number of revolutions of a spindle to make one piece, will be:

$$X = \frac{100A}{100 - B} = \frac{29{,}400}{70} = 420$$

Accurate V-Blocks

By W. S. Haines

A V-block, to be both accurate and durable, should be made of tool steel, hardened and ground. In small sizes, it is possible to make such V-blocks in one piece, but in larger blocks the expense must be considered.

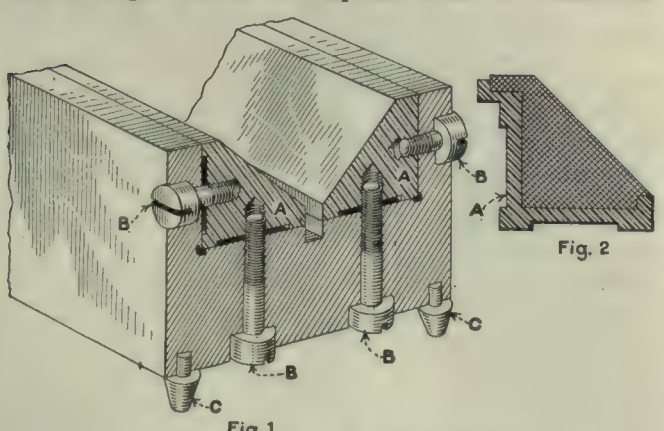


FIG. 1—V-BLOCK WITH HARDENED INSERTS. FIG. 2—V-BLOCK FOR POLISHED WORK

The V-block shown in Fig. 1 has a cast-iron body, while hardened and ground steel inserts A are used to form the V. The inserts should be recessed on the bottoms and sides, as shown, to insure a good bearing in the body. Screws B are used to hold the inserts in place.

The body is provided with feet C, to insure its taking a proper bearing on the machine table. The feet may be loose pieces attached to the body by screws and dowels, or may be shouldered pins driven in. In any case they should be hardened and ground parallel with the bottom of the seats for the inserts.

When holding soft, polished or nickel plated work, a set of inserts as shown in Fig. 2 can be made to replace the hardened inserts. The retaining shell A is made of tool steel and has babbitt metal cast in place as shown. The retaining shell need not be hardened, though it should be ground on the outside surfaces.

Holding a Boring Bar in the Tailspindle

By C. L. Janney

Having occasion to use a number of boring bars in the lathe and not wishing to incur the expense of making a taper shank on each, I had recourse to the expedient shown in the accompanying sketch.

A single bushing with a straight central hole was



THE BORING BAR AND THE BUSHING

made to fit the tailspindle, and was slotted crosswise at the outer end. The slots at either side of the central hole were extended a short distance at a right angle in the direction of rotation of the lathe. The shanks of the bars were made a close fit for the hole in the bushing and fitted with a cross pin at the proper distance from the shoulder; the length of the pin being equal to the larger diameter of the bushing.

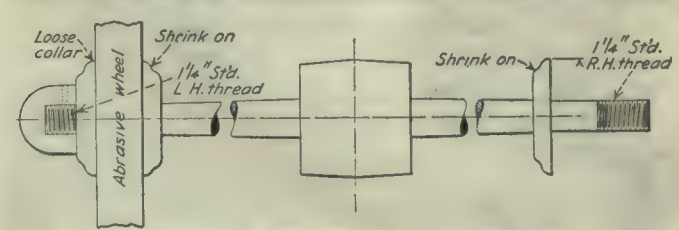
The pin locks the bar in position for boring and holds it against the turning moment of the cut. To remove a bar it is necessary only to give it a partial rotation backward and draw it out of the hole.

This method of fastening has the advantage of providing an easy means of taking a bar out of the work without drawing the point of the cutting tool over the finished surface.

A Safety Grinding-Wheel Arbor

By Russell C. Lego

The sketch shows an improved form of double-end arbor to carry two grinding wheels on the regulation floor stand. End play is taken care of by the opposed taper journals, and if suitable shims are placed under



SAFETY GRINDING-WHEEL ARBOR

the caps when pouring the babbitt any looseness that may become manifest in service may be corrected by removing some of the shimming material and tightening down the caps.

The round nuts on the ends of the arbor constitute the safety feature. They are polished all over and are set up by means of a spanner. As the threaded ends of the arbor are completely covered and there are no corners or angles upon the nuts, there is no place where loose clothing may be caught.

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Editors
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What Are Normal Conditions?

A BULLETIN recently issued by one of the well-known statistical bureaus raises the question once more as to what should be considered the normal condition of an industry. In the bulletin the statement is made that many of the conclusions drawn from comparing present prices of farm products and all commodities with those of 1913 are entirely misleading. Why? Because prices of farm products in 1913 were abnormally high on account of short crops.

If one goes deeper into the subject and takes such a year as 1900, or such a period as 1890-1900, as a base, relations are exactly reversed. With either of these bases of comparison farm prices are found to be relatively higher in 1923 than general commodity prices.

Assuming that it is fairer to use as a basis of comparison a ten-year period such as 1890-1900 rather than a single year such as 1913 when conditions were somewhat unusual the cold figures afford little comfort to the "radical" members of Congress who are weeping over the farmer's misfortunes and decrying the grasping industrialists.

There is no question but that farmers who are trying to get returns on ill-advised investments in lands bought at speculatively inflated prices are up against it. But are they any worse off, or in a situation so very different, than the manufacturer who has had to face the readjustments of post-war conditions with an expensive plant built at war-time prices and several times too large for present requirements?

It all comes down to the question as to what constitutes normal conditions. Average statistics are of little use unless they can be compared with some base. If the base taken is not correct the whole comparative structure falls to the ground and the conclusions drawn are apt to be worse than misleading.

Why Not A Law-Repealing Body?

THE IMPENDING convening of Congress is being eagerly awaited all over the country. Much new legislation will be proposed and some old bills that have failed before will be put in again.

President Coolidge's first message to Congress will be critically scanned.

The actual power of the "radical" group about which there has been so much speculation will finally be tested. And there will be the usual flood of bills, wise and otherwise.

Comparative records of our own with foreign law-making bodies indicate that as producers of ill-considered and unenforceable laws we are without equals. Our lawmakers can turn out several times as many laws in the same number of weeks as can any others in the same line of business. But there seems to be no way of repealing the many out-of-date, useless and superseded laws that clutter up the statute books.

It is probably utterly hopeless to think of attempting to curtail the number of bills that will become law before this session of Congress ends, but wouldn't it be a great help if no law could be passed without repealing some old one that was no longer necessary? This idea is probably Utopian, it would make many of our lawyers jobless and it might result in some good legislation being lost, but wouldn't it simplify matters?

Writing Insurance On Industrial Preparedness

FIVE YEARS ago America celebrated by far the most fervent Thanksgiving Day of recent times. The Great War was just over and everybody was devoutly thankful to be released from the strain and worry of war preparation even though he had not been called upon to risk his life in national service. Most people looked forward to the return of peace without the faintest idea of the drastic political, economic and industrial readjustment that must accompany it. The chaos in Russia, the disintegration of Germany, the Fascist movement in Italy, the unemployment problem in England were hidden behind the veil of the future.

But today, five years later, we have learned by sad experience that the economic problems of peace may be as difficult of solution as those of war. The high, unselfish war spirit hardly outlived the sound of the last guns. It got its deathblow during the final bickerings over the terms of the treaty of peace and has been sorely missed in the struggles that followed.

Among the sad lessons of the war was the discovery that soldiers can be trained and placed in the field about a year before the materials of modern warfare can be supplied in sufficient quantities. After the echoes of war had died out and we could take an inventory of our contributions to the Allied cause we awoke to the rather unpleasant truth that our contributions of war material had hardly been as large as we thought. We had made every possible effort but we had not realized the time necessary to get going.

Apparently the lesson has been learned and we can be thankful that steps have been and are being taken, under the National Defense Act, to prevent a recurrence of the failure. Some of them are outlined in the first article this week. In it the Assistant Secretary of War, Dwight F. Davis, tells what has been planned and asks for the help of the men in industrial lines who would have to assume the burden of munition manufacture in case of another disturbance.

Perhaps plans for the mobilization of industry to prepare for war do not form the most cheerful subject in the world to be thankful about at this season of the year. At the same time an occasion may arise when we will be most thankful for those early preparations that are now being made. Insurance seems rather a burden when one is paying premiums but it looks very different when a claim is being settled.

Shop Equipment News

Walker Single-Stroke Vertical Rotary Surface Grinding Machine

The O. S. Walker Co., Inc., Worcester, Mass., has recently placed on the market a vertical, rotary, surface-grinding machine that embodies a number of distinctive features. It is especially intended to perform the face grinding operations upon disks of steel or other material (of which the standard metal saw is a familiar example) but can be used also in surfacing small machine or tool parts that may be arranged upon and held by a magnetic chuck.

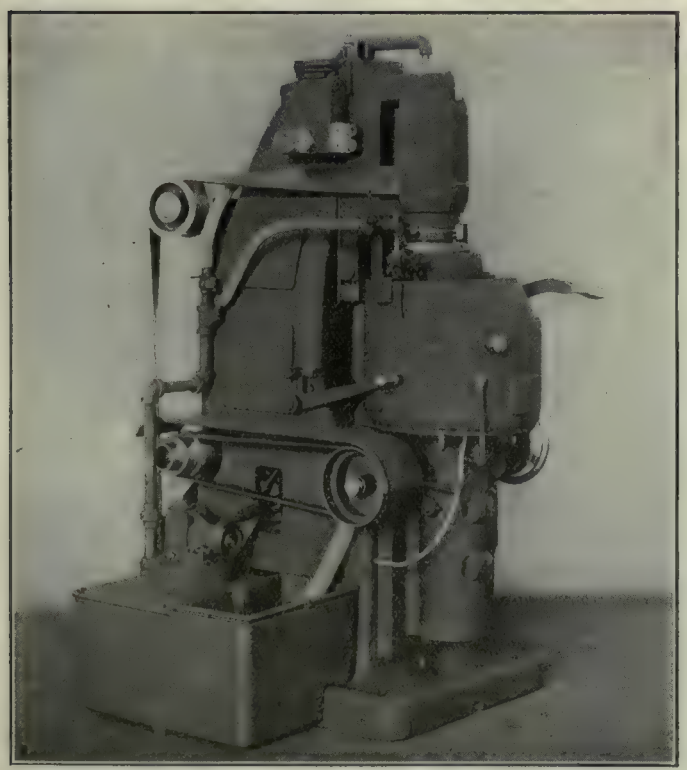
The grinding medium is a cup wheel having a rim section 3 in. deep by $\frac{5}{8}$ in. in radial thickness, mounted in a specially constructed holder which permits a reduction in depth of rim section of $2\frac{1}{4}$ in. by wear and redressing before the wheel need be discarded. The design of the holder is such as to prevent segments from being thrown out in case of wheel breakage.

The wheel-holder is attached by four easily accessible screws to a faceplate upon the lower end of a vertical spindle, the spindle running upon ball bearings in a vertically sliding head. This head takes its bearing directly upon the face of the column, to which it is fitted by means of the usual dovetail and tapered gib for adjustment. This bearing is 24 in. in length. Movement of the head is accomplished through the medium of a hand lever and a range of 5 inches is available. Positive stops limit the downward movement of the head in two positions. A counterweight within the column balances the weight of the head and its attached parts, so that the movement is free in either direction and the wheel will remain in any position in which it may be left.

The thrust of the wheel is borne by two Gurney radial thrust bearings and the weight of spindle and wheel is over-balanced by compression springs located in the upper bearing housing, so that backlash is always taken out in an upward direction.

The wheel spindle is driven by a 3-in. belt, running over idlers from the horizontal driving shaft in the base of the machine. A guard covers the belt at the point where it passes over the spindle pulley, thus preventing not only injury to the belt from the splashing of grinding compound, but also protecting the operator from injury by reason of accidental contact with the belt or rotating parts.

The work spindle carries at its upper end a standard Walker 12-in., rotary, magnetic chuck, the face of which is the work table. The upper bearing of the spindle is tapered to insure permanent alignment and ample bearing surface, and is located as closely as possible to the chuck. The lower end of the spindle is carried by a radial ball-bearing. The head in which the work spindle with its appurtenances is carried is a



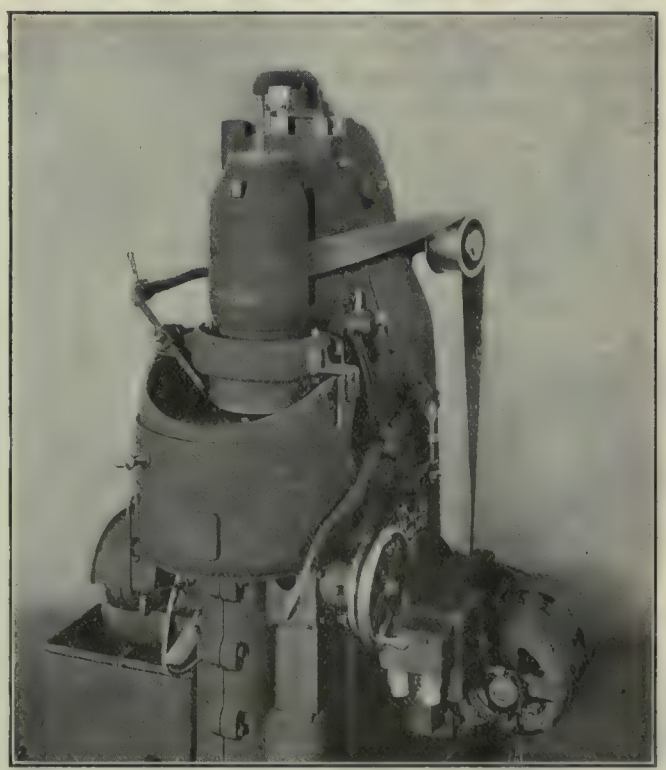


FIG. 1—WALKER SINGLE-STROKE GRINDING MACHINE. FIG. 2—FRONT VIEW OF WALKER MACHINE SHOWING CHUCK AND WATER GUARD

complete unit, attached to face of the column by means of a swiveling joint and opposed adjusting screws in such manner that the alignment of the work spindle relative to the wheel spindle is easily and quickly adjustable. Such adjustment is necessary to adapt the machine for concave grinding (as with circular saws) and for convex grinding, as well as for parallel work faces.

When this adjustment has been made the unit remains rigid with respect to the column, but the bearings of the work spindle are carried in a sleeve within the unit, which sleeve is capable of movement in a direction parallel to the axis of the spindle through a maximum distance of 4 inches. The sleeve is actuated through the medium of a hand-wheel, miter-gears and a screw.

This movement, supplemented by the difference of two inches obtained through the different settings of the positive stop on the wheel head, is the range of thickness to which work can be ground. A dial of large diameter is carried on the handwheel shaft, and the graduations on this dial are so spaced as to read in thousandths of an inch of elevation of the work table. Besides being the means of determining the original thickness of work pieces, this movement provides for adjustment to compensate for wear of the grinding wheel.

The rotary movement of the work spindle is derived through helical gearing, a pair of 3-step cones, and a belt from the main driving shaft of the machine. The driven gear upon the work spindle is made sufficiently long so that the spindle may be moved through the full range of its adjustment without disturbing the relation of the gear.

The main driving shaft may be equipped with tight and loose pulleys and a friction clutch for a belt drive from overhead or, as shown in Fig. 2, may take its power from an independent motor attached directly to the machine base and driving by silent chain. For motor drive the clutch is omitted and the machine is controlled by the starting box.

A centrifugal pump for handling grinding compound is attached as a unit to the base of the machine and takes its power through gearing directly from the main driving shaft. It is always running when the machine is in motion, regardless of whether the work spindle is running or stationary. A 14-gal. tank, fitted with baffle plates and a settling compartment, provides ample capacity for the compound.

The movement of the grinding wheel to the work is accomplished by a single downward sweep of the hand lever until the wheel head comes to rest against the positive stop, at which point the grinding is completed. Hence the name "single-stroke."

When the wheel head is in its upper position, the work spindle is stationary and the energizing current is cut off from the magnetic chuck. The first part of the downward movement automatically closes the electric circuit through the chuck and at the same time starts the work spindle in motion. As the wheel head is raised from the work the automatic switch sends an instantaneous current through the coils in reverse direction and thus completely demagnetizes the chuck.

Ordinarily the chuck is stopped and demagnetized when the grinding head is up, and energized and in motion when the head is down. An auxiliary lever at the left of the machine provides means for stopping and starting and at the same time, magnetizing or demagnetizing the chuck, regardless of the position of the grinding wheel. This is wholly an emergency control.

Fig. 1 shows the left side of the machine and Fig. 2 is a front view, showing the movable water guard in its lower position with the wheel and chuck exposed for unloading and reloading.

The speed of the grinding wheel remains constant at 2,200 r.p.m., giving a surface speed of 4,200 ft. per minute. There are three speeds of the work spindle, 30, 50 and 75 r.p.m., obtained by shifting the small belt upon the cones.

The machine with driving motor occupies a floor space of 53x50 in., and weighs 4,200 lb. net. A 7½-hp. motor, running at 1,750 r.p.m., is best adapted to meet the requirements.

Universo Work Holder and Drill Jig

An adjustable work holder and drill jig which is especially adaptable to drill press work in the tool room and the general shop, has recently been placed on the market by the Universo Tool Corp., Rochester, N. Y. Fig. 1 shows the essential parts of the device, to which other appurtenances may be added to suit the purpose for which the tool is to be used.

A short jaw is adjustably mounted on a long stationary jaw as shown, connected at the left-hand end by a toothed bar and a guide, and at the other end by a tie-bar. The tie-bar may or may not be used depending on the conditions, and when used, follows the short movable jaw as it is adjusted. Quick adjustment of the short jaw is obtained by raising it slightly from its position on the notched bar and sliding it to another position.

Work is clamped against the long jaw, either on the upper or the lower edge, by means of the clamping screws on the short jaw, the screws shown on the long jaw being provided for adjustment purpose. As shown in Fig. 1, the device is intended for holding single pieces which are laid out by hand and takes

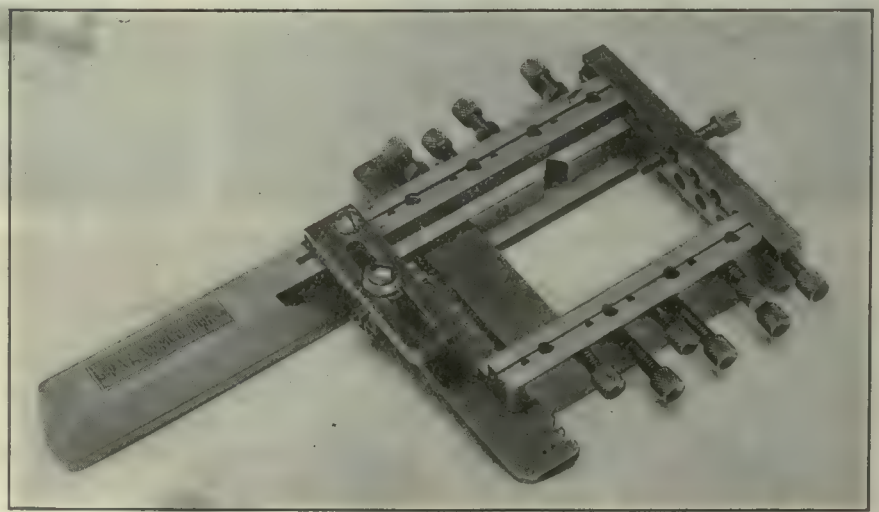


FIG. 1—UNIVERSO WORK HOLDER AND DRILL JIG

the place of the vices, clamps and straps used in various places to hold work on the drill press. The lower ledges may be removed, if desired, so that the work may be laid on the table.

A movable stop is shown in Fig. 1

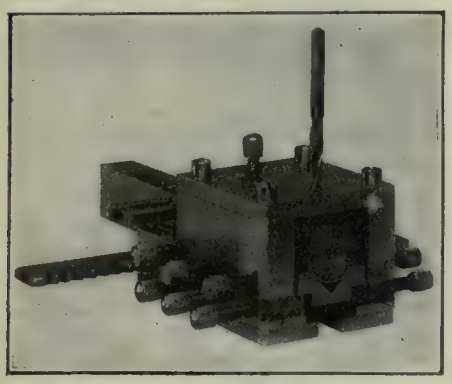


FIG. 2—UNIVERSO JIG FOR ROUND STOCK

attached to the long jaw above the toothed bar, and may be adjusted to bear on an irregular-shaped piece at the most convenient point. The use of the tie-bar also permits the clamping of the piece at a point directly opposite the stop.

Distance pieces, a V-block, and a jig plate may be added to the device, as shown in Fig. 2, making a box jig for drilling round stock. The adjustable stop is set to provide the proper length of stock beyond the

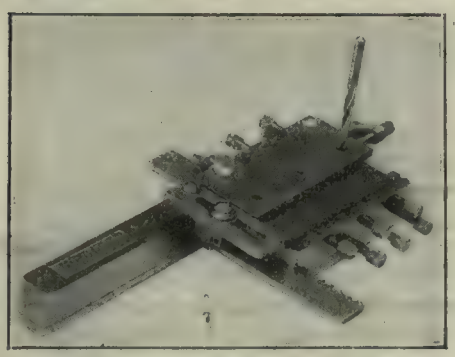


FIG. 3—UNIVERSO JIG FOR FLAT WORK

hole to be drilled, and the piece is then located by pushing it against the stop and clamping it with one screw.

A variety of pieces and attachments such as these can be furnished by the manufacturer of the device and others can be easily made in the shop or tool room to suit special requirements.

The work held in the jig in Fig. 3 is clamped on the upper ledge with a template or jig-plate fastened to the stationary jaw. The template is mounted so that it may be swung out of the way to permit countersinking or similar operations. A swinging clamp is fastened to the end of the long jaw and is used for clamping the work against the stop.

Many other combinations of standard and special pieces are possible.

Cincinnati 3-Way Open-Side Planer

A special open-side planer, having three ways instead of the usual two, has recently been built by the Cincinnati Planer Co., Cincinnati, Ohio. The accompanying illustration shows the position of the ways, together with the back of the knee and rail.

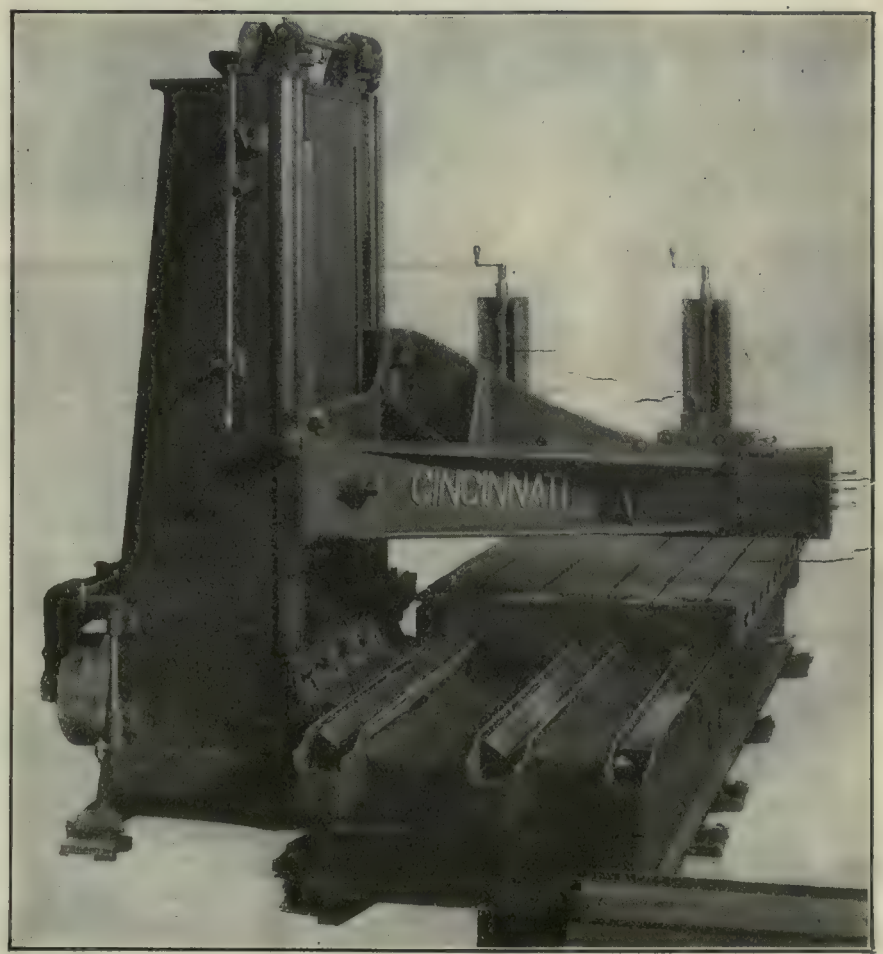
Two of the ways are V-shaped and one is flat, giving wide support to the box table, which is also equipped with a table clamp and inner guides. This construction is to avoid any liability of the table lifting or tilting out of the track. The top surface of the table is provided with five T-slots for clamping purposes. The ways are lubricated by a force feed system, employing a reversible pump which forces the oil into the ways directly under the cutting tools. Before being used again, the oil is settled and strained to avoid the possibility of dirt getting into the ways.

The rail is of the extended type and constructed to allow heavy cutting at the extreme end. The knee is bolted and doweled securely to the rail and may be clamped to the column by full-length T-blocks.

The heads are equipped with rapid power traverse in all directions and are made of sufficient length to permit planing some distance below the rail. The heads are so constructed that the slides have a full bearing at all times and the down-feed screw is always in tension. The rail has a power elevating device for raising and lowering, and a limit stop prevents raising the rail above its maximum height.

The column is braced and ribbed on the inside to prevent distortion and, in addition to being bolted and doweled to the bed, is also held in position by a large tongue cast integral with the bed. This tongue fits a groove in the column.

The side head is also equipped with rapid power traverse and the slide is equipped with a handwheel for feeding.

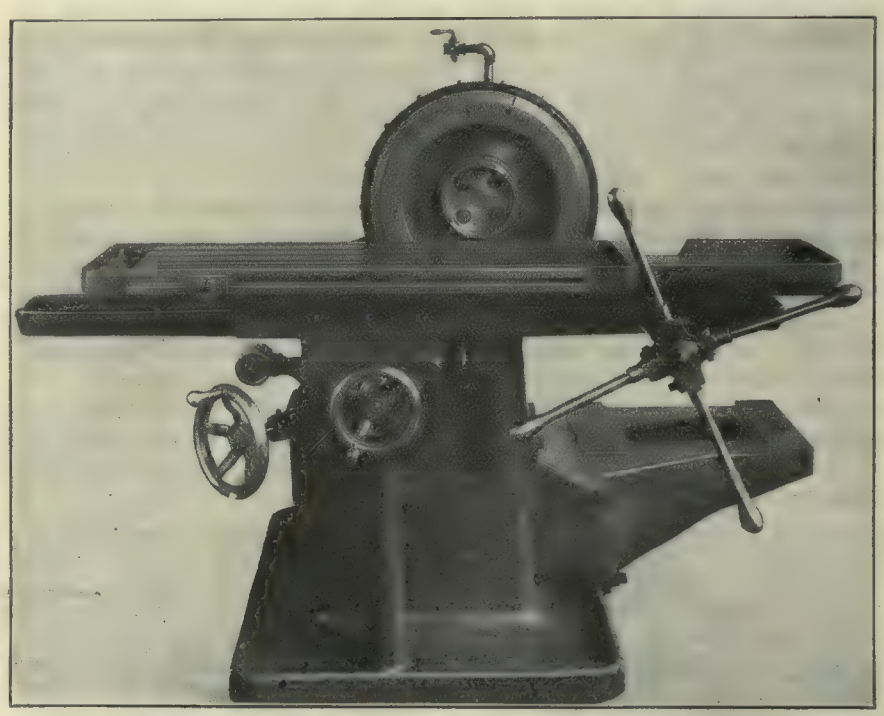


CINCINNATI 3-WAY OPEN-SIDE PLANER

Graham 18-In. Face Grinding Machine

The Graham Mfg. Co., 71 Williard Ave., Providence, R. I., has added to its line the 18-in., knee-type, face grinding machine here shown, which in addition to its increased capacity presents some features that were not included in the smaller machine of the same class, illustrated on page 532, Vol. 55, of the *American Machinist*.

The machine swings an 18-in. ring wheel which is held in a pressed steel chuck bolted to the collar of the spindle. The spindle runs upon Timken roller bearings so arranged that all end movement is automatically taken care of by the tension of a heavy coil spring. Adjustment to compensate for wear is provided by ring locknuts. Felt washers exclude dirt and abrasive dust from the bearings and the latter are fitted with glass-body oilers to indicate the level of the lubricant.



GRAHAM 18-IN. FACE GRINDING MACHINE

The machine is arranged to be driven by a motor which is permanently mounted upon a bracket at the side of the column. From the driving pulley of the motor a 6-in. belt extends to a 9-in. pulley located midway between the bearings of the spindle.

The knee is gibbed to the face of the column and has a vertical movement of 8½ in., actuated by a conveniently located handwheel. The saddle has a cross movement in a direction parallel to the axis of the wheel spindle of 3½ in., and is also actuated by a handwheel and screw, the latter fitted with a micrometer dial to facilitate exactness of setting when duplication of parts is desired.

The table presents a work surface of 13x44 in. and has four ⅝-in. standard T-slots for attaching work pieces, jigs or fixtures. It has a traverse of 24 in., actuated by a pilot wheel that is made collapsible so that it may not interfere with large pieces or projecting parts of work. At its maximum height the surface of the work table is 1½ in. below the center line of the wheel spindle.

The table is surrounded by a generous water channel and provided with means for attaching splash guards so that an ample supply of cooling liquid may be directed upon the point of contact between wheel and work. An extension bracket provided with raised edges is bolted to the end of the table to catch any liquid that may overflow because of long or overhanging work. Below the table are permanent basins attached to the saddle and drained toward the center to carry any possible overflow back to the tank. A No. 2 Brown & Sharpe geared pump supplies the liquid from a settling tank located within the column of the machine.

The abrasive ring, or ring wheel, is 18 in. in outside diameter, 4 in. deep and has a 14-in. hole. The rotative speed required may vary somewhat in accordance with the nature of the work being done but should average around 1,200 rev. per min. The drive may be from overhead countershaft or independent motor, and for the latter purpose a motor base is attached to the column and becomes a part of the machine.

The machine requires a floor space of approximately 3x4 ft., stands 42 in. high, and when crated for domestic shipment with either countershaft or motor base, weighs 5,000 pounds. From 15 to 20 hp. is required to drive it.

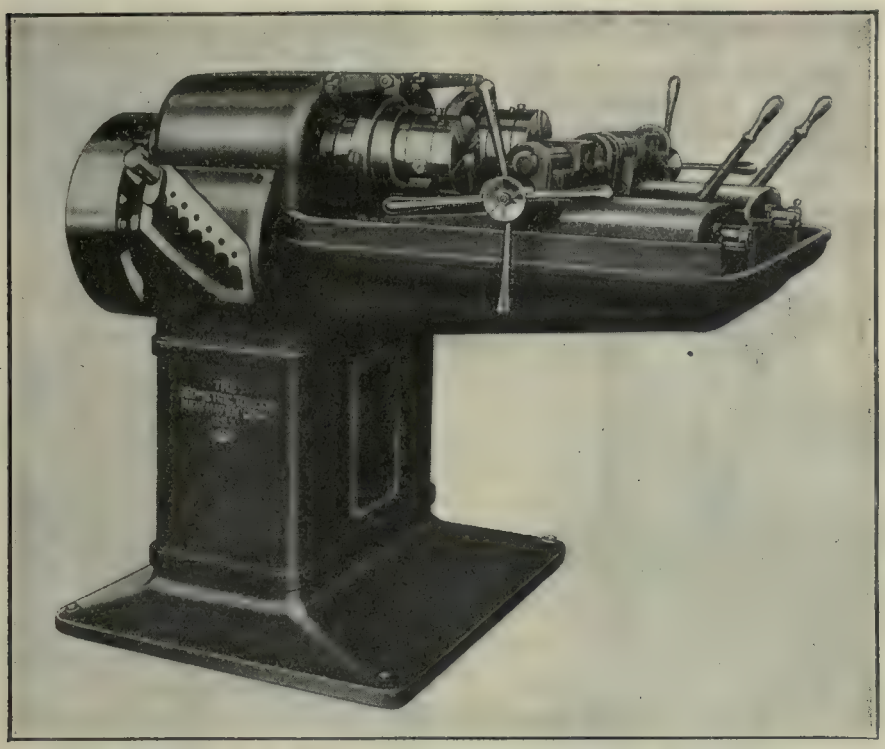
Geometric 1½-In. Double-Spindle Threading Machine

A 1½-in., double-spindle threading machine has recently been added to the line of threading machinery and tools manufactured by the Geometric Tool Co., New Haven, Conn. The machine is similar in construction to the ¾-in. double-spindle machine previously described on page 388, Vol. 54, of the *American Machinist*.

This larger size machine, like the smaller size, is designed for threading work in which the threading time for each piece is sufficient to allow the operator to chuck and start a second piece while the first is being completed. For this class of work the double-spindle machine is practically as fast as two single-spindle machines.

Both spindles may be fitted with dieheads for external threading, or with collapsible taps for internal work. Also one spindle may carry a tap and the other a die, for work that requires both an internal and an external thread. A high-speed tapping device can be furnished for tapping holes which are too small to permit the use of a collapsible tap.

The spindles are mounted in bronze bearings and driven by a single pulley, but may be driven independently by means of the change gear levers. These levers also control the spindle speeds and can be set to furnish the proper speeds for the threads being cut. The machine will cut threads of the following diameters: ¾, ⅞, 1, 1⅛ and 1¼ inches.



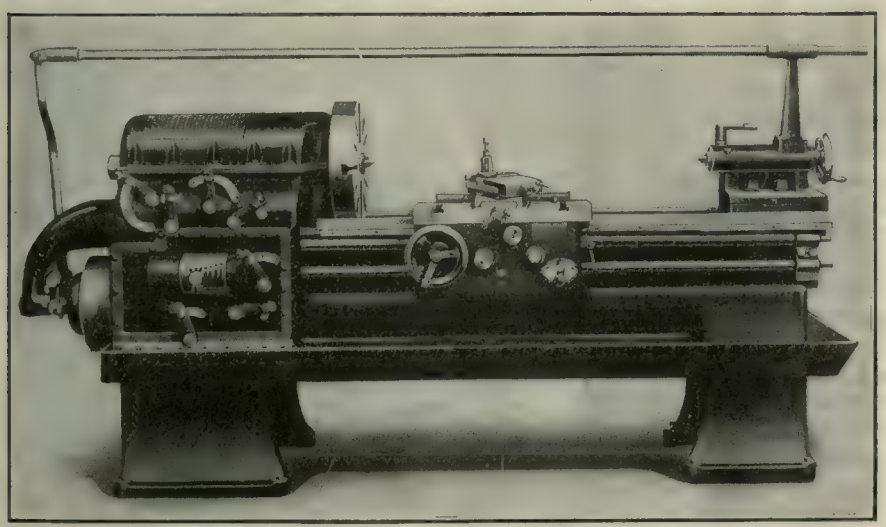
GEOMETRIC 1½-IN. DOUBLE-SPINDLE THREADING MACHINE

An adjustable swinging gage on the side of the carriage governs the opening of the diehead and the length of thread to be cut, and an adjustable stop back of the carriage controls the closing of the diehead. The greatest length at which the swinging gage can be set at one time is 9 in., but with resettings a length of 14 in. can be obtained.

The recommended countershaft speed is 296 r.p.m. The floor space required is 48x65 in., and the net weight is 2,165 lb. The machine can also be fitted for motor drive, in which case a 6-hp. motor is required.

Walcott Low-Drive Lathe

The Walcott Lathe Co., Jackson, Mich., has just brought out its "Low-Drive" lathe that is here illustrated. The outstanding feature of the machine is the drive mechanism, which is different from that usually employed in lathe construction, and which is stated to greatly reduce vibration. The single driving pulley with its clutch can be seen low down at the head end of the lathe. The driving mechanism is located directly under the spindle below the ways of the lathe. Among the advantages claimed for the construction are simplicity, rigidity and a low center of gravity. The belt pull comes much nearer the center of gravity, and hence has less disturbing effect than when the driving pulley is high up on the head. The clutch can easily be operated from any part of the lathe by the overhead shifter rod.



WALCOTT LOW-DRIVE LATHE

Among the other important features are the following: The headstock, bed and gear box containing the working parts of the head are cast in one piece, assuring rigidity and also being oil tight. All gears and shafts are flooded with oil by means of a geared pump, which insures lubrication of the working parts. All the gears are contained in a single housing, thus eliminating overhanging gear boxes and making the head symmetrical and pleasing in appearance, as well as smaller in size. A three-point bearing is employed to secure proper alignment of the bed.

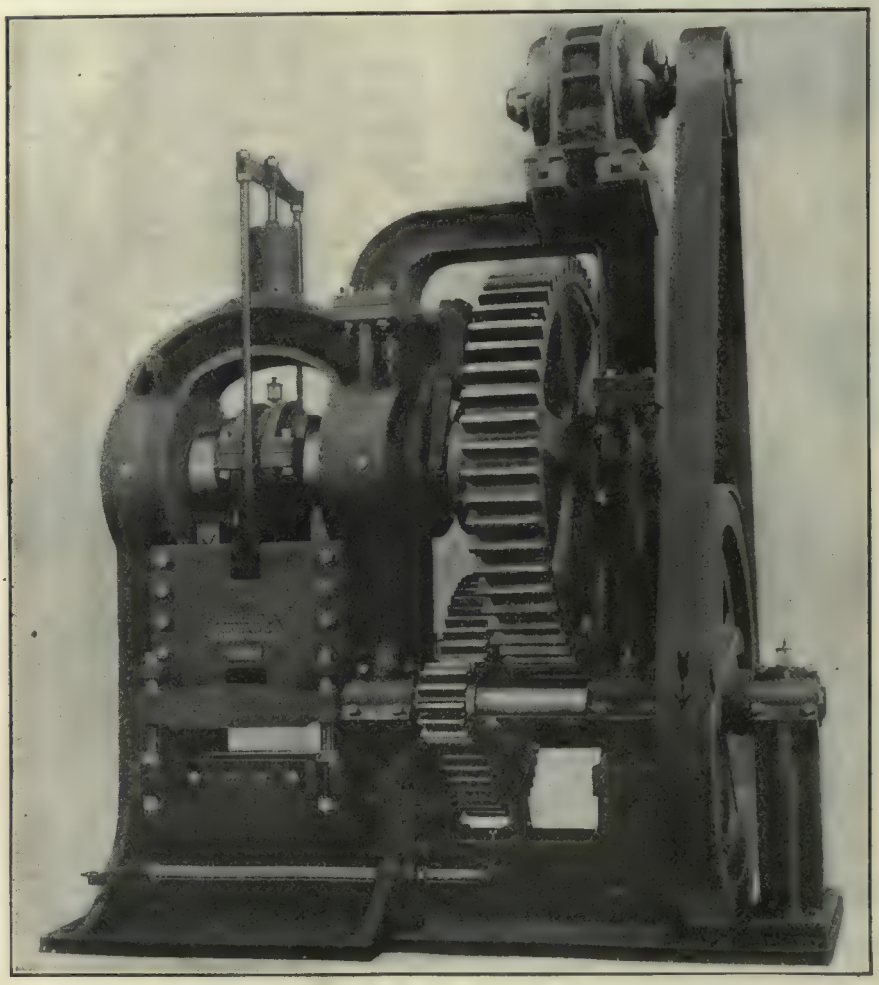
Three levers are used to obtain the forty-two feeds and three other levers to obtain the twelve speeds. A lever is also provided for reversing the feed, as well as one for changing the feed from the rod to the screw. The arrangement of the levers on the head can be seen in the illustration, those levers controlling the drive being on the head and those for the feed being on the front of the bed.

High-carbon heat-treated steel is used for all gears and shafts and bronze bearings are employed throughout. A departure from the construction previously followed by the concern can be noted in the fact that the feed is set in inches per minute regardless of the spindle speed, instead of in thousandths of an inch per revolution as heretofore. The feed mechanism is driven from a constant-speed drive shaft, which arrangement gives forty-two feeds from 0.4 to 22.4 in. per min. travel of the carriage.

Since the combination of the twelve speeds and the forty-two feeds provides a maximum capacity of 504 thread changes, the range of threads that can be cut covers all standard threads and many odd and special threads as well. The lathe is built in sizes from 10 to 30 in. swing. Regarding the general features not herein explained, the machine follows the design and practice of the other lathes made by the concern.

Long & Allstatter Guillotine Bar Shears

A redesigned and improved line of guillotine bar shears is now being marketed by the Long & Allstatter Co., Hamilton, Ohio. The improved machines are adapted to the shearing of square, round or flat bars, and built in a range of sizes for cutting off steel bars from 1½ to 7 in. square.



LONG & ALLSTATTER GUILLOTINE BAR SHEAR

In order to obtain a machine that will be as rugged, compact and free from flexure as possible, the main frame or housing is made from a one-piece casting of box design, the material for the frames of the larger sizes being cast steel and for the smaller machines, a semi-steel mixture. It is said that series of tests on these machines have shown remarkable endurance of the cutting edges of the blades, due in a great measure to the rigid construction maintaining the blades in alignment.

The slide or ram has a long bearing on its guides and the slide bearings are lined with bronze. The weight of the slide is counterbalanced by air, by springs, or by weights that operate below the floor level. The gears are of steel with cut teeth and are placed at the side of the machine in order to give unobstructed access to the cutter. The gear shafts are all mounted in bearings at each side of the gears, so that no gears overhang.

An improved automatic stop for operating the clutch always brings the slide to rest with the blades open, and is provided with a safety locking device so that the clutch will be engaged only when the treadle is completely down. The machine can be stopped after each stroke or can be run continuously, as desired.

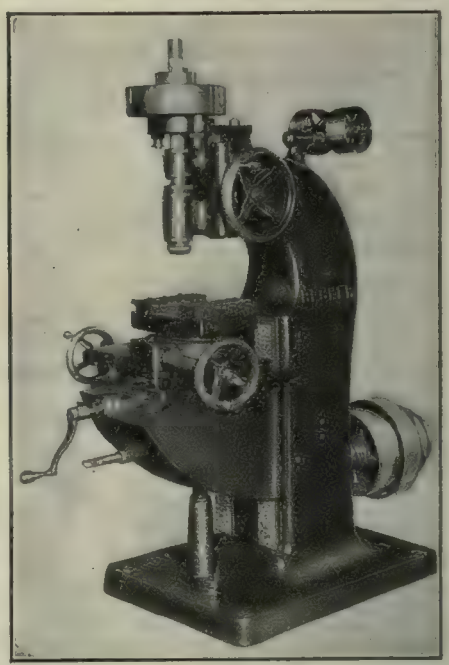
The flywheel is made sufficiently heavy to relieve the motor, or other driving medium, of much of the high peak load at the instant of cutting. The machines are all self-contained, the various parts being assembled on a base to insure proper alignment.

The size H machine is shown in the accompanying illustration, and will cut mild steel up to 5½ in. square or 6 in. round. The stroke is 6½ in., the length of blade is 26 in., and the width between housings is 30 in. A 40-hp. motor is required to drive the machine at 16 strokes per min., and the floor space required is 142 x 109 in. Six other sizes of the machine are built.

Becker No. 4 Die-Sinking Machine

A modification of the standard Becker No. 4-B milling machine adapting it especially to the needs of the die-sinker, has been placed on the market by the Reed-Prentice Co., Worcester, Mass.

Instead of the usual milling machine table, this machine is fitted with a special vise mounted permanently upon the upper sliding number and capable of rotation through a complete circle by means of the handwheel, worm and worm-wheel. The capacity of the vise jaws is 9 x 7 inches, and a movement of 14 in. to and from the face of the column and at a right angle thereto is available.



BECKER NO. 4 DIE-SINKING MACHINE

The knee may be elevated through a distance of 19 in., and this is supplemented by a vertical movement of the spindle head through a range of 5 inches. No power feeds are applied.

The spindle is fitted with internal reduction gears and is driven by a 2¾-in. belt running over idlers from the horizontal drive shaft at the rear of the column. A 3-step cone

takes the belt from the countershaft and with the reduction gearing makes available 12 spindle speeds, ranging from 11½ to 680 revolutions per minute.

The main bearing is of bronze, having a diameter of 2⅜ in. and a length of 6¼ inches. There is a through hole ⅛ in. in diam. for draw back and knockout rods. A No. 10 B&S taper hole provides for the reception of shank mills and the spindle nose is threaded for attaching chucks or cutters that are screwed into place.

The machine occupies a floor space of 59x60 in. and weighs approximately 2,440 pounds.

Cleveland Automatic Hub Machine

A recent addition to the line of automatic machinery manufactured by the Cleveland Automatic Machine Co., Cleveland, Ohio, consists of an automatic lathe for the manufacture of automobile wheel hubs. This machine is similar in action to the automatic piston machine manufactured by this company, and Fig. 1 gives a general view of the essential features.

The hub is mounted on an arbor as

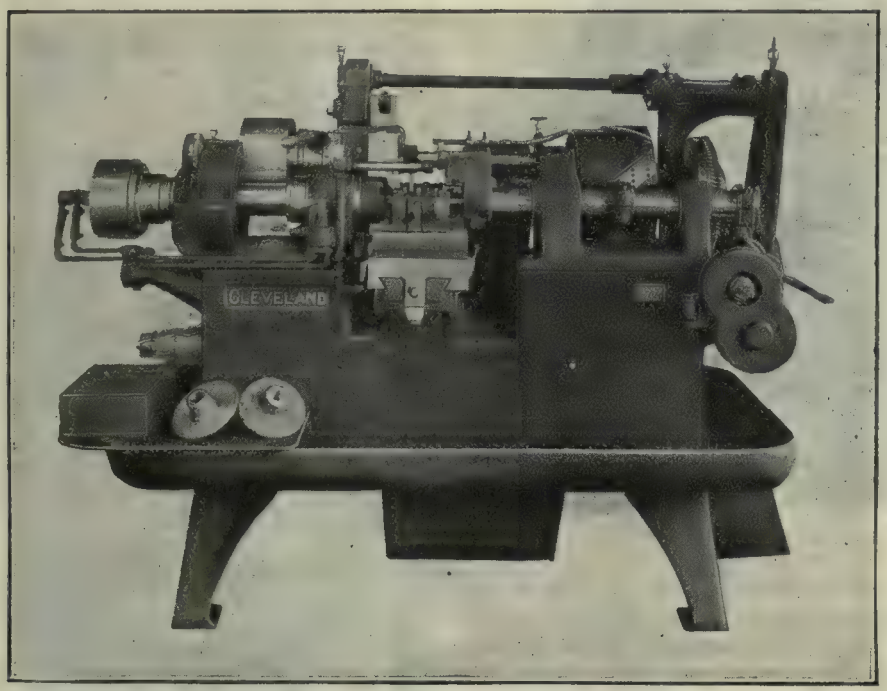


FIG. 1—CLEVELAND AUTOMATIC HUB MACHINE

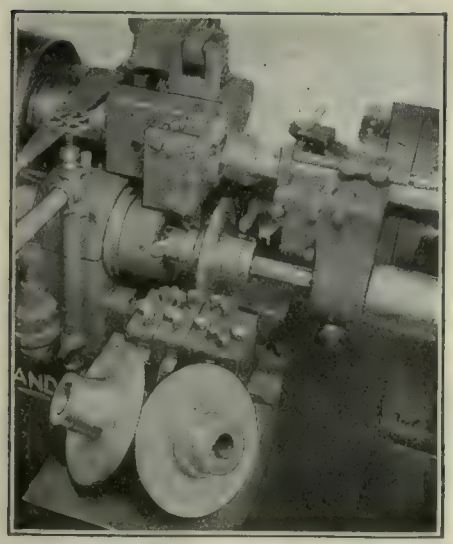


FIG. 2—TOOL SET-UP ON CLEVELAND HUB MACHINE

shown in Fig. 2, one end of which is chucked in a hand-operated air chucking mechanism. The other end of the arbor is supported by a roller bearing in the tool stock spindle and is driven by the boss on the spindle hood, which engages the lug on the arbor.

The overhanging arm mounted on the tool stock spindle and rigidly supported in the rear, carries three cutters, one of which turns the flange diameter, while the other two rough turn the small diameter and face one end.

The overhead turning attachment which is mounted securely on the spindle head and operated longitudinally by a cam on the camshaft, carries two cutters for rough turning the other small end. Three cutters in blocks mounted on the rear cross-slide rough face the flange and rough form and face one end.

Both ends are finish formed and the finish facing of the front of the flange is done by four cutters which are mounted on the front cross-slide. A hub is produced at each cycle of the camshaft.

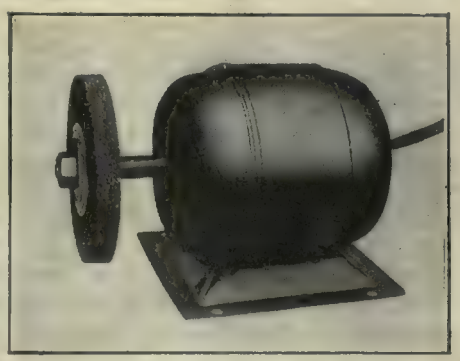
The machine is driven from a single pulley with a clutch which automatically stops the machine as each hub is completed. The machine is arranged for either belt or motor drive and the lever for starting the machine, as well as the air control lever, is within easy reach of the operator.

It is stated that three machines can be operated at once by one man, and that 12 hubs can be produced per hr. by each machine from forgings.

Atta Bench Tool Grinder

The Atta Tool Co., 172 Union St., Worcester, Mass., has recently brought out a small bench tool grinder that should command attention because of its unique construction, its lightness and cheapness. It is intended for use in homes, garages or other places where a grinding wheel is occasionally needed to sharpen small drills, chisels and similar tools.

The device is made almost entirely



ATTA BENCH TOOL GRINDER

of sheet metal stampings; the rotor shaft being the only machined part. The base is a single stamping and the body is composed of two flanged cups, held together and to the base by the central band. But one machine screw is used in the entire construction.

The motor is designed for 110-volt alternating current only, and may be attached to any convenient a.c. lamp socket. The device swings a 4x½-in. wheel.

Gray Switch Planer

For heavy planing work in the manufacture of railway switches, the G. A. Gray Co., Gest & Depot Sts., Cincinnati, Ohio, has just placed on the market a special design of switch planer. The heavy switches now used in railway work are generally made from open-hearth manganese steel rails which have a high carbon content, and this

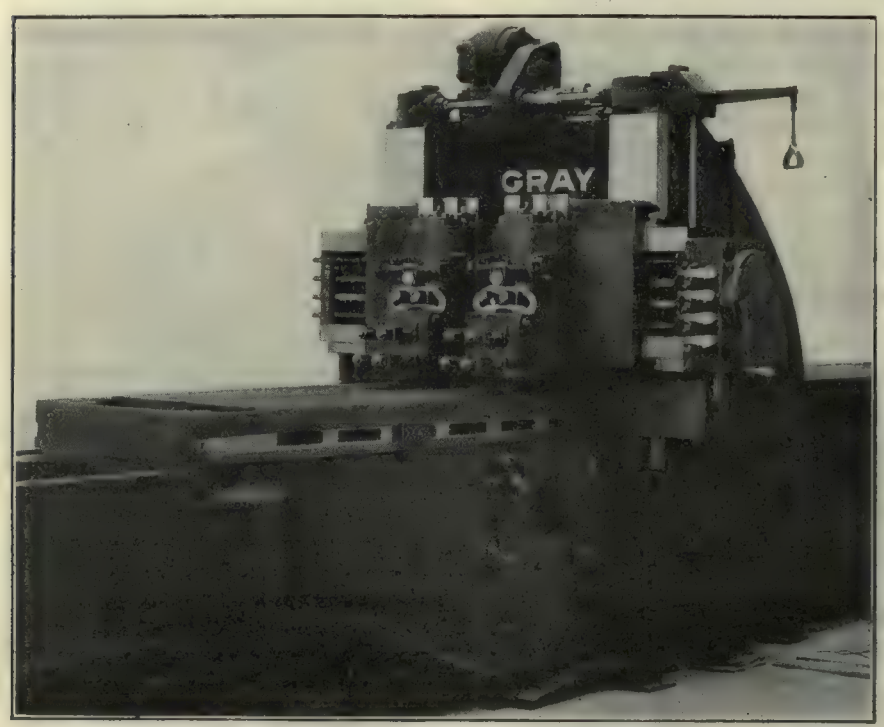


FIG. 1—GRAY SWITCH PLANER

planer is of exceptionally rugged construction to perform the heavy service required. The weight of the parts and the power of the machine are indicated in Fig. 1, which is a general view.

The housings and the rail surfaces are much larger than in the ordinary planer, and the bed has also been made very deep so that it will be rigid at the point where the gears are supported and where the heavy strain of cutting must be sustained.

Switch planing work is practically confined to two major operations. First, feeding the two heads toward each other in order to take simultaneous cuts on the sides of two rail heads; second, the operation shown in Fig. 2, in which both tools feed directly down into the flange of the rail, cutting off the flange.

In the first-mentioned case, the operator depresses the highest and the lowest clutch lever shown at the right-hand end of the rail, thereby throwing both traverse and manual feed levers into engagement with the cross-feed screws. Then by turning a single crank at the end of the rail, the desired amount of feed is easily provided, the heads moving toward each other. When the cut has been completed a single pull on the traverse lever, which is directly underneath and near the manual feed lever, starts the traverse motor and moves the heads quickly apart, ready for the next cut.

For flange cutting, the second operation mentioned, the second and third levers are depressed, the others being released by touching buttons provided for that purpose. The manual feed lever will then give a feed of both tools down toward the work, and a single motion of the traverse lever brings both slides quickly back to the starting position. It will be noted that to change from the first operation to the second requires little time and no great effort on the part of the operator who, with only two control levers to manipulate, is able to keep his eyes on the tools and the work. If desired, either head can be independently controlled.

The heads are heavy and rigid and the tool apron is provided with an abutment or shoulder at the lower end, so that the heavy upthrust of the tool is not borne on the pin upon which the apron swings, but by the bearing of this shoulder against the tool box. Twin purpose taper gibs are provided for slides and heads, a turn of the handle in one direction positively adjusting the gib to the operating position, and a turn in the other direction locking the two parts securely together throughout the length of the gib.

The table driving gears are of unusual size and of steel throughout, the pinions being cut from steel forgings. From the drive shaft pinions to the bull pinion the gearing is of the balanced helical type. At the first reduction, for instance, a driven gear is mounted on each end of the pinion hub, thus balancing the torsional effect. The shafts are pinned to the gears and rotate with them and are therefore subjected only to a shearing strain. This design is exceptionally rigid and tends to eliminate vibration and chatter. The gears run in a bath of oil.

The bed is cast solid on the bottom to form an oil tank and at the same time tie the side walls together. The bed has two walls on each side of the gears, these double walls being tied together by heavy webs. The bearings which are mounted in the walls are therefore rigidly supported, and the bed is stiffened between the housings and throughout the gear space.

The planer has a complete automatic oiling system. Not only do the gears run in oil, but a flood of

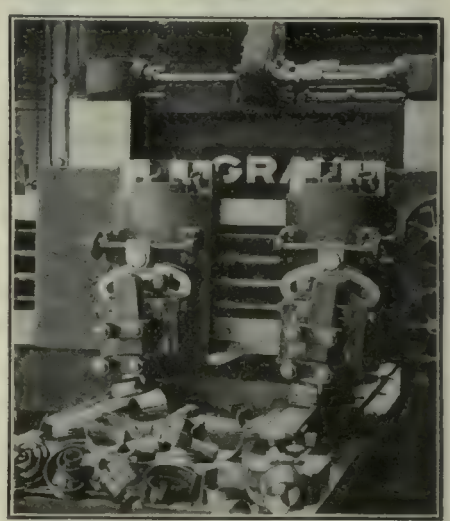


FIG. 2—GRAY SWITCH PLANER IN OPERATION

oil is also pumped to the ways and to the drive shaft bearings. At each end of the bed a strainer plate and a settling basin are provided, from which the oil returns to the central reservoir. As an additional safety feature, the oil is passed through

another strainer and a filter before being again pumped to the ways and bearings. Both the filter and the pump are mounted on the outside of the planer for easy inspection. The oil pump is coupled direct to the drive shaft.

While the position of the rail is not often changed in switch shops, it may be readily raised and lowered by pulling down the stirrup at the operator's end of the rail and pushing the traverse lever into the running position. The rail is clamped on the outside and inside edges of each housing.

It is stated that one of these planers in a test run cut through the flanges of two 100-lb. R.B. rails, of 70-point carbon, open-hearth steel, in five strokes. The width of the cut varied from zero to 3 in., the feed was about ⅛ in., and the cutting speed was 25 ft. per min. The range of cutting speeds of the planer is from 25 to 50 ft. per minute.

Ramsey Silent Chain

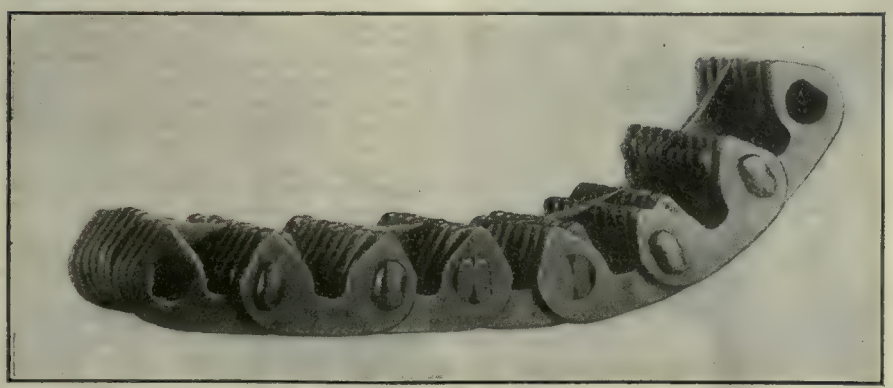
A type of silent chain, which is simple in design and at the same time possesses features which should insure satisfactory operation, is now being marketed by the Ramsey Chain Co., Inc., 1031 Broadway, Albany, N. Y. A section of the chain is shown in the accompanying illustration, one outside link having been removed and the ends of the pins at the joint having been ground off to show the profile.

The joint is the feature of the chain and, from its action under operating conditions is called a compensating joint. The ground joint at the left shows the pins in their relative positions when the chain is straight, and the adjacent joint shows their relation when the chain is flexed around a sprocket of comparatively small diameter. A chain of appreciable pitch always receives a slight accelerative impulse as it goes into mesh with a sprocket and this acceleration is compensated in this chain by an increase in the pitch of the link, produced by the joint at the meshing point. The position of the pins as the chain meshes with the sprocket will be somewhere between the two positions shown, and in this position the profile of the pins allows them to move toward each other, thus decreasing the effective pin diameter and increasing the pitch of the link to compensate for the accelerative impulse. This feature of the chain tends to smooth running with all its attendant advantages.

It will be noted that the profile of all the pins is the same, producing a symmetrical joint and allowing the chain to run in either direction with equal facility and efficiency. The individual links are also symmetrical and the simple contour of the holes for the pins facilitates accurate construction of the links. Since the relative motion of the pins is rolling there is no tendency of the faces to slip and groove as wear occurs, a condition which is also helped by the small angle between the pin faces throughout their action.

One pin of each pair is carried through the outside links in which it is a drive fit, and is spun over after assembly. This method holds the pin in proper relation with the chain at all times.

The accuracy and precision of this chain are said to be remarkable, a result of the simple design and the use of Johansson gage blocks for the production and inspection of manufacturing tools and gages. The comparatively large cross-section of the pins also tends to produce a chain with ample strength for the service required. The chain is now made in standard pitches from ⅜ to 1 in. inclusive.

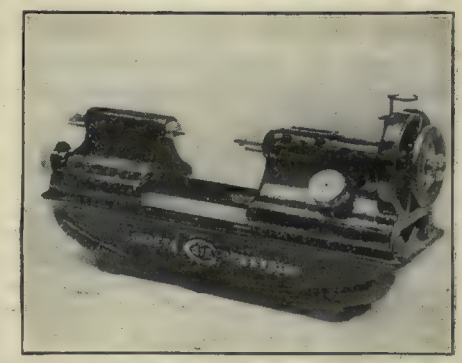


RAMSEY SILENT CHAIN

Societé Genevoise Bench Micrometer

The R. Y. Ferner Co., 1410 H. St., N.W., Washington, D. C., has recently placed on the market a line of precision bench micrometers manufactured by the Societé Genevoise d'Instruments de Physique, Geneva, Switzerland. These instruments are said to be accurate to within 0.00005 inch.

A bed with accurate ways forms the base of the machine, upon which the headstock containing the micrometer screw may be set at any desired point. The zero anvil consists of one of the test comparator tubes manufactured by this company, mounted in a tailstock in which the comparator tube may be adjusted by a slow motion device to obtain the final adjustment before



SOCIETÉ GENEVOISE BENCH MICROMETER

taking readings. Only an occasional setting of the headstock is necessary as the micrometer screw has a range of 2 inches. The contact spindle does not revolve.

The micrometer head is protected by a heavy shield which covers all the graduations except those opposite the vernier index. Each division of the head represents 1/20,000 in., and the vernier permits readings to 0.000005 in. An adjustable reading glass is provided, and the head is rotated by means of a fiber handle to prevent conduction of heat from the user's hand.

The test comparator tube also serves as a pressure indicator, its contact plunger being pressed against a helical spring until a pointer reaches the zero of a scale graduated to thousandths of a millimeter. A knife-edge amplifying mechanism actuates the pointer.

These instruments are furnished in three sizes. The smallest has a capacity from 0 to 4 in., the second from 0 to 8 in., and the largest from 0 to 16 in. End measuring rods are

furnished so that the headstock can be set to measure any distance in the range of the instrument. The headstock is clamped in position by the large knurled thumbnut shown in the illustration, and a window at the top of the headstock is provided through which the multiple of turns of the micrometer head may be determined.

These micrometers are supplied standardized for 62 or 68 deg. F., as desired, for the inch units, and can also be furnished with metric graduations, in which case readings can be made to 0.0001 mm. by means of the vernier.

Buffalo Improved Combination Woodworker

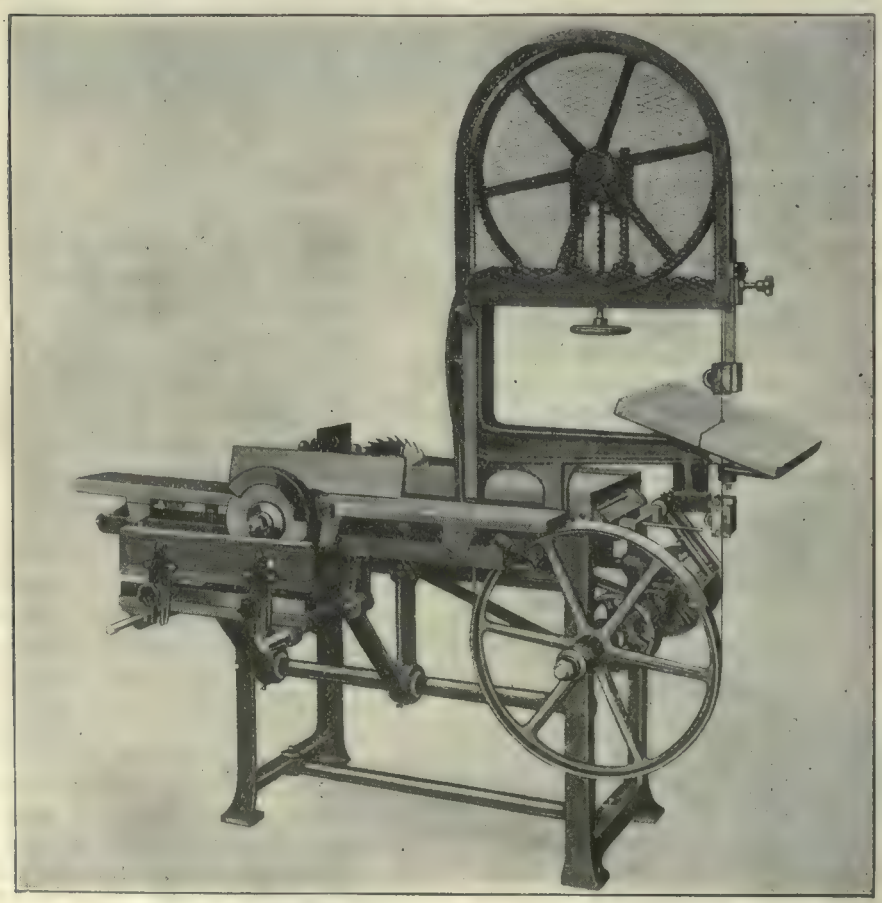
The Buffalo Forge Co., Buffalo, N. Y., has recently made some improvements on its No. 2 combination woodworker, and is now marketing the redesigned machine, the essential features of which are shown in the accompanying illustration. The more important improvements include provision for quicker, simpler and more accurate adjustment of the planer guide, and the introduction of a positive drive for the rip-saw and jointer mandrel, obtained by means of a raw-hide pinion and gear.

The new planer guide arrangement consists of a slot in which the planer guide is moved backward and forward. The guide is locked in position by means of one thumb-nut, and can also be set at any angle.

The use of the pinion and gear drive to the jointer and circular saw shaft gives smoother running than the former belt drive and eliminates belt slippage. The ratio of the gears is approximately 2 to 1.

The machine combines in one assembly a circular saw, a band saw and a jointer. Jaw clutches are arranged in the drive so that the different parts of the machine may be run independently. The saw and jointer tables are adjustable. Arrangements are made so that an emery wheel may be mounted on the outer end of the jointer shaft, and an 18-in. disk sander may be attached to the lower bandsaw shaft.

The bandsaw has a cast-iron tilting table which may be locked in any desired position. The drive shaft should run at 700 r.p.m., and the power required is about 2 hp. for the bandsaw and up to 3 hp. for the ripsaw depending on the working conditions.

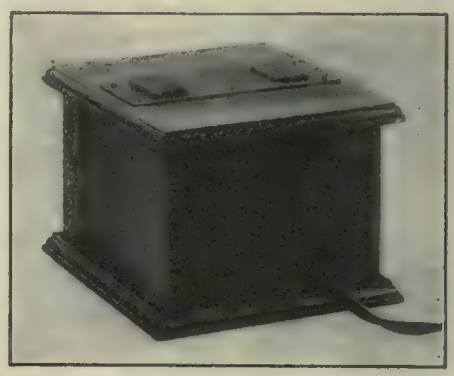


BUFFALO IMPROVED COMBINATION WOODWORKER

Thorn Demagnetizer

A. J. Littlejohn, 508 East Genessee St., Syracuse, N. Y., is now distributing a portable demagetizer, designed for moderate sized machine shops and for tool rooms in which magnetic chucks are used, and manufactured by the Thorn Machine Tool Works, Syracuse, N. Y.

The instrument operates direct from an ordinary electric light socket, thereby eliminating all installation cost, is easily portable and occupies but small space. The effectiveness of the device is said to compare favorably with higher priced and more complicated equipment.



THORN DEMAGNETIZER

The demagnetizer is built for 110- and 220-volt alternating current, and it is claimed that the maintenance and operating costs are remarkably low.

Many Autos Exported Last Year

Exports of automobiles and parts from the United States stand first among all manufactured products shipped from this country, says M. H. Hoepli, Acting Chief of the Automotive Division of the Department of Commerce. They are now exceeded only by five other commodities, none of which is classed as "manufactures."

The government figures for the foreign trade of the United States during the fiscal year 1922-1923 show that "Automobiles and Parts" occupy sixth place among all the commodities exported, being exceeded only by the following: cotton, unmanufactured; mineral oils, refined; wheat, tobacco leaf, and coal. In the export table they are considerably in advance of the other leading manufactured products, including cotton cloth, which holds ninth place; iron and steel, which is sixteenth; and agricultural machinery, which is nineteenth.

The total value of the automobiles and parts exported in 1922-1923 was $132,035,000, representing an increase of 467 per cent over the pre-war average for 1910-1914, and an increase of 72 per cent over 1921-1922.

News Section

Founders Discuss Problems of Labor at Annual Convention

Giving particular attention to various phases of the labor problem with the idea of improving the relationship and furthering co-operation between employers and employees the National Founders' Association held its twenty-seventh annual convention on Nov. 21 and 22 at the Hotel Astor, New York City. The opening session was devoted chiefly to reports of officers and committees, although in addition Magnus W. Alexander, managing director, National Industrial Conference Board, told of conditions in Europe as he had recently observed them.

The address of the president, William H. Barr, covered a broad field. With reference to the relationship between employers and employees he made the following statement: "During a year of substantial prosperity and ready employment our relationship with our employees has been comparatively harmonious and singularly free from evidences of discord so often expressed by dissatisfied workers in other trades. This is due in part to a better appreciation of the opportunities to be found in the sound policy of the "open shop," or American plan of operation. I believe that a definite factor which has favorably influenced this friendly relationship is the development of a better understanding of the mutual problems involved. Calm analysis, equitable dealing, and capable foremen to interpret the views of the management, have eliminated many causes for dissatisfaction in plant personnel relations."

In the afternoon session Dr. H. H. Myers of the Malleable Brass Co., Mansfield, Ohio, spoke on personnel work and showed the need and the value of it. Horace A. Frommelt of the Falk Corp., Milwaukee, told about an apprentice training system that had proved successful. Fred R. Marvin, of the *New York Commercial*, spoke of the evil effect of radical literature, his subject being "Bootlegging Mind Poison." The value of educational motion pictures was the subject of Dr. Paul Smith, of the American Motion Picture Corp., New York City. At the convention dinner an address was delivered by the Honorable J. Adam Bede, of Minneapolis. Stereopticon views showing the opinions of prominent men in favor of the open-shop principle were shown on the screen.

The Thursday morning session was devoted to two subjects. Enrique Touceda, consulting engineer, American Malleable Castings Association, gave a talk on grey-iron foundry practice and the remedy for some of the troubles encountered. The "Progress of the Open Shop" was the subject of Noel Sargent of the National Association of Manufacturers.

The present staff of officers was re-elected, as follows: President, Wm. H. Barr, the Lumen Bearing Co., Buffalo; vice-president, Charles L. Taylor, the Taylor & Fenn Co., Hartford, Conn.; commissioner, A. E. McClintock, Chicago; and secretary, J. M. Taylor, Chicago.

Immigration Problems Will Be Discussed

On Dec. 13 and 14 at the Hotel Astor, New York City there will be held a conference known as the National Immigration Conference which will be under the auspices of the National Industrial Conference Board. At that time six questions touching upon the immigration laws and the remedy of the situation as it now stands will be discussed. Preceding the opening of the discussion a concise presentation of the present immigration problem will be set forth.

The tabulation of questions ready for discussion is as follows: Shall the Per Centum Limit Act which expires by limitation on June 30, 1924, be retained by extending the period of operation?, Shall the Per Centum Limit Act be retained with amendments in respect to administrative features?, Shall the Per Centum Limit Act be retained with amendments in respect to present restriction?, Shall the Per Centum Limit Act be superseded by new legislation and if so, by what kind?, Shall special legislation be enacted to assure better selection, distribution and assimilation of alien immigrants?, and Shall an Investigatory Commission be appointed by the President under Congressional resolution to inquire into and report within a limited time?

Car Loading Remains at Record Rate

Car loadings for the week ended Nov. 10 totaled 1,037,067, the largest for the corresponding week in any year, an increase of 291 cars over the preceding week and of 91,881 cars over the same week of last year. This was the twenty-first week in which car loadings totaled more than a million, and in four other weeks the loadings were at the rate of a million, but did not reach that figure on account of holidays.

Loadings of all classes of revenue freight in the Eastern district showed an increase of 4.4 per cent over the same week last year, while the Southern district reported an increase of 4.9 per cent and the Western district 19 per cent. In the forty-five weeks since the first of the year the car loadings throughout the United States have totaled 43,691,728 cars, against 37,144,181 last year.

But while a slight gain was made in the total loadings, as compared with last week, merchandise and miscellaneous car loadings, generally taken as a criterion of manufacturing conditions, showed a decrease of 20,286 to 613,961 cars, a figure still 56,891 over the same week of last year. A large part of the decline in comparison with last week, it is pointed out, is due to the seasonal reduction in merchandise loadings.

Vocational Education for Workers

Adult wage earners, who wish to receive technical training which will help them in their occupations, may now secure such training from the public school, announces the Federal Board for Vocational Education.

Under the Federal and State Vocational Education Acts, funds are available to assist the public schools in each community to set up adult evening classes for wage earners. To receive such instruction, it is necessary that a group of workers, employed in a common industry, take the initiative by organizing themselves into a class. Next, they should present themselves to the local school authorities and request an instructor. The local school board is empowered to provide an instructor and a class room, to the applicants. Thereupon, the class begins its sessions on a regular nightly schedule.

The only restriction that the public schools lay upon such adult extension work is that all members of the class be workers, actually employed in the trades for which they desire training. Thus the mistake of training workers for trades in which they can not get employment is avoided.

Factory Equipment at Power Show

Shortage of common labor has driven the manufacturers of the country to an intensive study of the possible economies of material handling equipment in industry. The addition of material handling equipment to the National Exposition of Power and Mechanical Engineering is timely as it furnishes a remarkable opportunity for executives and engineers in industry to study the latest development in this art. The exposition is to be held in the Grand Central Palace, New York, from Dec. 3 to Dec. 8.

The equipment to be exhibited will include conveyors of all kinds, fireless steam locomotives, industrial trucks, elevators, hoists and large scales. Many novelties are on the list and interested engineers will have an excellent opportunity to study each type, select the one most suitable for their particular problem and secure the cost data necessary for the decision.

Philadelphia Business Reported As Satisfactory

General business conditions in the Philadelphia district were reported satisfactory this week with seasonal lulls in some lines. A general feeling among iron and steel men that prices of these basic commodities might soon be reduced was one of the bright spots in the outlook, and this was supported by reports that automobile production is keeping up.

Philadelphia manufacturers of auto bodies are busier now than in several years. Manufacture of auto trucks was reported to be satisfactory.

Business men have reports that steel mills are ready to reduce prices if a reduction would stimulate business. Whether a stimulation would come with a price reduction was one of the subjects being studied.

Activity in automobile production has not benefited the machine tool industry. Most of the auto factories are well tooled up and little or no changes in patterns are being made. Tool manufacturing in Philadelphia is slow and there is nothing in the inquiries received or in the general business outlook to indicate an early change for the better.

Announcement by the Pennsylvania Railroad Co. of a sharp curtailment in its shop personnel throughout the entire system affecting a total of 60,000 men in the four regions, was not good news for the tool manufacturers. Starting Nov. 22, shops in which general repair work was done were shut down until Dec. 3, the company announced, and unofficially it was stated when they reopen it will be with a curtailed personnel.

In Philadelphia and Wilmington, Del., about 3,000 men are affected. The road's statement on the shop closure said:

"In November there is normally seasonal reduction in railroad traffic earnings. The Pennsylvania R.R., in compliance with the American Railway Association, has placed its property in good condition for the Winter, and has a surplus of cars and locomotives available for service. The usual adjustment in working forces is accordingly taking place."

New York Market Remains Steady

Business during the month of November in the New York district has been steady but not as good as was anticipated nor as good as the business done during either of the preceding two months. This does not mean that business is bad, but it is in the peculiar state characterized by dealers as "waiting." Inquiries from general industrials and lists from railroads are being figured on and every effort at the command of the salesmen is being put forth to close contracts, but the success usually attendant upon such endeavors is not forthcoming. Many of the dealers are of the opinion that this waiting attitude will last until the first of the new year, but this will not be so unusual a condition as the month of December is traditionally quiet.

Railroads Buying

Railroad buying is reported from some sections and the New York Central R.R. is beginning to close on a long list of tools for which it inquired several weeks ago. The Delaware, Lackawanna & Western R.R. is also ready to buy before the first of the year if rumors are correct. Whereas the railroads and the automobile shops were the purchasers during the Summer and last Spring, now the general industrials are purchasing more freely than before, and the other two sources are not in the market to the extent that was expected.

One is impressed with the extremely optimistic views of the coming year that are manifested by machine tool dealers in New York City. It is pointed out that there is nothing on the horizon to check the prosperity that seems sure to come. The slight influence for curtailment of buying that is usually accredited to the presidential election year is discounted and the Mellon tax reduction plan is hailed with delight by these men who see a freer money market and better invested capital. The automotive industry and the railroads should be as good customers in 1924 as in 1923, it is pointed out, and the general industrials should be in the market to a much greater extent than during the past year. Added to this is the anticipated Japanese business which will not be coming before next Spring, but which will continue steadily once it has started.

Cleveland Trade at Even Pace

While the larger industries, such as the automotive trade, the railways and the like, have continued their inquiry for machinery and tools that will be needed in their respective plants to turn out new equipment and product for 1924, to a certain extent this prospective new business has slowed down for the present, and the expected action probably will not develop in orders until nearer the end of the year.

This is the opinion of leading machine manufacturers and distributors in the Cleveland district, following some pressure on their part to bring this business to a close.

On the other hand immediate business, though smaller in character, will fill in the gap. This likewise is the opinion of leading authorities on business here with the advent of plans of not a few independent interests for enlargement of their operations here.

Some of these improvements may be enumerated here. They include additions or new manufacturing buildings for such firms as the Ferro Machine & Foundry Co., the Henry Furnace & Foundry Co., the P. A. Geier Co., vacuum cleaner and vibrator manufacturer; the White Motor Co., and the Cleveland Cutter & Reamer Co. These improvements alone involve an expenditure for buildings of about $400,000, and a corresponding outlay for equipment may be expected, though these plans have not yet been made public.

Probably the most encouraging feature to break in the last fortnight is the announcement of the formation of the Goodyear-Zeppelin Co. at Akron. This is believed to mean the establishment of Cleveland as a center for Zeppelin parts manufacture. Unofficially it is stated that the Aluminum Co. of America may be retained to manufacture frames for the new type of aircraft, since this firm has previously made similar parts for American type dirigibles. This is but one phase of an industry that may develop to large proportions. The Akron interests have acquired the American rights to the German patents and eventually hope to promote the establishment of regular aircraft routes in which the new type of ship will be used.

Indiana Trade Better Than Last Year

Little change is to be seen in the general demand for machine tool and machinery trade in Indianapolis. In some lines business has shown a tendency to slump, while in others there is sufficient expansion to keep total volume well up to normal. In fact, after a somewhat poor start, dealers believe the late Fall and Winter will be better than last year.

Due to some reverses in automotive circles during the last two weeks, involving a receivership petition for both the Haynes and Apperson companies, there is a note of caution in the entire automotive trade. Demand for special machinery and tools has fallen off and there is no disposition to expand production. Business in closed cars is much better than last year, according to orders being received from dealers, but there is an undercurrent of uncertainty that is holding up expansion projects.

Fred A. Gardner, treasurer of E. C. Atkins & Co., makers of saw mill machinery and special woodworking tools, says business is exceeding all ideas of members of the company. He says big orders are being received from the Southern pine and hardwood districts that indicate a confidence on the part of the trade for next year. Some big orders have been filled for West coast mills during the last few weeks and there seems to be no end to demand for these machines.

Two makers of brick manufacturing machinery here say the outlook is encouraging. They have made many sales during the last month to plants in Indiana and Illinois and others to points more distant. They say indications point to active demand for their machinery during the entire Winter. There will be a slight lull in manufacture of brick during the mid-winter season, they say, and this will enable the plants to make some much needed additions and replacements.

Dealers in used machinery report a slight decrease in demand now, but say a volume of inquiries leads to the belief that business will pick up during the next month.

Production and Sales Are Improved in Cincinnati

Business among the Cincinnati machine tool houses continues at about the same pace that has been maintained during the past month. Production is going along at a fair rate with many manufacturers reporting that their orders have increased slightly within the last two weeks. Inquiries are also more numerous and are lending encouragement to the sales departments of the various plants. The buying being done by railroads is increasing and several roads have had inquiries out regarding machine tools lately. It is expected that some of this business will come to the Cincinnati market. The buying by the automotive industry has held up to a fair level, according to the statements of several local manufacturers. It is not anticipated, however, that there will be much of an improvement in the Cincinnati machine tool business before the opening weeks of 1924. Observers believe that the present rate of production will be adhered to during the rest of November, while December will see a slight falling off in activities although some manufacturers state that they expect business to be good during the rest of the year.

Several of the largest factories making lathes and milling machines have held up to a satisfactory production schedule during the Fall season. It has been necessary for the sales department to expend strenuous efforts to secure orders, but those plants which have been on the job every minute have succeeded in holding their output up to a fair level considering the decreased buying which has been done the past two months.

The dealers in used machinery say that their sales have shown increases during November and the present outlook is for good business the rest of this year. The sale of small tools has also been good and manufacturers are encouraged with the trend of business in this line.

Planers have been in fair demand with inquiries rather numerous, but purchases are being made cautiously. Upright and radial drills have had a quiet market and demand has not been heavy. Electrical tools have been selling in fair quantities with the outlook good for future business. Production of automobile accessories by local houses is maintaining a satisfactory pace with orders booked ahead for the next few weeks. Wood working machinery plants are busy with their departments running at capacity.

It is expected that there will be some foreign business done by Cincinnati houses within a short time. Negotiations have been entered into with Japanese concerns and several large orders from the Orient are expected to be placed in this market within the next month.

In the metal trades there has been slight improvement in recent weeks and sales are slightly in advance of 1922 for this period. More inquiries are being received concerning pig iron, though actual business as a result is negligible and very little tonnage is being placed for first quarter delivery. Even in view of the fact that consumers' stocks are low they continue to buy cautiously and prices are rather unstable.

The labor situation in this city is very good. Government reports show that employment gained here during October and also the early part of November.

South Gains: Future Prospects Good

Machine tool conditions in the Southeast have experienced comparatively little change during the past two weeks, though the various Atlanta distributors are feeling a little better over the outlook than they have for some time. If anything, sales have improved a little as compared with the first ten days of November, and it is practically certain that the month will be quite a bit better than November, 1922. Regarded as a whole, machine tool sales at this time are about 10 to 12 per cent better than during the same period last year, though with the individual distributors conditions show a varying tendency, in some instances showing no gain over last year. Conditions are expected to remain about the same in December.

Fewer Inquiries

Inquiries appear to be rather slower than usual so far as the number received is concerned, yet are developing more business, with the result that sales will be slightly better this month than they were in October. There is not so much tendency on the part of buyers to shop around for the best prices as was the case in the late Summer.

Conditions are very spotty as regards the various industries of the district doing the machine tool buying at this time. While textile plants were buying on a good basis a month or so ago, there has been a marked falling off the past two weeks. This is due to rapidly increasing cotton prices, which is sending cotton manufactured goods upward and retarding the mill demand considerably. Therefore, textile plants are buying little or no machinery to speak of until the situation stabilizes, which will probably not be before the early part of the year.

Railroad Sales Improving

Inquiries have recently been received from the railroads of the district, and sales in this field are improving steadily. They are, in fact, better than they have been in some time, with the outlook for the first quarter of the coming year very good. The principal machine tool demand right now is from the railroads, those in the South having spent large sums the past two or three months in shop equipment, and planning still further expenditures the next few months.

Smaller shops still are reported as inactive buyers, but improvement in this field seems certain after the first of the year. Save for the past month or five weeks the smaller shops have been among the principal machine tool buyers in the South all this year.

The outlook for the first quarter of the year is as good as it has ever been in the history of the South, and machine tool distributors are expecting to share in the prosperity that is certain.

Chicago Market Gets Many Orders

Machine tool dealers in the Chicago district have been anticipating a renewal of buying by industrials for several months, but were not encouraged by actual inquiries of consequence until the A. O. Smith Corp., Milwaukee, Wis., issued a list of 48 items including 10 engine lathes ranging from 12-in. x 6-ft. to 48-in. x 24-ft.; five milling machines; five planers; seven grinding machines; four horizontal boring mills; radial drills; slotters; shapers and drilling machines. Several other industrial inquiries are expected to be issued in the near future and would indicate a tendency of the industrial market to improve. Additional railroad inquiries will probably be issued soon for 1924 purchases. Dealers are not expecting another boom, but look forward to better business. The Delaware, Lackawanna & Western R.R. will soon enter the market for a list of machines. The New York Central R.R. is inquiring for about 20 machine tools including various sizes of lathes, mostly small ones, and three or four axle lathes. Also a 2-in. bolt cutter, a triple head bolt cutter, two motor-driven bolt threaders, a No. 5 universal milling machine, a 36x36-in. milling machine and a 30x120-in. planer. The Denver & Rio Grand Western R.R. has ordered a 90-in. wheel quartering machine. The Pennsylvania R.R. has placed an order with the Case Crane & Engineering Co., Columbus, Ohio, for a 5-ton 43-ft. span overhead traveling crane. The South Manchuria R.R. has placed an order with the Whiting Corp. for a 200-ton locomotive hoist. The Sante Fe R.R. will spend about $900,000 for machinery and tools in connection with extension of its shops at San Bernardino, Cal. The Illinois Central R.R. plans for an addition to its shops at Evansville, Ind., which will include the purchase of considerable machine shop equipment.

Car builders received inquiries during the week for 1,500 cars and steel companies report that 10,000 cars will be placed in the next week or ten days. Demand for structural steel is active. Tank buying is active.

Solves Labor Problem by Housing Idea

Within a few weeks 300 new homes for steel plant workers which are being built south of Smoke's Creek, near the Lackawanna plant of the Bethlehem Steel Corp., Buffalo, by the Bethlehem company, will be completed. This improvement is the first part of the plan which was mapped out by Timothy Burns, general manager of the Bethlehem Steel Corp. last January to provide living facilities in the vicinity of the Lackawanna plant to accommodate thousands of the workers and thereby make it easier to find men and decrease the labor turnover of the big steel mill. It is also expected that the company thereby will be able to obtain a better class of labor than in the past.

Taking Inventory in Detroit Plants

With just six weeks of the year 1923 left, the motor industry is getting ready to foot up its assets, preparatory to the opening of an even bigger year.

Practically every Detroit automobile factory will take inventory between now and the first of the year. Some are in the midst of their inventories now. The larger firms will devote two weeks to the work, while smaller companies are planning to do it in much less time.

This seasonal work is having its effect upon the machine tool industry in Detroit While there is necessarily a decline in the volume of business during the inventory season, leaders in machine tool plants agree that Detroit is experiencing "as good a business as can be expected."

They point to the absence of a normal year during the past eight or nine as giving any basis for contrast or comparison with 1923, but they say that there is every indication that this will be a normal year.

Production marks in the automotive field are likely to lose a little as a result of the yearly inventories, but no fear is entertained that any slump in the industry is near.

Splendid weather has meant much recently in the way of construction. Progress far beyond that anticipated has been made in factory additions.

A probable decline in the machine tool field during the remainder of the year will occur, it is believed, although this may not be as much as anticipated.

Employment figures show a further curtailment, the members of the Employers' Association having 212,528 on their payrolls last week, a decline of 1,297 during the seven-day period from the 213,825 mark of the previous week.

New England Plants Expanding

Plans of manufacturers regarding the Thanksgiving close-down serve as an index to the general condition of business at this time, and based on that, the inference is that the condition is uniformly good. Four large employers, who in the past three or four years closed their works Wednesday nights on the eve of Thanksgiving and keeping them closed until the Monday following, will close this year for the day only. Other manufacturers who will close for three days will take advantage of the opportunity of making needed repairs. Two of these manufacturers indicated that the straws point to a business condition at the end of the year which will make it necessary to have only a short shut down.

New England has been "spotty" lately—some factories working overtime and other factories practically shut down. Next year it is expected conditions will be more even and business steadier.

Another indication of the confidence held by manufacturers of this territory is the amount of building operations just at this time. The Stanley Works, New Britain, Conn., has awarded a contract for two additions, one six stories and the other three stories in height; Landers, Frary & Clark, New Britain, Conn., have awarded a contract for a six story addition; the New Departure Manufacturing Co., Bristol, Conn., will erect a modern forging plant. These operations, all announced within a week, called for half a million dollars in expenditures and are required to meet demands in addition to even very extensive war time additions.

Shop Expansion

A new organization to engage in automatic machine manufacture, is shortly to come into production. Another company in the Connecticut district, manufacturers of typewriters, is adding, by purchase, 55,000 sq.ft. of manufacturing space.

The pendulum is swinging back with a decidedly vigorous movement and in the opinion of shrewd far-seeing manufacturers the slough has been left behind.

Engineers Praised by Charles M. Schwab

American engineers are adding to their already numerous achievements, leadership in "human engineering," the science of imbuing workingmen with "the right spirit and a healthy orientation toward their work," Charles M. Schwab declared recently at a dinner given in his honor by the Engineers Club, Philadelphia.

"In recent years," he said, "the engineers of America have directed their energies not alone toward great mechanical achievements, but toward the promotion of sound and amicable relations with labor.

"The people who labor are not and cannot be treated like dumb, driven cattle. They are above all else human beings, with feelings and sentiment, hopes and aspirations, and the fundamental problem of all industry is to so relate the human elements in the men who do the work, to the machines which they operate, that the men themselves shall first of all be happy and healthy, and that they shall thus be able to operate their machines with good spirit and efficiency."

Apprentices Attend Institute Classes

By an agreement between the Pittsburgh Local, Amalgamated Sheet Metal Workers' International Alliance and the Sheet Metal Contractors' Association of Pittsburgh, apprentices in this trade in Pittsburgh and vicinity must attend sheet metal classes at the Carnegie Institute of Technology during the last four years of their apprenticeship, or until after they have finished the course for sheet metal apprentices. Further the agreement states that this training shall be for one day a week from Oct. 1 to May 1 during each of the four years and that the apprentice will receive his regular pay from his employer for the days so spent in training. Each apprentice, however, must pay his own tuition fee.

At the present time there are 65 apprentices receiving instruction at the school and special subjects have been added to the cirriculum. One of the inducements is the reward for scholarship. Receivers of Grade A will have their terms of apprenticeship shortened by two months thereby obtaining increased compensation earlier.

Westinghouse in Big Japanese Merger

A cable to the Chicago *Tribune* states that a big Japanese-American combine has just been effected. The Westinghouse Electric and Mitsubishi and Takata electrical interests have combined to form the Mitsubishi Electric Co., to manufacture and sell electrical equipment in Japan.

Through the combination American interests supplant German interests which heretofore have been closely affiliated with the Takata group. The company was incorporated for 15,000,000 yen ($7,500,000) to manufacture electrical goods and steam and electrical turbines. Shops are maintained at Kobe, Nagasaki and Nagoya and ground has been broken for the construction of a main plant at Nagoya to employ 4,000.

According to the agreement the Japanese corporation will get all the Japanese patent rights of the Westinghouse Electric & Manufacturing Co., while the Westinghouse International Co. will become the licensee of the Mitsubishi and Takata patents for the rest of the world.

Obituary

Lewis H. Nash, president of the Nash Engineering Co., South Norwalk, Conn., died Saturday, Nov. 17 after a brief illness. He was 71 years of age. Mr. Nash was born in South Norwalk and after his early education was completed he served an apprenticeship at the Norwalk Iron Works, becoming an expert machinist, and afterwards entered the Stevens Institute of Technology where he pursued the full course of mechanical engineering class of 1877. His death makes the first break in the ranks of graduates of that class. Upon graduation he received the degree of Mechanical Engineer and in 1921 the Institute conferred upon him the degree of Doctor of Engineering. From 1877 to 1905 he was chief engineer of the National Meter Co., Brooklyn, N. Y., and was the inventor of the Nash water meter and Nash gas engine made by that company. In 1905 he organized the Nash Engineering Co., manufacturer of the Nash hydropneumatic turbine air compressors and vacuum pumps. Mr. Nash was prominent in business, civic and fraternal circles and during his lifetime secured a large number of patents on mechanical devices used in products of the National Meter Co. and the Nash Engineering Co.

W. H. Stockham, of Birmingham, Ala., president of the Stockham Pipe & Fittings Co., and one of the best known iron and steel manufacturers of the South, died recently at his home in Birmingham.

William H. Jones, former superintendent of the Crosby Co., Buffalo, died recently at his home on a farm near Lockport, N. Y. Mr. Jones had retired to his farm in 1922 because of ill health. He was fifty-four years old and had been with the Crosby company since 1896.

Hugo Scherer, president of the Detroit Forging Co., Detroit, Mich., died recently in that city.

Personals

E. C. HENN, vice-president and general superintendent of the National Acme Co., has resigned his position as general superintendent. He has been succeeded as general superintendent by his son, Oliver L. Henn, formerly superintendent of the Windsor, Vt., plant of the National Acme Co.

GORDON H. STEWART, formerly representative of the Illinois Tool Co. in Detroit, has become Detroit manager of the Union Twist Drill Co., Athol, Mass.

R. P. MCCORMICK has been appointed Eastern sales manager of the Pawling & Harnischfeger Co. of Milwaukee. His headquarters will be at 50 Church St., New York City, and at 605 Stephen Girard Building, Philadelphia.

ALLEN C. SULLIVAN has charge of the newly opened Northwest branch of the Chain Belt Co., Milwaukee and his headquarters will be in Portland, Ore. Mr. Sullivan was formerly with the Allis-Chalmers Co., Milwaukee.

C. H. LANG will be the assistant manager of the newly created advertising and publication department of the General Electric Co., Schenectady, N. Y

EUGENE P. THORNTON has been appointed assistant district sales manager in the Southeastern territory for the Russell Manufacturing Co., Middletown, Conn. He succeeds O. G. WHITNEY who has been appointed manager of the Southwestern territory. Mr. Thornton's headquarters will be in Atlanta, Ga.

E. M. HERR, president of the Westinghouse Electric & Manufacturing Co., has been elected president of the Electrical Manufacturers Club.

WILLIAM KLINGENHOEFER has been made sales manager of the Latrobe Tool Co., Latrobe, Pa. He was formerly with the American Foundry & Construction Co., Pittsburgh.

DON B. CATTON, formerly with the Meese & Gottfried Co., will be the special sales representative for the Chain Belt Co., Milwaukee, Wis., in the Northwest territory.

W. H. DULEY has been appointed manager of the New Haven, Conn. branch of the Colonial Steel Co., Pittsburgh, Pa., Mr. Duley has been connected with the Chicago office of this company for some time.

WILLIAM F. NICHOLS will have charge of the Seattle and British Columbia territories for the Chain Belt Co., Milwaukee. His headquarters will be in Seattle. He was formerly with the Meese & Gottfried Co.

"JIM" STEWART, nationally-known motor truck transportation engineer, has resigned as general sales manager of the Signal Motor Truck Co., Detroit, Mich. to become associated with the Standard Motor Truck Co. He has been the Chicago branch manager for Kelly-Springfield; Chicago distributor for Acme, Clydesdale and Atterbury, and vice-president and general manager of Selden Sales & Service Co.

WILLIAM PORTER WHITE has been appointed to act as assistant to M. O. TROY, new executive assistant manager of the central station department of the General Electric Co., according to a recent announcement. His headquarters will probably be at Schenectady in common with Mr. Troy.

Business Items

The Philadelphia division of the B. F. Sturtevant Co., Boston, Mass., is now located at Thorne and Copewood Sts., Camden, N. J.

The Goss & De Leeuw Machine Co., New Britain, Conn., has been opened and production started. Stanley T. Goss was formerly sales manager of the New Britain Machine Co. and A. L. De Leeuw is a consulting engineer well known in the machine tool industry.

The Cleveland Duplex Machinery Co., Cleveland, Ohio, will move to larger quarters in the Penton Building, West Third St. and Lakeside Ave. on Dec. 1.

The Marshall & Huschart Machinery Co., 17 S. Jefferson St. Chicago, has been appointed exclusive agents in the Chicago territory for the V. & O. Press Co., Hudson, N. Y. L. F. Carlton is the factory representative working with the Marshall & Huschart company.

All patents, rights and stock of the Robinson Adjustable Center Co., Detroit, have been purchased by the Eclipse Interchangeable Counterbore Co., it was announced by officials of the Eclipse company this week at the main office in Detroit.

Receivers appointed Nov. 16, for the Acme Tool Co., of Ansonia, Conn., are the Home Trust Co. of Ansonia and Samuel Persky of the law firm of Stoddard, Goodheart & Persky of New Haven.

Automobile, truck and tractor parts, units and accessories will be manufactured by the Wausau Parts Manufacturing Co. which has been incorporated with $50,000 capital stock by W. C. Landon, W. F. Scholfield and Karl Mathie, all of Wausau, Wis.

In order to broaden the scope of the business the Alabama Machinery & Supply Co., a large firm at Montgomery, Ala., has increased its capital from $100,000 to $300,000, according to information received from one of the officials of the company recently.

The Remy Electric Co. of Anderson, Ind., one of the accessory and parts group of the General Motors Corp. has just purchased the plant formerly owned by the Arvac Manufacturing Co., of the same city. The Arvac company was builder of universal joints and other automotive parts.

It was recently announced in Atlanta by R. B. Pegram, vice-president of the Southern Railway Co., that the company has ordered 50,000 tons of new steel rails of the 100 lb. type mostly, for building 327 miles of track in various sections. More than 40,000 tons of the order will be produced in the Enseley, Ala., mills of the Tennessee Coal, Iron & Railroad Co., while the rest will be produced in Northern mills.

Authority to issue equipment-trust certificates to cover purchases of rolling stock to cost $37,260,000 has been sought of the Interstate Commerce Commission by the Southern Pacific Railway Co. With that large sum, the railroad company expects to purchase: 84 heavy freight locomotives; 15 passenger locomotives; 10 heavy passenger locomotives; 10 locomotive tenders; 10 electric locomotives; 2,000 steel underframe automobile cars; 500 steel underframe stock cars; 3,700 steel underframe box cars; 350 steel underframe flat cars; 1,150 steel underframe gondola cars; 300 composite steel and wood flat cars; 557 steel underframe work cars; 500 steel underframe logging cars; 90 steel underframe caboose cars; three steel underframe snow-plows; 150 steel electric motor coaches; 85 steel passenger coaches; 15 steel baggage coaches; 10 steel dining cars; 40 steel baggage-postal cars, and 16 steel buffet-baggage cars.

The Central of Georgia Railway Co. will at once rebuild its shops destroyed by fire at Savannah, Ga., a few days ago at a loss of $1,000,000, according to W. A. Winburn, president. Coach shop, planing mill, and other buildings of the plant were destroyed or badly damaged by the fire.

The Cox Foundry Co., of Bessemer, Ala., manufacturers of soil pipe and fittings, has taken over the plant of the City Foundry Co., manufacturers of building and municipal work castings, and is operating it as a separate unit of the Cox plant.

The Steel Products Corp. has been organized at Sheboygan, Wis., and incorporated with $100,000 with authority to undertake a wide field of manufacturing and marketing of steel products. The incorporators are Fred Zschetzsche, A. G. Stuedemann and W. B. Collins, attorney. Information concerning the new concern's plans will not be revealed until some time later.

The California-Oregon Metals Co. of San Francisco, Calif., has been incorporated. The company is capitalized at $250,000 and has the following directors: Eugene W. Kay, E. Draper Wilson and Oliver W. Kay.

A machine shop and foundry is being established at Rockingham, N. C., by the Victory Manufacturing Co., recently formed there, according to F. I. Mason, who has been named president and general manager.

Some new machinery will be needed for the rebuilding of the plant of the Eastern States Packing Co., Orchard Park, N. Y., which was recently destroyed by fire. The total damage to the plant and machinery was estimated at $100,000.

An order to show cause why a receiver should not be appointed for the Ogren Motor Car Co., 692-702 National Ave., Milwaukee, has been entered in the Milwaukee County Circuit Court on the petition of the Cleveland Hardware Co., Cleveland O., a creditor. The Ogren company was established in Milwaukee about six years ago to manufacture a six-cylinder passenger automobile. For several months it has not been in production. Fred G. Smith is president, and Robert E. Wiltrout, secretary.

The Industrial Review

Outlook for the coming year bright and machine tool builders are preparing for it

MACHINE tool business for the first eleven months of 1923 proved to be better in volume and in the total amount realized than the entire year of 1922 by from twenty-five to thirty per cent, according to estimates made by dealers in various parts of the country. With the railroads and the automobile makers both good customers, business has been maintained at a rather even pace for most of the year.

During the month of November business was fair and the general industrials were the purchasers rather than either the automotive industry or the railroads. The promised and expected buying by the roads did not materialize to the extent hoped, nor is it anticipated that machine tool buying in quantity will take place before the first of the new year.

The automotive industry has purchased only sparingly during the month, but makers of automobile parts and accessories have proved good buyers. Schedules of production for the coming year in the automotive field furnish the basis for much optimism among machine tool builders. It is anticipated that more machine tools will be needed in 1924 by the automobile builders than during the present year and plans are being made accordingly.

Textile makers in the New England states have not been buying much equipment since June, but the Southern plants have been in the market continually for machine tools as well as machinery. This business should show improvement in the Northeast within a month.

Demand for Woodworking Machinery

Woodworking machinery has been sold in good quantity during November around the Middle West and in the Northwest. Mining machinery has found a better market since the first part of October and builders of railroad cars and locomotives have both been customers during the past month.

The only definitely bad report during the past four weeks has been from the St. Louis district where business is said to be poor at the present time. The oil fields of the Southwest are not busy, but other industries in Texas and Oklahoma are reported as thriving so orders may be looked for within a short time.

Trade with Japan up to the present writing has been mostly indirect. Both the Ford Motor Co. and the Pierce-Arrow Motor Car Co. have sent trucks to Tokio and there have been some steel shipments also. Concrete mixers and woodworking machinery have been ordered, but none of the expected machine tools have been purchased. Inquiries have been plentiful from Japan and assurances of future buying have been forthcoming so that the machine tool builders are still hopeful of this business being added to the sales of the forthcoming year.

Reports from important electrical centers of the United States show some contrasts in the business as a whole. In a number of items production and distribution are at high levels, while in other lines one or the other of these factors is below normal conditions. The present lack of balance in the market is indicated by an unprecedented demand for all household appliances and novelties, while the industrial side of the industry is left with few orders of importance. The situation has been of this character for a number of weeks, although the general market has seen continued improvement. Power equipment is fair, with a slacking off in transmission towers and equipment.

> General industrials were the purchasers during November with the railroads adding a little toward the last of the month; holiday business occupies the electrical industry to the exclusion of heavier products; electric railway business has improved and car shops are on an efficiency basis; chemicals are steadier; mining interests report a good year and equipment buying is expected in Michigan; building statistics are at record figures, although October showed a decline from the previous month.

In the South manufacturers report excellent sales of outdoor transformer equipment, with deliveries running at from five to six months. Smaller sizes are running from six to sixteen weeks. Turbo-generator sales in the South are smaller than expected. In the Middle West the demand for rubber-covered wire has been enlivened by small price reductions effected several weeks ago. Transformers there have been reduced approximately 10 per cent owing to increased manufacturing facilities. Cautious rubber-covered wire buying is reported on the West Coast, where, as in other sections of the country, household appliances are attracting most attention.

Electric Railways

Statistics of the electric railway car repair shop industry just made public point the trend of developments in this line. The number of such shops has decreased from 624 in 1919 to 560 in 1921. During the same time, however, the number of employees has increased from 33,120 to 35,638. These are the bare outstanding figures. By the electric railway industry they are interpreted as bearing out the noticeable tendency toward larger shops and greater concentration of work. With this concentration has come a redistribution of equipment better suited to the needs of the shops. Prices for material consumed in the shops have, of course, been constantly on the increase, but even allowing for that, the figures of the value of the products turned out and of the cost of material consumed bear out the slowly but constantly growing magnitude of the shop work. They are: cost of material, 1921, $33,560,133; 1919, $32,025,484; 1914, $17,609,574. Value of products: 1921, $87,312,426; 1919, $75,210,701; 1914, $38,576,565. This growth is not spectacular. The railway industry is not a spectacular industry. It is, however, a growth that may be expected to continue indefinitely the constant record of more work done, more men required and more machines and equipment needed to do the work.

Chemicals Improve

Business in the chemical field is characterized as steady with few expansions but with hopes of growth during the coming year. There are many industries that contribute to the chemical trade, such as textile, paint, silk, drugs and other industries. Most of these have been enjoying good business during the year and it has been reflected to some extent in the chemical line. During November it was noted that heavy chemicals were moving well and recent exports proved to be larger than for the same period last year.

Mining Conditions

Machinery buying has been rather active in the Canadian mines of Ontario and in Arizona indications are that new equipment will be placed before many months. Minnesota mining is never active during the cold months. In Michigan the copper interests are planning improvements provided the price of copper shows the improvement that it has during the past few weeks. Just completed and ready for operation within a few months in the new salt mine at Retsof, N. Y., near Rochester. This will be the biggest salt mine in the United States when it is in operation, it is asserted.

Coal mining increased a trifle during the past two weeks to meet the demands of the buying public. In both the bituminous and the anthracite fields production was greater than in October if you except election day and the day following. A significant fact is recorded in West Virginia where the "smokeless operators" opposed a wage reduction proposal which would indicate that these owners do not relish the idea of more trouble and are willing to pay the difference demanded rather than suffer another costly strike.

Construction

Building figures for the month of October show a decrease as compared with the previous month of about five per cent, but a substantial increase as compared with the figures of October, 1922. The September totals were exceptionally large after those of August and July so that it is fair to state that October is at least an average month.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
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THE discerning observer must be impressed by the change that appears to have come over most of the commodity markets as well as the Stock Exchange of late. In detail the return of confidence and a normal optimism are attributable to a recognition of the favorable influences to which attention has been drawn in these letters for some time past. But the willingness of the public to interpret the facts by investing its money in goods or securities is significant of a psychological condition that is due to something more profound than the conventional "causerie" of the market place.

To appreciate the significance of this alteration in the popular mental attitude it is only necessary to consider the uncertainties which seem to becloud the future here and abroad. In this country we are approaching a presidential campaign whose result may be a reversal of our public policy in many important respects. Congress is about to meet and it is possible that it may pass a bonus bill that will increase the national debt by from two to five billion dollars and enact other legislation that will be anti-capitalistic in its character and purpose.

Great Britain is in the throes of a political campaign in which "free trade versus protection" is the leading issue. If the protectionists win, American goods may be shut out of many important British markets.

The Entente alliance is perilously near disruption. The German government is confessedly bankrupt. The hope that France can collect the reparations out of which she expected to pay her debts has been indefinitely deferred and the purchasing power of Europe and its financial credit are apparently diminishing from day to day.

And yet in the face of all this there is a distinct revival of both investment and speculation in England as well as in the United States, and even in Berlin and Paris prices are advancing as the value of the paper currencies used there declines.

A return to the gold standard by any of the important commercial nations of the old world is hardly possible during the present decade and it is not even discussed by their statesmen. Even in Great Britain indirect inflation through the issuance of government loans seems necessary in order to provide doles or employment for the unemployed and as the value of sterling declines all the gold produced or hoarded is gradually drifting to the United States in payment for the cotton and food that Europe must buy here.

The result is that the $3,135,000,000 of gold held by the Federal Reserve Banks last Thursday evening was 77.1 per cent of their deposit and Federal Reserve note liabilities combined and that it would be very nearly 100 per cent of those liabilities were it not for the constant effort to get gold into circulation that is being made by paying out "yellow backs" or gold certificates. Meantime the demand for rediscounts is decreasing and the consequence is that both the Federal Reserve Banks and the member banks are being compelled to buy acceptances and government obligations to employ their resources.

We are therefore facing inflation on both sides the Atlantic. In Europe it is the inflation that results from the emission of unsecured paper money. In America it is called "gold inflation" which is the phrase that has been coined to describe the expansion in the supply of credit made available under our Federal Reserve System by the preponderant portion of the world's gold now impounded in the banks of that system.

> "In this country new bond issues are being marketed at the rate of at least $150,000,000 a week. The telephone issue of $100,000,000 was absorbed in a day. The total of Land Bank bonds already sold is well in excess of a billion dollars and despite their alleged inpecuniosity, the railroads claim that they will spend two billions on improvements and new equipment during the current year."

When the Federal Reserve Act was passed no one dreamed that we would ever attract hither sixty per cent of the world's monetary gold, but it is here, it keeps coming and the consequence is that it has become so easy to borrow that every nation and every enterprise that have any credit is selling obligations or shares whose proceeds are expended in the employment of labor or the purchase of materials at gradually rising prices.

In London a few weeks ago subscriptions totalling over £100,000,000 were received for an offering of £8,000,000 in the stock of a company formed to acquire five leading English newspapers and only last week the cables announced that foreign loans amounting to over fifty million sterling in the aggregate were practically arranged for and would shortly be brought out by British bankers.

In this country new bond issues are being marketed at the rate of at least $150,000,000 a week. The telephone issue of $100,000,000 was absorbed in a day. The total of Land Bank bonds already sold is well in excess of a billion dollars and despite their alleged impecuniosity the railroads claim that they will spend two billions on improvements and new equipment during the current year.

In the final analysis inflation is the rapid expenditure of easily borrowed money and these are only a few of the outstanding financial transactions which make it clear that most of the world is engaged in thus borrowing and spending.

The business mind is coming to have a subconscious appreciation of this condition and as long as it lasts it is unlikely that political or social adversity or even war itself will check the upward tendency of the general price level. An excessive supply of this or that article or a change in fashion may cause a temporary decline in the value of specialties, but upon the whole higher prices are indicated until it becomes more difficult to borrow.

Just when this will occur it is hard to say. An advance in interest rates will be the first intimation of a change. Thus far there is no indication of tighter money and some are predicting an early reduction in the rediscount rate by the Federal Reserve Banks. This prediction is based upon the theory that the present administration is anxious to curry favor with the farmer by providing him with cheap money.

This may be a mistake but the criticism visited upon the Federal Reserve Board for the deflation and decline in prices which followed the advance in interest rates ordered three years ago makes it reasonably certain that the history of that sad period will not repeat itself, at least until after the election of 1924.

This is the larger view of the situation written at the end of a week during which the markets have been upon the whole monotonously firm and without any special feature unless it be the strength of the railway stocks, which seem to be at last reflecting the probability that the net earnings of the Class I roads for the year 1923 may reach a billion dollars.

An enormous holiday trade is expected by the retail merchants. A seasonal slackness in the distribution of staples will therefore be natural and is expected during the next four weeks, but after the New Year an active demand for essentials is anticipated and seems probable, barring only some sinister development of which there is no indication at present. Most people are preparing for a year equally as good as 1923 proved to be.

Fewer Combinations of Brass Traps Urged

Manufacturers of tubular plumbing goods, meeting Nov. 16 with the Division of Simplified Practices of the Department of Commerce, unanimously recommended that 1,114 varieties of combinations of brass traps now being produced be reduced to 119 combinations.

Specifications of these 119 combinations, which a survey conducted by the industry disclosed represented 85 per cent of the present production, will be submitted to the entire industry for approval or for such additions or eliminations as may be considered necessary. A general conference then will be called by the Division of representatives of manufacturers, distributors and users together with architects and engineers, to make the recommendation effective.

The survey showed that of the 1,114 combinations being produced, 382 represented 98½ per cent of all sales, leaving 732 to be manufactured, carried in stock and sold to satisfy 1½ per cent of the demand. The 119 selected as sufficient as they already satisfy 85 per cent of the demand were said to cover the range of all reasonable requirements.

Attending the preliminary conference Nov. 16 were: A. A. Ainsworth, secretary of the Tubular Plumbing Goods Association, Philadelphia; S. P. Hackley, the Bridgeport Brass Co., Bridgeport, Conn.; A. E. Moulton, the Wolff Manufacturing Co., Chicago; P. H. Cruikshank, the H. Mueller Manufacturing Co., Decatur, Ill.; H. C. Bulkeley, the American Sanitary Manufacturing Co., Abingdon, Ill.; K. L. Legner, and C. J. Muend, the Haines, Jones & Cadbury Co., Philadelphia; A. C. Recker, the Waterbury Manufacturing Co., Waterbury, Conn.; H. J. Mason, the American Pin Co., Atlanta; W. W. Bowers, the American Pin Co., Waterbury, Conn.; W. J. Frost, the Frost Manufacturing Co., Kenosha, Wis.; M. S. Little, the M. S. Little Manufacturing Co., Hartford, Conn.; Paul E. Holden, U. S. Chamber of Commerce; Dr. Hunter, Bureau of Standards; Capt. Hobson, War Department; Wm. A. Durgin, chief of the Division of Simplified Practices.

Plan Training for Apprentices

General principles which it was agreed should underlie apprenticeship training in the building trades were formulated at a conference in Washington Nov. 15 between the Federal Board for Vocational Education and representatives of employers and employees and material supply manufacturers.

Eight general principles were laid down. They are:

1—That a local representative committee composed of all interests in the industry is essential to determine the needs and supervise the training.

2—That part-time or evening schools should be provided to supplement job training.

3—That all-around training is more desirable than specialized training.

4—That the national associations should set up fundamental training standards for apprentice training and make the information thereon available for instructional purposes.

5—That co-operation with the public schools is essential to the promotion of apprentice education.

6—That incentives should be set up to induce boys to enter apprenticeship.

7—That pre-employment training for employed apprentices or boys under contract is recommended.

8—That emphasis should be placed on dull-season training to follow up the initial training given in the pre-employment period.

A number of those attending the conference, which was called for discussion of the apprenticeship problem rather than for immediate definite action, recited plans which have been followed in various trades at specific localities to induce more young men to enter apprenticeship, or which have been devised to be put into operation soon.

Auto Body Building in Detroit

Detroit is now producing seven-eighths of the country's automobile bodies, which means that it is the center of the body industry. Out of a total of 3,000,000 bodies manufactured in the United States, Detroit's output should reach 2,500,000. The bodies range from $100 for light, quantity bodies, to $1,300 and $1,500 for quality designs. An enormous equipment is necessary to provide bodies for cars made in this section. The Fisher Body Corp. alone has 32 large plants, each employing from 1,000 to 4,000 men. Other body manufacturers are the Briggs Manufacturing Co., which makes bodies for the Ford and Hudson cars, the C. R. Wilson Body Co., making bodies for Willys-Overland and Reo, the Towson Body Co., turning out body jobs for Packard and Lincoln, and the American Body Corp., supplying Stutz bodies. A score of smaller companies, in the aggregate, swell the production materially.

Trade Catalogs

Flexible Coupling. The De Laval Steam Turbine Co., Trenton, N. J. The De Laval flexible coupling is described in a twelve-page catalog. This coupling which has been developed for turbines or other motors. The product is illustrated and the text minutely tells of the details. There are charts and section drawings contained in the booklet.

Multiple Spindle Chucking Machine. The Goss & De Leeuw Machine Co., New Britain, Conn. The many features of this new machine are described in this catalog. The booklet is well illustrated showing parts of the machine and methods of use.

Air Hoists. The Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill. The many uses of air hoists in factories and mills are shown by this booklet. Blue prints of the device are also included in the catalog.

Electric Motors. The Reliance Electric & Engineering Co., Cleveland, Ohio. The advantages of electric motors and how to choose and use them for various kinds of work are told in this booklet. The application of motors and the horsepower needed for different machine tools are listed in the catalog.

Electric Drills. The Independent Pneumatic Tool Co., 600 W. Jackson Boulevard, Chicago, Ill. A 23x40 in. wall chart listing the symbol numbers of all parts used in the construction of Thor electric drills of ¼ in., ⅜ in., ½ in., and ¾ in. capacity. Photographs of the major parts make identification easy. The chart is printed on heavy paper, suitable for tacking on the wall in the toolroom or repair shop.

Dial Gages. The B. C. Ames Co., Waltham, Mass. The Ames micrometer dial gages are described and illustrated in a 16-page booklet. Each part is illustrated and the construction of the instruments is told in detail.

Gears and Pinions. The Union Gear & Machine Co., 27 Purchase St., Boston, Mass. The noiseless gears and pinions marketed under the trade name "Formica" are described in this catalog. Price lists of different sized gears are contained in the catalog as well as valuable tables relating to the subject.

Underfeed Stokers. The Westinghouse Electric & Manufacturing Co., Stoker Department, South Philadelphia Works, Philadelphia, Pa. Stoking apparatus and the new model multiple retort underfeed stoker are shown by illustration, explanatory text and diagrams in this 14-page booklet.

Grinders. The Graham Manufacturing Co., Providence, R. I. Machines for the rapid and accurate production of flat surfaces are described as to construction and operation. Drawings of the grinders and pictures of both assembled machines and of parts are contained in the folder.

Motors. The Wagner Electric Corp., St. Louis, Mo. The Fynn-Weichsel motor made by this corporation is described in an attractive four-page folder that has been issued. A chart showing the load characteristics is also shown.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Drilling equipment for oil wells. Tampico, Mexico. Agency. Reference No. 8175.

Hydraulic machinery. Caracas, Venezuela. Agency. Reference No. 8174.

Automobile factory equipment such as lathes, shears, chucks, grinding and polishing machines and woodworking machinery. Warsaw, Poland. Agency. Reference No. 8187.

Forthcoming Meetings

American Society of Mechanical Engineers. Annual meeting, Dec. 3 to 6, in New York City. Calvin W. Rice, 29 W. 39th St., New York City, secretary.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8. Headquarters, Grand Central Palace, New York City.

Society of Automotive Engineers. Annual meeting, Jan. 22 to 25, at the General Motors Building, Detroit, Mich. Coker F. Clarkson, 29 W. 39th St., secretary.

American Gear Manufacturers Association. Spring Meeting, April 28, 29 and 30, 1924. Lafayette Hotel, Buffalo, N. Y.

Society of Industrial Engineers. Eleventh annual convention. Buffalo, N. Y. April 30, May 1 and 2. Headquarters, 608 S. Dearborn St., Chicago, George C. Dent, executive secretary.

Southern Supply & Machinery Dealers Association, National Supply & Machinery Dealers Association, and American Supply & Machinery Manufacturers Association. Triple convention, May 19, 20 and 21, 1924, Hotel Cleveland, Cleveland, Ohio. F. D. Mitchell, secretary-treasurer, 1819 Broadway, New York City.

Foreign Trade Council. Eleventh annual convention at Boston, June 4, 5 and 6. O. K. Davis, India House, Hanover Square, New York City, secretary.

The General Committee of Dividion V, Mechanical of the American Railway Association. Convention and exhibits. Atlantic City, June 11-18, 1924.

Railway Supply Manufacturers Association. Exhibit. Atlantic City, June 11-18, 1924.

New and Enlarged Shops

Machine Tools Wanted

Del., Wilmington—Electric Hose & Rubber Co., 12th and Dure Sts., W. C. Briggs, Purch. Agt.—boring lathe, 24 in. swing, for boring out large size pipe.

Fla., Jacksonville—H. W. Dexter, Bisbee Bldg.—60 in. lathe and 60 in. clipper for veneer work; shear that will handle ¼ x 60 in. sheets for the manufacture of dredging pipe.

Ill., Elgin—C. A. Kerber, 440 Chicago St.—boring machine and chain hoist for garage.

Kan., Columbus—H. Hudson, R. R. 6—lathe, drill press, emery stand and wheel for garage.

Kan., Pittsburg—W. W. Wilson, 210½ South Bway.—drill press and lathe for machine shop.

Md., Baltimore—Eastwick Motor Co., 120 West North Ave.—lathe, drill press, etc., for automobile repair work.

Mich., Battle Creek—Rich Steel Products Co.—milling and cutting machines, shapers, drill presses, lathes, grinders, etc., for proposed $42,000 factory for the manufacture of castings, machinery and parts.

Mich., Detroit—H. Jensen, 3745 Crane Ave. (machine work)—one lathe, 10 in. swing, about 4 ft. bed (used).

Mo., Joplin—County Line Garage, Route A, L. H. Higginbotham, Purch. Agt.—air valve grinder.

Mo., St. Louis—M. Boettigheimer, 2649 Pestalozzi St.—lathes and general equipment for garage.

N. Y., Binghamton—Binghamton Auto-Renewal Co., 475 Court St., C. Thompson, Purch. Agt.—tools, press, vise, hoist and equipment.

N. Y., Buffalo—Atlantic Lumber Co., 1055 Seneca St.—tools and equipment for garage.

N. Y., Buffalo—F. L. Baldwin, 1654 Weston Ave.—tools, equipment and pump for service station and garage.

N. Y., Buffalo—G. Bova, 432 Plymouth Ave.—equipment for garage repair shop.

N. Y., Buffalo—S. Lipowicz, 758 Fillmore Ave.—equipment for garage repair shop.

N. Y., Elmira—P. H. Serio, 158 Fox St.—belting, hangers, pulleys, drill press and equipment for proposed $12,000 factory for the manufacture of specialties.

N. Y., Jamestown—F. L. Frick Garage, 317 Washington St.—tools, equipment, drill press and small lathe for new service station.

N. Y., Le Roy—R. W. Stroebel—garage repair tools and equipment.

N. Y., New York—Carr Bros., 65 Bway.—O. M. portable electrically driven grinder.

N. Y., New York—Sturtevant Tool Co., 1023 East 178th St.—No. 18 or 19 Bliss press.

N. Y., Pulaski—A. M. Gates—garage tools and equipment; press and drilling machine for the manufacture of light accessories.

N. Y., South Otselic—F. Crandall—repair tools, press, vise and equipment for new garage.

N. Y., Stillwater — Wood-Flong Corp. (manufacturer of paper), C. W. Townsend, Mgr.—three beaters, also lathe, pipe threading drill, etc., for machine shop.

O., Columbus—G. C. Hancock Electric Co., 20 East Spring St.—machinery for stamping and spinning brass for lighting fixtures.

O., Defiance—Clay Products Co., J. Molly, Mgr.—machine shop equipment, including lathes, drilling machines and tools.

O., Sidney—Sidney Brass Wks. Co. (machine shop and brass foundry), L. Linder, Mgr.—equipment, including one grinder, to enlarge shop.

O., Toledo—The city, A. Jackson, Service Dir.—complete machinery and equipment for proposed $160,000 garage and repair shop.

O., Youngstown—B. H. Carrier, Mahoning Ave.—equipment, including pump and tools for proposed garage and service station.

Ore., Portland—Packard Service & Sales Co., 10th and Burnside Sts.—lathes, milling machines, drills, etc., for proposed $75,000 garage.

Pa., Bethlehem—W. A. Wilbur, 3rd and Seneca Sts.—drill press, tools and repair equipment for garage, to replace fire loss.

Pa., Butler—Steel Car Forge Co.—belt driven alligator shears, 1⅛ in. round capacity.

Pa., Coplay—J. Stengel, Ruch St.—10 to 12 in. lathe, tools, press, emery wheel, stand and equipment for garage and repair shop.

Pa., Duncansville — S. P. Wilt — small lathe, press, repair tools and emery wheel for proposed addition to automobile repair shop.

Pa., Wilkes-Barre—H. Fierman, 93 South State St.—repair tools, press and work shop equipment.

Va., Roanoke—Norfolk & Western R.R., J. H. Clemmitt, Purch. Agt.—lathe and chuck, 16 in. x 4 ft.; No. 2 Universal milling machine; 60 in. x 12 ft. engine lathe with chuck jaws, all motor driven.

Wis., Milwaukee — Eslien Sheet Metal Wks., 1001 30th St.—sheet metal working machinery for proposed $60,000 factory.

Wis., Milwaukee—Individual Last Mfg. Co., c/o S. I. Rosefelt, 216 West Water St. (manufacturer of shoe lasts)—casting machine and drill press.

Wis., Sheboygan—F. Zschetzsche, 426 Grant St. (manufacturer of automobile parts)—grinder and hacksaw.

Wis., Wausau—Wausau Parts Mfg. Co., c/o W. R. Schofield, 529 McClellan St.—emery grinder, tool room lathe and one boring machine.

Que., Matane—W. Banville—tools and repair equipment for garage.

Que., Mont Joli—L. Hammond—press, tools and repair shop equipment for garage.

Que., Montreal—A. Papineau, 560 Carriere St.—equipment, garage repair tools, etc.

Que., Montreal—B. Simon, 2746 Papineau Ave.—tools, equipment and emery wheel for automobile repair shop.

Que., Montreal—A. Urquhart, 1640 St. James St.—small screw cutting lathe, 3 to 5 ft. bed.

Que., Quebec—E. Poulin, 133 Dupont St.—small lathe for garage.

Que., Rimouski—Riverin & Chasse—tools and other repair equipment for garage.

Machinery Wanted

Calif., Madera—The county, L. W. Cooper, Clk.—one 100 in. shew type laundry mangle.

Calif., San Rafael—County of Marin, R. E. Graham, Clk.—Rix compressor and air drill for Road Dist. 4, cost not to exceed $2,000.

Calif., Wasco—Wasco Creamery—equipment for proposed addition to creamery.

Colo., Colorado Springs—El Paso County Democrat, 28 North Nevada Ave.—linotype.

Ill., Chicago—M. Waldenberg, 54 West Kinzie St.—refrigeration equipment, brine type for proposed $150,000 apartment house.

Ill., Waukegan—Wilson & Ohm, 401 South Sheridan Rd.—air compressor, lathe and emery wheel for garage.

Ind., Hammond—Beatty Machine & Mfg. Co.—air compressor, capacity 1,500 to 2,000 cu.ft. per min.

Ia., Milo—Milo Enterprise, J. A. Harris, Purch. Agt.—gas burning typograph machine.

Kan., Bonner Springs—Kansas Portland Cement Co.—equipment for proposed cement mill.

Kan., Neodesha—H. V. Baxter—newspaper press, belting, hangers and pulleys.

Kan., Paola—E. McNutt—one 8 x 12 in. and one 10 x 15 in. job printing press.

Kan., Treece—V. Morris—shoe finisher, stitcher, belting, hangers and shafting.

Ky., Benton—J. M. Johnson—equipment for grist mill.

Ky., Louisville—Office of United States Engineer, P. O. Box 72—one 6,500 lb. pile driver hammer for Dam 46 at Owensboro.

La., Cedar Grove—R. Quarris—cylinder press and paper cutter.

Mich., Detroit—Detroit Auto & Machine Wks., 7640 Gratiot Ave.—plating equipment, including dynamo and medium size tanks.

Mich., Detroit—J. Takieli, 9201 Home St.—two circular rip saws with equipment, size 44 to 52 in.

Mich., Winona—Pampa Land Co.—power rip saw and one large band sawmill.

Mo., Joplin—Hargis Printing Co., 111 East 4th St., W. Hargis, Purch. Agt.—round cornering machine.

Mo., St. Louis—Abramson-Resnick Printing Co., 1102 High St.—8 x 12 in. job press with motor.

Mo., St. Louis—Missouri-Kansas-Texas R.R. Co., 1520 Ry. Exch. Bldg., G. E. Scott, Purch. Agt.—receiving bids Dec. 5 for 1,600 steel striking castings and 1,300 steel coupler yokes.

N. Y., Amsterdam—Merwin & Clapp Apron Mfg. Co.—complete machinery and equipment for proposed $250,000 plant, to replace fire loss.

N. Y., Batavia—Genesee Stone Products Co., J. W. Foster, Supt.—quarry machinery and equipment, including compressed air drills and conveyors.

N. Y., Buffalo—Danahy Packing Co., 25 Metcalf St.—equipment for proposed addition to packing house.

N. Y., Buffalo—Kensington Davis Corp., 144 Kensington St.—foundry equipment for new $125,000 plant.

N. Y., Buffalo—Vetter Optical Co., Inc., 1271 East Ferry St.—equipment for light manufacturing.

N. Y., Canandaigua—Roper Knitting Co.—looms, hangers, pulleys, special machinery, etc., for proposed addition to factory.

N. Y., Fayetteville—Precision Die Casting Co., c/o A. H. Chase—machinery and equipment for expansion program.

N. Y., Fort Miller—Fort Miller Pulp & Paper Co., S. A. Thorpe, Mgr.—machinery for ground wood pulp mill, 100 ton daily capacity, water power only.

N. Y., Hudson—Hudson Fibre Co., Inc., H. Hudson, Pres.—rag picker, cotton card and condenser for making cotton bats.

N. Y., New York—Esquerre & Son, 150th St. and 7th Ave.—bandsaw.

N. Y., Rochester—C. Zarcone, 168 Jay St.—machinery and equipment for cigar plant, to replace that which was destroyed by fire.

N. Y., Syracuse—Cloverland Dairy Co., 250 Lincoln Ave., W. L. Brodeur, Glens Falls, Purch. Agt.—machinery for the manufacture of ice cream, etc., for immediate expansion program.

O., Barberton—Lambert Tire & Rubber Co., G. M. Collette, Mgr.—tire making equipment, including two mixing machines, two vulcanizers, etc.

O., Columbus—Modern Showcase & Fixture Co., 162 West Locust St., G. M. Schwartz, Pres.—woodworking machinery, one molding machine, two saws, also metal working machinery.

O., Lima—Ohio Steel Fdry.—foundry machinery and equipment.

O., Mogadore — E. Slusser — complete equipment for proposed bakery.

O., Sandusky—Gartland-Carroll Fdry. Co., West End, J. J. Carroll, Mgr.—foundry machinery and equipment for expansion program.

O., Stryker — Ohio Trent Coal, Coke & Amalgam Co., F. M. Burns, Secy.—coal handling machinery and equipment for new plant for the manufacture of amalgam, 500 ton daily capacity, at Toledo.

O., Youngstown—Concrete Products Co., W. G. Reese, 624 Martin St., Purch. Agt.—machinery and equipment for proposed plant for the manufacture of tile and concrete blocks.

Pa., Erie—F. H. Holmes, Jr., State and 26th Sts.—pumps and equipment for proposed service station.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Active pig-iron buying in Birmingham market for first quarter delivery; possibilities of an upward trend in prices. Downward price tendencies in steel hoops, bands and galvanized sheets. Iron and steel scrap up. Steel structurals remain firm at the $2.50 base, with bars at $2.40 per 100 lb., Pittsburgh. Steel demand small, due to approach of inventory season. Buying of structurals, however, fairly active in New York district.

Advances—Tin, 1⅛c. per lb. higher than week ago; market, however, shows tendency to weaken. Fabricated brass and copper products higher in New York. Solder up ¼c. per lb. in Cleveland.

Declines—No improvement in volume of copper buying; price down ⅛c. per lb. in week. Zinc dropped 15c. per 100 lb. and antimony, ½c. per lb.; lead, steady in New York. Old copper lower in Cleveland. Linseed oil down 3c. in New York and 5c. per gal. in Cleveland.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.05
Northern Basic	24.00
Southern Ohio No. 2	24.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	28.00
BIRMINGHAM	
No. 2 Foundry	22.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.25
Virginia No. 2	28.17
Basic	24.00
Grey Forge	24.00
CHICAGO	
No. 2 Foundry local	24.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	27.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.77
Basic	25.77
Bessemer	26.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.75
Cleveland	4.75
Cincinnati	7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.00
No. 12	3.10	4.64	3.80	4.05
No. 14	3.20	4.69	3.85	4.10
No. 16	3.40	4.79	3.95	4.20
Black				
Nos. 17 and 21	3.70	4.95	4.45	4.70
Nos. 22 and 24	3.75	5.00	4.50	4.70
Nos. 25 and 26	3.80	5.05	4.55	4.75
No. 28	3.85	5.15	4.65	4.85
Galvanized				
Nos. 10 and 11	3.90@4.00	5.15	4.70	4.85
Nos. 12 and 14	4.00@4.10	5.25	4.80	4.95
Nos. 17 and 21	4.30@4.40	5.55	5.10	5.24
Nos. 22 and 24	4.45@4.55	5.70	5.25	5.40
No. 26	4.60@4.70	5.85	5.50	5.55
No. 28	4.90@5.00	6.15	5.80	5.85

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0,17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold drawn shafting or screw	4.65	3.90	4.55
Cold drawn flats, squares	5.15	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.10@3.15 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 5/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York				13.62½
Tin, 5-ton lots, New York				45.37½
Lead (up to carlots), St. Louis	6.65	New York		7.22½
Zinc (up to carlots), St. Louis	6.25	New York		6.70

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.20	27.00	26.50
Antimony (Chinese), ton spot	10.00	10.50	10.50
Copper sheets, base	21.00	21.00@21.25	23.00
Copper wire, base	16.26	19.00	16.25
Copper bars, base	20.00	22.50	19.50
Copper tubing, base	23.50	27.25	23.00
Brass sheets, base	17.75	22.00	18.75
Brass tubing, base	22.00	27.00	20.50
Brass rods, base	15.50	18.00	15.75
Brass wire, base	18.25	22.00	.....
Zinc sheets (casks)	10.25	10.45	.....
Solder (½ and ½), (case lots)	31.00	30.50	28.50
Babbitt metal (83% tin)	52.00	54.00	45@48
Babbitt metal (35% tin)	25.00	17.50	20@25
Nickel (ingot and shot)	29.00	.....	.....
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00

Shop Materials and Supplies

METALS—Continued

Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.75	11.00	11.25
Copper, heavy, and wire	10.75	10.50	10.50
Copper, light, and bottoms	9.50	8.75	9.50
Lead, heavy	5.75	5.25	5.75
Lead, tea	4.75	4.00	4.75
Brass, heavy, yellow	7.00	....	7.00
Brass, heavy, red	8.75	9.25	8.75
Brass, light	6.25	5.00	6.00
No. 1 yellow brass turnings	7.00	5.75	6.50
Zinc	3.75	2.75	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$25.10	$22.85	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.40	18.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	13.00	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.14
Cotton waste, colored, per lb.	.08@.13	.12	.10½
Wiping cloths, 13¼x13¼, per lb	11.00	36.00 per M	.16
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.16
Sal soda, per 100 lb.	2.40	2.25	2.65
Roll sulphur, per 100 lb.	3.60	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.95	1.00	.94
Lard cutting oil (50 gal. bbl.) per gal	.55	.50	.67½
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.297	.35	.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30–10%	30–10%	30–10%
Heavy grade	20–5–2½	30%	20–5–2½%
Rubber and duck:			
First grade	50–10–5%	50–10%	40–10%
Second grade	60–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20
Fire clay, per 100 lb. bag	....	.65	.60
Coke, prompt furnace, Connellsville	per net ton		3.50@4.00
Coke, prompt foundry, Connellsville	per net ton		5.00@5.50
White lead, dry or in oil	100 lb. kegs		New York, 14.00
Red lead, dry	100 lb. kegs		New York, 14.00
Red lead, in oil	100 lb. kegs		New York, 15.50

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0354	$0.0354	$0.0304
Cold finished shafting	per lb.	0.0465	0.0465	0.039
Brass rods	per lb	0.155	0.1525	0.17
Solder (½ and ½)	per lb.	0.31	0.295	0.275
Cotton waste	per lb.	.10@.13	.10@.13	.09@.11½
Washers, cast iron (⅛ in.)	per 100 lb.	6.50	6.50	6.00
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.02
Lard cutting oil	per gal.	0.55	0.55	0.60
Machine oil	per gal.	0.297	0.297	0.33
Belting, leather, medium	off list	30–10%	30–10%	30–10%
Machine bolts up to 1x30 in.	off list	40–10%	40–10%	40%

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40–10%	60%	45–5%
1⅛ and 1¼x3 in. up to 12 in	15%	50–5%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	25–10%	$3.50 net	.....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30–10%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65–5%
Lag screws, coach screws	40–10%	.....	60–5%
Square and hex. head cap screws	60%	70%	70–10%
Carriage bolts, up to 1 in.x30 in.	30–10%	50%	40–5%
Bolt ends, with hot pressed nuts	40–10%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 9/16 and smaller	60%	.....	.....
Semi-finished nuts, ⅝ and larger	55%	70%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	0.50	3.50	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	0.50	3.50	2.50
Nuts, cold punched, sq., per 100 lb. Off list	0.50	3.50	2.50
Nuts, cold punched, hex., per 100 lb. Off list	0.50	3.50	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	50–10%	60%	60%
Rivets, tinned	50–10%	60%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3.60	$3.75
Cone heads, ditto (net)	5.60	3.80	3.85
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

Pa., Monaca—F. Cancillo—refrigeration machinery for proposed $40,000 fruit and vegetable warehouse.

Pa., Sayre—J. Snyder, Route 1—complete machinery and equipment for sawmill (used preferred).

Pa., Scranton—Homemade Baking Co., 2229 Brown Ave.—machinery and equipment for proposed $10,000 addition to plant.

Tenn., Knoxville — Duncan Mchy. Co., Box 265—chain mortising machine and a No. 1½ Boilger & Kirsten shears (used).

Va., City Point—Wilson Hock Co. (machinery dealer)—5 ft. band sawmill.

Va., Wytheville—R. P. Johnson (machinery dealer)—jaw crusher.

W. Va., Philippi—Philippi Blanket Mills—six or eight Crompton & Knowles looms, 8 harness end cam, 4 x 1 box with 4 chain multipliers.

Wis., Appleton—C. Helm, 578 Locust St. (stone)—air compressor and two jib cranes.

Wis., Fond du Lac—E. C. Halverson, 105 South Main St.—bakery machinery, including electric ovens, mixers, etc.

Wis., Fond du Lac—B. F. & H. L. Sweet Mfg. Co., 245 West Arndt St.—small tools, woodworking machinery, etc., for the manufacture of heavy duty sleds.

Wis., Kenosha—Winther Motor Co., c/o R. D. Mock, Genl. Mgr.—miscellaneous tools and special machinery for the manufacture of motor trucks.

Wis., Madison—N. Olsen, 1928 Railroad St.—36 in. planer.

Wis., Madison—G. Ripp, 20 South Bassett St.—26 in. planer, bandsaws, circular saw, heavy rip saw and bench tools.

Wis., Madison—United States Automotive Shift Co., c/o B. R. L'Hommedieu, 252 West Gilman St.—special machines and tools for the manufacture of auto gear shift and metal specialties, for plant at Eau Claire.

Wis., Milwaukee—Milwaukee Paint & Varnish Co., 1503 Holton St.—one medium duty air compressor.

Wis., Milwaukee—Natl. Biscuit Co., 12 Erie St.—air compressor for proposed garage.

Wis., Sawyer—A. Behnke, R. D. (manufacturer of cheese and other dairy products)—one power churn, one separator, several vats, belting and shafting.

Wis., Watertown—W. C. Schultz, 603 Clyman St. (woodworking)—one veneer press, standard size.

B. C., Chemainus — Victoria Lumber & Mfg. Co.—complete machinery and equipment, to replace $25,000 fire loss.

B. C., New Westminster—United Shingle Mills, Ltd., J. McKercher, Purch. Agt.—machinery and equipment to replace fire loss.

B. C., Port Coquitlam—Hammond Cedar Milling Co., D. Hartnell, Purch. Agt.—machinery and equipment for $200,000 lumber mill.

N. S., Halifax—Newcombe & Tingley, H. W. Tingley, Purch. Agt.—polishing and cutting machinery for monumental works.

Ont., Cobalt—I. H. Rattray, Wallace Block—mining machinery.

Ont., London—Bd. Educ., A. N. Udy, Chn.—complete manual training equipment.

Ont., London—Western University, J. M. Moore, Archt., 489 Richmond St., Purch. Agt.—$50,000 worth of laboratory equipment.

Ont., Mitchell — Burritt Knitting Co. — knitting machinery and equipment.

Ont., Ottawa—Dept. of Public Wks., R. C. Derochers, Dept. Minister—machinery and equipment for grain elevator at Edmonton, Alta.

Ont., Ottawa — Dept. of Rys. & Canals, Parliament Bldgs.—hoists for canal at St. Catherines.

Ont., Sarnia—Sarnia Oil & Gas Co.—complete equipment for proposed $300,000 plant, daily capacity 5,000 gal. gasoline and 9,000 lb. of carbon black, at Medicine Hat, Alberta.

Ont., Sombra—H. P. Stover—complete equipment for grist mill, to replace that which was destroyed by fire.

Ont., Strathroy — Rathwell Baking Co.—complete equipment for bakery, to replace that which was destroyed by fire.

Ont., Windsor — Empire State Ice Co., Michigan Central Yards—three ice making machines, special refrigeration equipment, brine pumps, etc., to supply refrigerator cars.

Que., Amqui — J. A. Gagnon — general equipment for sawmill.

Que., Bourget—P. Hurtulise—complete blacksmith shop equipment.

Que., Montmagny — Courrier de Montmagny, A. Caron, Purch. Agt.—cutter and possibly job printing press.

Que., Montreal—J. Bradley, 192 Guy St.—emery stand, tools and equipment.

Que., Montreal — Canadian Automatic Machine Co., Ltd., L. C. Herdman, Dir., 4038 Dorchester St., W.—special equipment.

Que., Montreal—J. Lacasse Shoe Co., Ltd., c/o Z. Lacasse, 1771 Ave. de Chauteaubriaud—machinery and equipment.

Que., Montreal—Lee Puncture Proof Tire Co., c/o W. P. Creagh, 2048 Cartier St.—special machinery for the manufacture of pneumatic tires.

Que., Quebec—P. Noel, 28 Des Jardines St.—equipment for plumbing shop.

Que., Quebec—A. Rochette, 1 Racine St.—blacksmith shop equipment.

Que., Rimouski—L. Pelletier—equipment for sawmill.

Que., Rimouski—A. Sirois & Bro. (sawmill)—drum saw and self-feed rip saw.

Que., Ste. Claire — J. A. Roy — bakery equipment.

Que., St. Mathieu—E. Dionne—swing cut saw.

Metal Working Shops

Ark., Hot Springs—W. Dodson, 625 Central St., is having plans prepared for the construction of a 2 story garage and display room on Ouchita St. Estimated cost $40,000. S. M. Frank, Archt.

Calif., Eureka—A. Frisch, 231 E. St., plans to build a 1 story, 50x110 ft. garage on 4th and C Sts.

Calif., Los Angeles—C. A. Doody awarded the contract for the construction of a 4 story, 150 x 150 ft. garage on 6th and Kenmore Sts. Estimated cost $280,000.

Calif., San Francisco — The Amer. La France Fire Engine Co., Elmira, N. Y. (office of local representative, 151 New Montgomery St.), plans to build an assembling plant, office and service department, here. Estimated cost $150,000.

Calif., San Francisco—J. A. Nelson, Inc., 517 6th St., sheet metal works, is having plans prepared for the construction of a 1 story plant on 10th and Howard Sts. Estimated cost $40,000. H. A. Thomsen, Jr., 613 Sharon Bldg., San Francisco, Archt.

Conn., New Britain — The New Haven Dairy, Woodland St., awarded the contract for the construction of a 2 story, 50 x 50 ft. garage, etc. Estimated cost $40,000.

Conn., Torrington—The Allen Candy & Fruit Co., 33 East Main St., awarded the contract for the construction of a 1 story, 60 x 210 ft. garage and salesroom. Estimated cost $45,000.

Conn., Waterbury—P. Laskas, 1844 East Main St., will soon award the contract for the construction of a 1 story, 60 x 130 ft. garage on Meriden Rd. Estimated cost $40,000. F. L. Lauper, 16 Albion St., Waterbury, Archt. Noted Nov. 8.

Ind., Evansville — The Illinois Central R.R., 135 East 11th Pl., Chicago, is having plans prepared for an addition to shops, etc., at Harwood Yards, here. Estimated cost $750,000. F. L. Thompson, Ch. Engr.

Ind., Indiana Harbor—The Youngstown Sheet Tube Co., Stambaugh Bldg., Youngstown, O., plans to build two butt weld pipe mills and a blast furnace, here. Estimated cost $4,000,000. J. A. Campbell, Pres. Engineer or architect not announced.

Ia., Denison—G. W. Newcomb is having preliminary plans prepared for the construction of a 2 story, 80 x 150 ft. garage. Estimated cost $40,000. E. L. Barber, Denison, Archt.

Ky., Lexington — The Baker Car Co., Lafayette Bank Bldg., awarded the contract for the construction of a 1 story, 60 x 320 ft. automobile factory. Cost will exceed $25,000. Noted Oct. 4.

Ky., Louisville—The Standard Sanitary Mfg. Co., 6th and A Sts., awarded the contract for the construction of a 2 story addition to pattern shop and warehouse building. Estimated cost $50,000. Noted Nov. 1.

Ky., Louisville—The Standard Sanitary Mfg. Co., 6th and A Sts., plans to build a factory, foundry, etc., for the manufacture of brass plumbing fixtures on 6th and Shipp Sts. Estimated cost $1,500,000. Engineer or architect not selected.

Mich., Crystal Falls—The Webb Garage Co. will soon award the contract for the construction of a 1 story, 50 x 100 ft. garage. Estimated cost $40,000. F. E. Parmelee & Son, Iron Mountain, Archts.

Mich., River Rouge (Detroit P. O.)—The Ford Motor Co., Highland Park (Detroit P. O.), awarded the contract for the construction of a 1 story, 600 x 1,223 ft. and 2 story, 98 x 132 ft. addition to foundry and motors building, here.

Minn., Minneapolis — The Minneapolis Garage Co., 3411 Hennepin Ave., awarded the contract for remodeling a 9 story, 135 x 165 ft. manufacturing building into a garage on 2nd Ave. N. and 3rd St. C. D. Fintzell, Mgr. Estimated cost $100,000.

Minn., Minneapolis — The Rent-A-Ford Co., 7th St. and 2nd Ave. S., is having plans prepared for the construction of a 2 story, 50 x 140 ft. garage at 902 1st Ave. N. Estimated cost $45,000. P. Silver, Mgr. Ekman, Holm & Co., 302 Phenix Bldg., Minneapolis, Archts.

Mo., St. Louis—The Niedringhaus Metal Wares Co., 5700 Natural Bridge Ave., awarded the contract for the construction of a 2 story, 100 x 200 ft. factory for the manufacture of light metal wares at 5719 Natural Bridge Ave. Estimated cost $45,000.

Mo., St. Louis—The Warren Steel Casting Co., 3400 Maury Ave., is having revised plans prepared for the construction of a 1 story, 60 x 200 ft. steel foundry on Kingshighway. Estimated cost $60,000. O. J. Popp, Odd Fellows Bldg., St. Louis, Archt. Noted Sept. 6.

O., Cleveland—The Fixit Body & Fender Repair Co., c/o E. M. Hauserman, Secy., 2075 East 65th St., is having plans prepared for the construction of a 2 story addition to factory. Private plans. Estimated cost $50,000.

O., Cleveland—R. C. Patton and R. T. Hisey, 536 Engrs. Bldg., awarded the contract for the construction of a 1 story, 45 x 280 ft. garage at 1833 East 82nd St. Estimated cost $80,000. Noted Oct. 4.

O., Cleveland—Paul Bros. Co., 601 Fidelity Mortgage Bldg., is receiving bids for the construction of a 1 story, 110 x 160 ft. garage at 4320 Superior Ave. Estimated cost $50,000. J. F. Steffens, Fidelity Mortgage Bldg., Archt.

O., Toledo—The city plans to build a garage and repair shop. Estimated cost $160,000. A. Jackson, Service Dir.

Pa., Frankford (Phila. P. O.) — The Frankford Grocery Co., Inc., Penn and Unity Sts., is having plans prepared for the construction of a 1 story, 45 x 100 ft. garage, etc. W. E. S. Dyer, Land Title Bldg., Phila., Engr. and Archt.

Pa., Phila.—L. Friedman, Inc., Agent, 251 South 15th St., awarded the contract for the construction of a 1 story garage on Carlisle Ave. near Montgomery St. Estimated cost $97,600. Noted Nov. 1.

Pa., Williamsport — Mead & Goodrich, Inc., 350-370 West 3rd St., plans to build a 3 story, 120 x 170 ft. garage, sales building, show rooms and Ford Assembly plant. Estimated cost $140,000.

Tex., Big Spring—The Stokes Motor Co. awarded the contract for the construction of a 2 story, 50 x 140 ft. garage. Estimated cost $45,000.

W. Va., Huntington—The Motor Sales Co. plans to build a 1 story, 115 x 125 ft. automobile sales room and repair shop. Estimated cost $40,000.

Wis., East Troy—The Brown & O'Malley Co. plans to build a 2 story, 48 x 80 ft. garage on Main and Brown Sts. Estimated cost $40,000. Engineer or architect not selected.

Wis., Hurley—The Norman Auto Co. will build a 1 story, 95 x 100 ft. garage and repair shop. Estimated cost $40,000. B. E. Norman, Pres. Noted Nov. 1.

Wis., Kenosha—The Central Fuel & Ice Co., 159 South Ridge St., will build a 1 story, 57 x 100 ft. garage. Estimated cost $40,000.

Wis., Ladysmith—The Arts & Diedrich Co. will build a 2 story, 50 x 90 ft. garage and repair shop. Estimated cost $40,000.

Wis., Milwaukee—The Eslien Sheet Metal Wks., 1001 30th St., is having plans prepared and will soon receive bids for the construction of a 3 story, 60 x 120 ft. factory. Estimated cost $60,000. C. F. Behnke, 827 34th St., Milwaukee, Archt.

Wis., Milwaukee—The Luick Ice Cream Co., 183 Ogden Ave., awarded the contract for the construction of a 4 story, 120 x 120 ft. garage on Van Buren St. Estimated cost $180,000. Noted Oct. 25.

Wis., Milwaukee—The Milwaukee Electric Ry. & Light Co., Public Service Bldg., awarded the contract for the construction of a 1 story, 60 x 100 ft. garage on 38th St. Estimated cost $40,000. Noted Oct. 25.

Wis., Racine—F. H. Applegate, 1043 Washington Ave., awarded the contract for the construction of a 1 story, 100 x 174 ft. garage. Estimated cost $55,000. Noted Aug. 16.

Wis., Waukesha—The Thompson Malted Food Co., Riverside Dr., awarded the contract for the construction of a 1 story, 52 x 100 ft. garage. Estimated cost $40,000. Noted Nov. 8.

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Equipping an Ideal Automobile Plant

By A. L. De LEEUW
Consulting Engineer

Magazine feeds, combination machines with rotating tables, non-adjustable standard type machines and standard unit combinations are some of the non-existent types that would find a place

DREAMING is not considered the best method to obtain fame or fortune, but occasionally it is an agreeable pastime and, after all, there are few of the worth-while things we have at the present which were not dreams at one time or another. And so I may perhaps be permitted to dream of what I would do if I were building automobiles and could get just exactly the kind of equipment I wanted.

I do not know whether machine tool builders would want to build the machines I dream of nor whether automobile manufacturers would want to buy such machines if they were made. However, such practical things do not affect dreams.

For such items as screws and screw machine parts, my dreams do not indicate anything better than the present styles of screw machines. Not that I mightn't wish for some little improvement here and there, but as a whole the present-day screw machines are about as productive as the present-day tools permit them to be. I would carefully go over every part which can be made in an automatic screw machine, determine quantities per year and time per piece and buy either multiple spindle or single spindle machines according to which kind would give the best economy combined with the proper quality.

I would then take a look at secondary operations which might have to be done on such parts—operations such as slotting, squaring, milling, castellating, cross-drilling, threading the second end, etc. I would not be satisfied until I had found a machine which would do these operations either automatically or else as nearly automatically as possible, keeping in mind all the time that, though an automatic machine may break down occasionally, labor itself breaks down too, and is not nearly so easy to repair. And so I would have automatic screw machines with magazine feed, small drilling machines with magazine feed, and small slotting machines with magazine feed—in short, I would have a group of machines of which the main essential would be the magazine feed.

I would be wide awake enough during my dream to realize that a magazine feed is not always economical and that at times it may be better to have a machine in which the piece is chucked by hand; but in that case I would want the machine so arranged that both machine and operator are comfortably busy all the time. There are such machines in existence at the present time which will do cross-drilling and for certain milling operations the rotary feed fills the bill. But there are other operations which might be done in the same manner—that is, the machine would have facilities for a number of fixtures and a number of spindles, so that the operator could go from fixture to fixture while spindle after spindle operates.

And not only that, but I would want a machine in which certain operations could be combined. Such, for instance, as cross-drilling, threading one end, or maybe counter-sinking or milling a flat, and I can imagine that such a machine would consist of an indexing circular table with a number of fixtures on it and a number of small heads for drilling, milling, etc., placed around a part of the circumference of this table. All

HOW OFTEN have you said, when facing a particularly trying production tooling problem, "That would be a cinch if I only had a....." (some machine not on the market)? And then perhaps you have let your thoughts wander for a while and drawn a mental picture of the kind of tool that would be just suited to your problem.

A waste of time? Perhaps. But haven't most new designs started in exactly that way?

In this article the author indulges in just such visions, but instead of confining himself to one particular problem he wanders over the whole plant and suggests many types of machine tools new to the automobile industry.

these heads would receive their feed from one source, so as to have them always in time. The piece would pass one head after another and be cross-drilled, counter-sunk or milled. From what I have noticed when I was awake, I should think that there is quite some room for such a machine, not only in the automobile shop but also in other shops where small articles are made in large quantities.

Somehow, the magazine feed has taken hold of me. I seem to remember a number of pieces which are capable of treatment by this method: pistons, for instance, and valves. This magazine principle could be applied to lathes and drill presses and grinding machines. After all, a magazine feed is merely an attachment to a machine, and the imaginary turn-table machine which I mentioned is merely a combination of machines with the addition of an indexing table.

But the machines themselves also have been the subject of my dreams. For instance, I can see very well why the ordinary drill press is made with an overhanging arm. Today we may be drilling pieces not bigger than my fist, and tomorrow a piece of which the tail sticks out ten feet into the shop. When I do not know what kind or size of pieces I may have to drill next, I will naturally want a machine which will accept almost any pieces. But if I have to drill one size of hole in a piece that is nowhere bigger than 4 in., why should I want a drill press with an overhang of 12 in. and which has nine speeds and sixteen feeds, or whatever the number may be? What I should want there is a drilling machine of which the spindle is held as rigidly as possible, with just enough travel to accommodate the depth of the hole and the variation in length of the drill, and with sufficient capacity to take in a piece of 4 in. I might liberalize this a little and make the capacity great enough so as to take in a greater range —let us say up to 8 in., and to accommodate pieces of various heights, say from 1 in. thickness up to 4 in. And then I would have a machine which would be as rigid as possible for quite a variety of *my* work. If the height of the work should be still greater, this could be compensated for by making the table adjustable in height and clamping it in position.

A New Kind of Drill Press

If you wish to picture this machine just imagine two uprights fastened to a sole plate, with a small cross head at the top carrying the spindle. A table is adjustable in height between the uprights and can be clamped to them. The spindle has an amount of feed a little more than the deepest hole I want to drill. It has only one speed and one feed. If I should wish to use this press for another piece of work of perhaps a different material and requiring a different sized hole, I would obtain the proper speed and feed by the use of change gears. In the majority of cases I would not need these change gears at all because the quantities in most automobile shops are great enough to set a machine aside for a single operation.

If the machine tool builder objects that this machine would be of too limited use to be profitable for him to build, I would tell him that he may be right but that it would not change my dreams, and I would add that it might not be so very difficult to build such a machine out of units so as to make it possible to have a drill press for different widths of work, different heights, different speeds and feeds, and yet carry through the same system for all of them.

The advantages of such a machine? Its chief merit would be its rigidity. There would be no spring and, as a result, a truer hole could be drilled with less breakage of drills. Besides, the machine would be of simpler construction, with fewer parts and, consequently, less danger of getting out of order. The floor space required would also be less and this is an item worth considering, especially where a plant must be enlarged for additional production.

Such a machine would not be a general utility machine; it would not be particularly useful in a tool room or in a jobbing shop; nor could it be considered as a one-operation machine in the strictest sense of the word. It would be a machine arranged for one certain operation but adapted to be set up for quite a wide range of other operations.

Many Hobbing Machines Used

This simplification of machines and the more rigid construction can be carried out on other types of machine tools. Take hobbing machines, for instance. I would not be surprised if I were told that more hobbing machines are used in the automobile industry than in all other industries combined. Only a few varieties of gears are made in any automobile plant, but a large number of each kind. It is doubtful if there is a single instance in the larger plants of the use of a hobbing machine for more than one gear. On the other hand, there are many instances of the use of a battery of such machines for one single gear. Now, when I get this dream plant of mine going, I'll see to it that I get hobbing machines best adapted to the gears I have to cut. There will be no need of the swivel, for I'll have the spindle of every machine set at the proper angle for the gear it has to cut; or rather, for the hob I am going to use. There will be a simple gear reduction, because it will not be necessary to arrange a machine for all kinds and sizes of spiral gears as well as spur gears, and there will be only one speed and one feed. If I must make a change I will do it by means of change gears. Of course, the amount of vertical feed and adjustment can be kept down to the irreducible minimum, and so with the horizontal adjustment.

Gear cutters, gear grinders, and gear shapers would have to follow suit.

I would make the fullest possible use of continuous milling machines and see to it that in no case the piece of work came under the finishing cutter while the roughing cutter was working on it. Here, too, I would reduce the machine to its simplest form by arranging it for one speed and one feed only. I would not want the machines specially arranged and built for every piece I have to make; in other words, I would not insist on having a new pattern for every piece of work, but I would cut out all the features that make the machine handy to change over from one job to another. Whether such a change takes one hour or six hours would not interest me when the machine will have to do the same job for at least a whole year.

Of course, I would use multiple and gang drilling machines to the utmost, and I would get multiple tapping machines and use them wherever possible. Such tappers should have every spindle controlled by its own lead screw so as to produce as perfect a thread as possible and, at the same time, reduce the breakage of taps.

As to grinding, the wide-faced wheel would be much in evidence and preferably used in an automatic machine. I would want the machine so arranged that the

wheel has a slight axial oscillation when it has come to the proper diameter. Of course, wherever possible, magazine feed would be combined with this automatic machine. In addition, there would be automatic control of the feed so that all pieces would be produced within the given tolerances. Cylinder grinding machines cannot well be arranged to grind all four or six holes of a bloc at the same time. But that we cannot grind six at once is no reason why we should not try to grind two or three at one setting; and so I would insist on a multiple cylinder grinding machine.

Air Chucks Would Be Used

In recent years several machines have been brought out which are particularly adapted to parts which can be machined on a chucking machine. Some of these can be provided with air chucks. In my shop all the machines would have such chucks. When practically all of the work done by the operator consists of chucking pieces, besides, of course, the supervision of his machines, it becomes a matter of great importance to make this chucking as light as possible, always keeping in mind that the man should be the guiding hand and that the machine should furnish the motive power. Tightening something with a wrench every so many seconds and doing this all day long is hard work and the tendency of the times is to relieve the operator from all unnecessary physical labor.

As a rule, the machines which are now in existence for chucking work have a wide range and, as a result, are quite large. This means that they cost more money than they should and that they take up too much floor space. In my dream shop no machine would be much larger than would be actually required for the work. To have a machine which will bore a hole 12 in. deep is very fine when such holes must be bored, but why should we take up all this unnecessary floor space when the depth of the hole is only 3 in., and why spend all this unnecessary money? Whether machine tool builders would be willing to furnish one type of machine with different ranges is a question, but that I would want them is certain.

Making Pistons From Bars

Speaking of pneumatic chucks reminds me that their advantage does not merely lie in the fact that they will relieve the operator of unnecessary work, for the same thing will be done by any other automatic chuck. One of the greatest advantages of the pneumatic chuck is its ability to take a tight hold on a piece of work of widely varying diameter or size and that the hold will always be equally tight. If such a chuck were used on automatic screw machines it would no longer be necessary to use stock of very even size. Hot rolled stock might be used, and even cast iron bars. In fact, one of the side trips I made in my dream was in the region of pistons being cast in the form of long bars and being turned up and faced on the automatic screw machine. That there are certain difficulties connected with the casting of such long bars would not hold the automobile people back; they have solved greater difficulties than this one. Besides, other people have done it.

If there should be trouble in applying a pneumatic chuck to the screw machine, and I do not see why there should be, then the cast iron bars might be subjected to a preparatory operation in which the scale is removed and the bar turned up to even size, though without making a straight bar of it; in other words, the bar would go through a hollow milling operation.

Of course, if I had a very large automobile plant and if the automobile I manufactured were sufficiently standardized to give me a feeling of safety, I would go a step further and have a number of machines constructed in which some or even many operations are combined. Against such machines the objection is often raised that when this machine breaks down there is a sudden stoppage as far as that part is concerned, and another objection is that if one tool gets dull or breaks all other tools must stop work. This last argument is no longer seriously considered by progressive people. If they did they would not use automatic screw machines or chucking machines or even hand turret lathes. Neither would they use multiple spindle drilling machines or tapping machines. What we should do is this: If we have a multiple spindle drilling machine with twenty spindles we should not figure on an output equal to that of twenty single spindle machines. The output may be equal only to fifteen or twelve or whatever the number may be. We should make this little calculation beforehand and then we will not be disappointed.

When To Use a Special Machine

As to the possible breakdown of a special machine which does a number of operations, there is certainly such a possibility and it would never be wise to install a complicated machine without having standby equipment. If somebody should tell me that such machines require the attendance once in a while of a skilled mechanic for tool setting or adjustment or small repairs, I would say that, if the total cost of the operator plus the labor of this mechanic plus the overhead on the machine brings the cost of the article well below what it used to be, then one is justified in buying or building such a machine. It does not make any difference whether the wages are paid to a number of machine operators or to one machine operator and a skilled mechanic. Whichever gives the lower total is the better method.

Things which go easily and naturally in a dream may not move quite so smoothly in actual life. The machine tool builder who should take my dream for gospel might find that the automobile builder has not done so, and vice versa. To bring about the building of classes of machinery specially adapted to the automobile industry and of such a simple construction that there are no parts, complications or adjustments which are not actually required for the work to be done, would require the co-operation of the automobile manufacturer and the machine tool man, and I see no reason why such co-operation should not be brought about.

The Character of a Steel Affects the Results Obtained in Carburizing

Samples of various "normal" and "abnormal" steels submitted to the Bureau of Standards by different manufacturers have been carburized and examined microscopically. The structural characteristics of these carburized steels confirm the contention that there is a difference in the carburizing properties of steels which show but little difference in their composition as ordinarily determined. These differences consist in variations in the average depth of penetration, as well as in the character of the pearlite.

What About Automobile Shops?—Discussion

By E. C. Oliver
President, Oliver Instrument Company

As A manufacturer of drill grinders I have read with much interest the article on page 683, Vol. 59, of the *American Machinist*, "What About Automobile Shops?" particularly in connection with the problem of grinding drills. This article makes a statement of fact—may I suggest a remedy?

From the nature of our business we spend considerable time in automobile and other shops in the interest of better drilling and have been impressed with the fact that the drilling operation, though one of the most important in the manufacture of machines, does not receive much consideration. In the olden days when the all-around machinist and apprenticeship were in vogue, the first lesson to a beginner was the grinding and use of drills but in this day of specialists there is only an occasional mechanic who can put a cutting edge on a twist drill that will permit it to cut with ordinary accuracy and freedom.

Practice in drill grinding varies. There is the shop or department where each operator grinds his own drill. Each has his own idea of what a proper grind is and each drill is ground differently so there is a variety of point angles, a variety of clearance angles and a variety of special additional grinds such as point thinning, chip breakers, increasing chip clearance by backing off the heel of the lip, breaking the corner of the lip and perhaps others, the combination of which produces any number of points, one of which may be the best but surely not all.

Then there is the shop, or department, where all drills are ground by one man. This reduces the number of points to those answering his requirements but unless this man is wonderfully expert, has the facilities for testing, and uses them, his product cannot be uniform, and, sad but true, he usually has his peculiar grinds and makes an effort to have his superiors understand that he is getting results which cannot be attained in any other manner.

There is also the shop where all drills are sent to a department for grinding and this department is equipped with proper machines for grinding and testing drills. This is, of course, the best method provided men, machines and testing devices are used intelligently. Here again, however, if a system is lacking, drills go back to machines not properly ground, the machines are condemned through no fault of theirs, and hand grinding starts again.

What Factors Affect Drill Efficiency?

Now if this system is to be improved and drills required to perform to their maximum efficiency, a study should be made of the various elements which tend to efficiency. A drill point has certain changeable features. The included angle may be altered, the clearance angle may be altered and the chisel point angle may be altered. In addition to this the point may be thinned or other alterations made. The choice of the various angles and other additions should, however, be made by actual trial by an observer who is qualified to judge results and when once determined should be adhered to, and the machines set to produce that point.

It is not necessary that exactly the same point be used on every job or every material if a slight variation will produce better results but here again it should be decided by a competent observer and not left to the judgment of the operator, and no more variations made than are absolutely necessary.

The most efficient grinder is one which will produce most nearly uniform drill points with the least chance of error and which requires the least skill in operation. Any drill grinder, however, requires some skill in its operation and a little care here will assist greatly in permitting the drills to give results. Some attention should also be given to the accuracy of the drill itself. It should be tested for centrality of the web and in some cases for proper index of the lips. If a drill showing these inaccuracies is used they should be corrected.

As an instance of the improvement shown in drilling, at a certain plant where drills were ground by the operators, they obtained from thirty-five to eighty-five pieces per grind and after the drills were ground on a drill grinder in the toolroom the production per grind went up to three hundred pieces. It has also been demonstrated that with a properly ground drill the feed can be increased as much as fifty per cent without showing any increased strain on the jig or machine.

A multiple spindle drilling machine is particularly sensitive to the type of grinding of its drills since any abnormal strain, due to poor grinding, is multiplied by the number of drills. We have seen a machine of this type under test with thirty-six drills, half of which were ground by hand and half ground on an improved type of drill grinder, used in drilling cylinder heads. A noticeable increase in temperature was noted where the hand ground drills were used. Also, the machine stalled on a casting which was slightly harder than the rest but was easily drilled by the machine ground drills.

In almost every instance it is possible to increase materially the feed of drills when properly ground and this calls attention to a detail in the design of drilling machines. We have been prevented a number of times in increasing the feed of drills due to the difficulty of this operation, first in getting permission for the change (in one case it was necessary to go through four persons in order to get authority) and then the actual work of changing gears required the services of a fifth person.

It seems that all drilling machines should have at least three feeds available without altering the gearing so that if there was a slight difference in the character of the material, or if desirable for any other reason, a slight change in the feed could be made.

We have demonstrated that a properly made and properly ground drill can be forced into the work with about sixty per cent of the pressure and will last for from two to three times as many holes as a drill ground in the ordinary way, besides making the hole closer to size with a better surface and with less strain on the drilling machine. The proper machine intelligently used to produce uniform drill points is a trifling investment compared with the return possible in increased production.

Most architects and building engineers have adopted ¼ in. to the foot as a standard for floor layouts. Remembering this makes it easy to make manikins, or models of the machinery and other equipment you want to arrange or rearrange. And it is much easier to move bits of cardboard than to shift machinery.

Recent Developments in Precision Bench Tools

By B. A. BEHREND
Consulting Engineer, Boston, Mass.

The universal bench milling machine and some of its attachments — Differs from larger machines of the same well-known type in size only—Concluding article

THE constant demand for a small milling machine, capable of doing all the work ordinarily laid out for large universal milling machines, prompted us to approach the Pratt & Whitney Co. to develop a universal bench milling machine with a swivel table and a universal dividing head. Under the direction of Major Earle Buckingham such a machine has been turned out by the Pratt & Whitney Co. It is shown in the accompanying illustrations. In order to indicate the small size of the machine in contrast with the operator, there is reproduced in Fig. 29 the operator and his machine.

A view of the entire machine is also given in Fig. 30, which shows the milling machine set up for cutting 45-deg. teeth in a small helical gear. The new dividing head is in all essentials similar to the spiral heads built by the Brown & Sharpe Manufacturing Co. The spindle is made similar to the spindle of the Pratt & Whitney bench lathe and of the milling machine proper, and the same collets fit the milling machine, the bench lathe, and the spiral head. The footstock center is adjustable in height. Brackets are supplied to mount the necessary gears which have the same numbers of teeth as used by Brown & Sharpe, so that the B. & S. tables can be used throughout. It is unnecessary to go into details as to the numerous applications of such a dividing head. Its usefulness is extraordinary, and a few specific applications are being shown herewith.



FIG. 29—UNIVERSAL BENCH MILLING MACHINE BUILT BY THE PRATT & WHITNEY CO.

In Fig. 31, for instance, is shown the milling machine in the operation of graduating a scale by means of the spiral head geared to the feed screw of the table. In Fig. 32 the dividing head is shown set up for differential indexing. In Fig. 33 the dividing head is shown set up for milling flutes in a twist drill. The reader must keep in mind that this is the picture of a small machine, the spiral head of which has a swing of only 3.625 inches. In Fig. 34 the spiral head is shown in position for milling the end teeth of a small milling cutter. In Fig. 35 the spiral head is shown for indexing and milling the teeth in a small bevel gear. In Fig. 36 the spiral head is shown in a vertical position, as its swing is too small to mount the gear in a horizontal position. A support must, of course, be placed under the rim of the gear at the cutting point.

In Fig. 37 the machine is shown set up for straddle milling the square head of a bolt, the bolt being held in a fixture which takes the standard collets.

In Fig. 38 is shown a slitting saw and the work

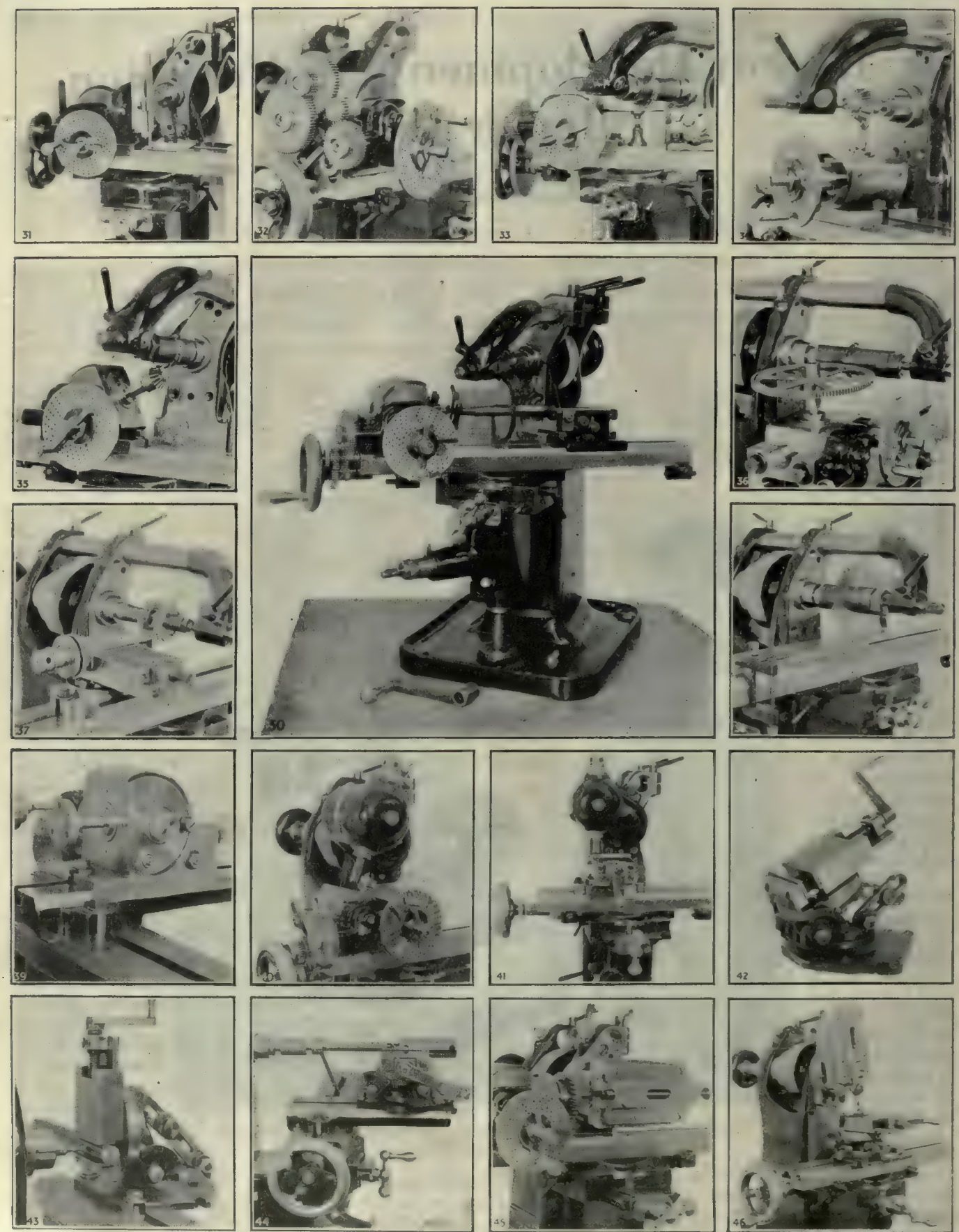


FIG. 30—CUTTING A 45 DEG. HELICAL GEAR. FIG. 31—GRADUATING A SCALE. FIG. 32—SET-UP FOR DIFFERENTIAL INDEXING. FIG. 33—SPIRAL FLUTING. FIG. 34—MILLING END TEETH IN CUTTER. FIG. 35—CUTTING A BEVEL GEAR. FIG. 36—CUTTING A SPUR GEAR. FIG. 37—STRADDLE MILLING A BOLT HEAD. FIG. 38—SLITTING. FIG. 39—USE OF RIGHT-ANGLE ADAPTER. FIG. 40—MILLING A CAM. FIG. 41—USING THE VERTICAL HEAD. FIG. 42—UNIVERSAL VISE. FIG. 43—USE OF UNIVERSAL VISE. FIG. 44—KEYSEATING A BUSHING. FIGS. 45 AND 46—USING THE SLOTTING ATTACHMENT

strapped on the table, clearance for the saw being furnished by the T-slot of the table.

In Fig. 39 is shown a right-angle adapter, on which is mounted the spiral head for drilling holes spaced 120 deg. apart in a small coupling.

In Fig. 40 is shown the spiral head in place and the vertical head mounted on the main spindle in the operation of cutting a cam. The tables prepared by Brown & Sharpe for cam cutting can be used for this operation.

The vertical head is again shown in a routing operation in Fig. 41, the work being held in a vise.

In order to avoid the use of special angle cutters, we have developed a small universal vise, somewhat on the lines of the well-known universal vise of Brown & Sharpe, and which is shown in Fig. 42. The vise proper is mounted on a base provided with a circular T-slot, and the main base is also equipped with such a circular T-slot. The vise is shown in position on the milling machine in Fig. 43. It was made for us by the Waltham Machine Works.

In Fig. 44 there is shown a long bushing, in which a keyway is being milled by means of an internal milling tool operated directly from the spindle. The bushing is held in the universal vise, which is mounted on the right-angle adapter.

We have found it necessary to devise for our milling machine a universal slotting attachment, which was jointly worked out and built for us by the Waltham Machine Works. It has an adjustable stroke of a little more than one inch maximum. It is shown on different operations in Figs. 45 and 46.

In closing this series of descriptive articles, it may not be amiss to point out that naturally the cost of the small high-grade tools described is not inconsiderable. However, if a broader market is created for them, the cost of production will be reduced, there being no doubt in the writer's mind that the operators who have become familiar with such small tools, and who have to do extensive small work, will soon become greatly fascinated with the ease and convenience offered by them. There is, besides, the great field for the ever-increasing number of people who do some experimental work of their own, in which case the machines can be installed in office buildings, and even in houses, without the necessity of expensive foundation work. Though not well suited for production work, accurate experimental work can be done on them to advantage.

Tool Room Troubles

By A. H. KINGSBURY
Crucible Steel Co. of America, Atha Works, Harrison, N. J.

POSSIBLY the most frequent cause of tool room troubles is primarily in the improper selection of the steel. In deciding this question to the best advantage, a careful consideration should be made of the work accomplished.

If the tool maker or designer does not have at least a working knowledge of the characteristics of the various tool and alloy steels available, or the proposition is one with which he is not thoroughly familiar, he can generally obtain the necessary information from the steel manufacturers, though in some instances the maker's experience will not allow him to state definitely just how the steel will perform under all conditions when it is in the finished tool. However, in making this choice the tool maker may find some assistance in the following questions:

1. What are the physical characteristics of the metal to be cut or otherwise worked by the tool? Is it soft, hard, soft and tough, medium and tough, hard and tough, or will it have an abrasive action on the cutting edge of the tool?
2. Does the work planned necessitate an ordinary carbon, extra carbon, or alloy tool steel? Can initial hardness in the steel be sacrificed to gain toughness?
3. Does the class of work demand a deep hardening steel? Is there danger of the tool sinking and consequently cracking under pressure, when made from a shallow hardening steel?
4. How much size change is permissible in hardening?
5. At what speeds will the steel be required to work?

In answer to questions 1 and 2 for soft materials where toughness is not a factor, a hard steel should be used, and while most of this class of work can be satisfactorily accomplished by using a carbon steel, tungsten tool steels will generally give much longer service. For hard steel the same is true, but the difference between the length of service obtained by using one of the tungsten steels is much greater than where soft material is to be cut. For soft and tough cutting, a softer or tougher tool steel will show up to advantage though a harder steel may be used to a better advantage, if the drawing is sufficient to produce the maximum toughness obtainable with the necessary hardness. For hard and tough steels, alloy tools work to the best advantage, particularly the tungsten or chromium-tungsten steels, which develop a very hard close grain. This condition naturally enables them to resist wear and abrasion better than a steel which does not have this characteristic developed to the same degree. It is not intended to imply that good carbon steels will not be suitable for any or all of these classes of work, but the fact is emphasized that tungsten tool steels will work to advantage, and in the majority of cases give much longer service than those steels which do not contain this element. In answer to question 3 it has been found that for most tools which have to withstand heavy pressures, such as dies, punches, etc., a deep hardening steel is recommended particularly for those where the metal to be worked is dense in nature, or hard. A carbon steel, except in small sections will not harden deeply, so the use of an alloy steel is preferable. In addition to their deep hardening characteristics these alloy steels, either chromium, chrome-vanadium or chrome-tungsten, resist wearing action and abrasion. The oil-hardening mondeforming steels harden deeply and for many classes of punch and die work these steels are being used with a great degree of success. Another advantage gained by using this type of steel is that they do not change size in hardening. They do not attain, however, the intense hardness of some of the other alloy steels, and as a consequence can be used to better advantage on the softer classes of work.

The steels containing 2 to 7 per cent tungsten are capable of remarkable abrasion resisting qualities and their use is an economy for finishing tools on automatic machines for most classes of work. Their dense close grain will enable them to cut the hardest materials, but not at high speeds. The fact that a steel contains tungsten does not necessarily make it a high-

Abstract of a paper presented before the New York chapter of the American Society for Steel Treating.

speed steel, neither does it follow that the presence of this element will allow the tool to cut at much higher speeds than ordinary carbon steels, though the tungsten steels will last much longer on most of the materials at the same or slightly higher speeds and they will cut materials upon which carbon steels will not even start. Thus the chief advantage of the tungsten over the carbon steels is longer service between grindings, a better finish due to their intense hardness, close grain, and their ability to cut materials which are too hard for carbon steels and at times impossible to cut with the standard high-speed steels. Due to their much wider hardening range, the hazard of loss by overheating in hardening is much reduced.

One frequently hears nearly all classes of tungsten steels referred to as semihigh-speed steels, but this terminology, the writer is convinced, is misleading. The fact that the so-called tungsten tool steels, such as those containing from 1 to 7 per cent tungsten, have their hardness breaking down points but slightly higher than carbon steels and much below that of both the old self-hardening and modern high-speed steels, would indicate the term "semihigh-speed" should be applied, if it is really necessary to apply it at all, to the almost obsolete self-hardening steel whose hardness breaking-down point is about 300 deg. higher than that for the carbon or tungsten steels and approximately 400 deg. below that of the modern high-speed steels. Therefore, if on using a carbon or tungsten steel at what might be thought to be sufficiently low speeds, the tool does not stand up and it is known that the proper conditions have been met in the treatment, do not jump at the conclusion that the tool has not been softened under the frictional heat of the chip simply because the edge does not show color or the softness cannot be felt with the file. Reduce either the speed or adopt a high-speed steel for the purpose and increase the speed, for as a rule, high-speed steels work to a disadvantage at carbon steel speeds.

For this discussion the steels referred to as "tungsten steels" are those which contain tungsten in excess of 1 per cent and do not come in the high-speed or "self hardening" steel classes.

Vanadium As An Alloying Element

Vanadium as an alloying element is very active in changing the properties of steel. In fact, it is so active that its addition to the extent of even 0.15 per cent makes the steel to which it is added an alloy steel, while any of the other alloying metals have to be present in appreciably greater quantities to place the steel in the alloy class. The addition of vanadium in correct proportions to a carbon steel, adds several valuable properties, such as increased hardness and toughness, both of which augment to a great extent the life of the tool. It also adds several other properties to steels which, however, are of no direct bearing on the subject so will not be discussed.

World War Hastened Standardization

MANAGEMENT will be aided whenever anything is achieved which either reduces the cost of or increases production. It is therefore quite conceivable that anything which results in economy should be welcomed by management, and it is my purpose to attempt to show that standardization is of very great benefit to management. Indeed it is hard to realize anything which will not be materially benefited by standardization.

The President of the Portland Cement Association very aptly says: "Quality and quantity standards are essential for the free interchange of commodities in commerce beyond the stage of first-hand transactions, in which personal observation and opinion govern. Progress in civilization is measured by commerce, so standards are at the base of civilization as well as of commerce."

The general public has been informed through the press and by many able speakers of the activities in simplification, standardization, and elimination of waste, and whenever any of these activities touches on something in our everyday life, and effects a great economy, we are much impressed with the desirability of extending it to other things.

The layman naturally asks why all this activity in standardization? We never heard much about it until after the World War. That is probably true as far as the layman is concerned, but the manufacturer has known it a long time. The World War merely hastened it because in a great many different ways it showed the great need for it.

One of the first pieces of standardization which the United States did when entering the war was to adopt only two sizes of small arms ammunition, the 30 caliber for rifles and the 45 caliber for revolvers and pistols. This proved to be one of the best decisions made during the war. It saved millions of dollars, avoided the kind of serious mistakes which so nearly wrecked the Russian army, and provided an interchangeability of ammunition heretofore unknown in warfare.

It is not generally known that the French, English, and Americans all had to provide miles of common water pipe of its own standard on the battle fronts, because none of them would screw into any of the others. Think of the money and time and maybe lives that would have been saved if international standardization of pipe and threads had been accomplished before the war. In many cases adapters with one end fitting American pipe and the other English or French were used, but these were most difficult to obtain, became lost, or ruined the end of the pipe by getting the wrong end on.

Due to lack of standardization the Ordnance Department of the U. S. Army had to deal with fifteen different and distinct thread systems in order to furnish material for our allies and ourselves. It must be understood that our allies demanded with the consent of Congress that the material we furnished be interchangeable with their own. All this necessitated a very large amount of unnecessary tools, fixtures and gages, to say nothing of the delay caused by American engineers and workmen in trying to work with systems unheard of in America. Some idea of the amounts involved may be had when it is known that at the close of the war the Ordnance Department of the army had on hand in good working condtion 35 million dollars worth of gages, not counting special machinery, jigs, and fixtures. It is conservatively estimated that at least half this amount of gages had been worn out while making the material.

From address of Col. E. C. Peck, before Cleveland Engineering Society.

Repairing Locomotives in Contract Shops

By FRED H. COLVIN
Editor, *American Machinist*

Problems of shops repairing locomotives in place of their regular product—Diversity in railroad practice—How Ford eliminated spring breakages—Oil economy vs. repair costs

FOR SEVERAL reasons, one of which is to keep the shops busy, a number of concerns having an equipment of fairly large machine tools, have taken contracts for the repairing of locomotives for the various railroads. Some of their experiences are interesting in a number of ways. One well known firm with a large shop, good crane equipment and a goodly supply of large machine tools, has gone into the work quite extensively. At the time of my visit it was overhauling locomotives from nine different railroads.

Having a well equipped time study and planning department, all the main items of repair are scheduled and a price made on each item. The inspector for the railroad decides which parts are to be repaired or replaced. Then the work is done accordingly and the bill rendered for these items. It is safe to say that this gives most railroads a better idea of actual unit cost than they have ever had before.

The locomotives go into a large shop which was built for ordnance, and are here stripped and the parts cleaned in lye tanks. After inspection they go to the different departments for repairs or replacement. And these repairs show very clearly the great diversity of practice on different roads, each of course, contending that its method is best.

Many Kinds of Hub Liners

Taking hub liners on driving wheels as a shining example of this diversity, we find three kinds of plates let into the driving wheel hubs—cast iron, steel and brass. The fastenings are made in various ways, usually by patch bolts with their beveled heads fitting into holes countersunk in the liners. Some hub liners are held by screw studs with the heads riveted over, while still others are held by pins or dowels driven into holes in the hubs and the heads riveted over as before. In a few cases the rings are "tacked" around the edges with a welding torch, and in some instances a floating liner ring has been used. The only real uniformity with the inserted rings is that they are all made in two parts so that they can be put around the axles with the wheels in place.

Two roads lift the axles up on end and cast the hub liners in place. One road uses babbitt and the other brass. Many are skeptical as to casting the hub liners being good practice, owing to the effect of the expansion on the wheel fit on the axle, due to the heat of the molten metal.

A somewhat similar difference is noted in the method of making driving boxes. A few, and only a very few, are casting the crown brass and hub, or wear plate, right into the steel driving box casting, with excellent results even on heavy power. The great majority, however, still slot or shape out the box for the crown brass, shape or turn the crown brass to fit, and force it in. And then, many proceed to take a chance at loosening the crown brass in the box by casting the hub, or wear plate in place. Most roads use a brass plate but a few use babbitt, cast in place.

A number of roads use a brass plate but pin or bolt it into place on the driving box much as they do the corresponding plate in the driving wheel. A few use a cast-iron plate on the driving box, usually casting it as a ring, or at least with a tie bar across the bottom, to hold it in shape while it is being machined.

Ford Hub Plates, Springs and Lubrication

In this connection, it is interesting to note that the method used on the locomotives of the Ford railway continues to give excellent results. It will be remembered that Ford driving wheels have a hardened and ground vanadium-steel liner in the hub and a bronze wear plate on the box. A number of these liners have now been in service for over twenty months, which means over 160,000 miles run with a lateral wear of approximately $\frac{1}{16}$ in. It isn't a cheap job to start with, but the locomotives stay on the job.

The new automobile-steel springs, which go on every Ford locomotive as fast as it comes into the shop, have completely eliminated the spring breakage. Tire wear is the first thing that now brings a locomotive back to the Ford shop for repairs, which means about eight months or 65,000 miles run, at the present time.

Another important item in which the Ford railway differs from most others is that of lubrication. While economy is the watchword of the whole Ford organization, its automobile experience has taught it that a dry bearing is a dangerous proposition. And it knows full well that when you skimp your oil supply to the lowest notch, there are going to be many times when a bearing will be insufficiently lubricated, if not actually bone dry. Furthermore, it knows that a few cents saved in oil may easily cost dollars in repairs, and it has not fallen for that particular brand of economy.

It is fully aware of the fact that it might get along with a little less oil, but it also knows that a few gallons of oil, even wasted, is much less expensive than renewing a bearing, not to mention the loss of revenue from having the locomotive out of service. And the siren song of the oil saver hasn't yet touched the heart strings of the powers that be.

Getting back to contract shops that are repairing

locomotives, we find them confronted with a real problem. It recalls the address of Herbert Flather a few years ago, at the convention of the National Machine Tool Builders' Association, regarding the taking in of contract work in dull times.

The particular contract concern referred to, put it something like this, "We were building a class of machinery where the tolerances ran from one to three thousandths of an inch. Very few railroads demand or can use such close work, and we had a hard time weaning our men away from our standards. And during this educational process, the costs ran above what we had estimated. Now, when we come to get back to our own work again, we've got to reverse this process, and re-educate our men to close tolerances. Just what the net result is going to be, is something of a problem."

In the meantime the railroads are presumably having an opportunity to study methods that differ from as those c
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any they have been accustomed to. It is not, however, a fair comparison between railroad and other shop methods, because few of the shops are equipped with the modern machinery adapted for railway work. And not knowing how long the work will last, they do not feel justified in investing many thousands of dollars in wheel lathes, axle lathes or small boring mills, and so forth.

As a result we find driving boxes being bored on horizontal instead of vertical machines, because that is the equipment at hand. They are, however, bored in pairs, or even more, instead of singly. Driving wheel tires are turned in a blocked up engine lathe at a slower rate than on a modern wheel lathe, but yet at a lower net cost when it is considered that the investment could only be spread over a comparatively few locomotives. The experience will, however, be educational to both sides. Let us hope that it will be mutually profitable.

More About Lacing Belts

By M. W. Edgar
roit Belt Lacer Co.

us article that the endless belt the perfect belt so far as d running qualities are con- s true mainly in the case manufacturer, and where eatment of the final ith the rest of the occur in actual usually of a a quick today. ge is eat ot a p no nickel, chrome-vanadium, and chrome-molybdenum of steels heat-treated in various ways. The lathe tools are beenow being prepared, and several manufacturers of thretructural steel have promised to supply sufficient matemanial for the required test logs. It is hoped to carry out and e work in such a manner as to throw some light on were ease of machining various alloy steels heat-treated end ofhow equal hardness.

Due set of high-speed steels of special composition is ment o being prepared in the high frequency induction and disace, as it is planned to test steels having quite for ourrent chemical composition from present commercial our allis, to determine the effects of added elements to the the mat chrome-tungsten-vanadium steels.

own. order to supplement tests already carried out on unnecesy" high-speed steels, thermal analyses were made the dela welve samples intentionally flaked by repeated in tryin hing. No marked difference in the thermal ar- Some id were observed, except in one case. Samples is know hed three times from either 1,260 or 1,350 deg. C. partmen d no evidence of the Ac, transformation on re- condtion g, whereas steel which was first quenched from specia r of these temperatures once, twice, or five times, tively rly showed this transformation at about 423 deg. had ntigrade.

life of lacing to be 1½ years. Another, in which the belts are heavily overloaded and continuous production vital, reports the lacing and replacement of a belt in 45 seconds.

To meet present conditions belts must be laced, or a loss of productive and, consequently, competitive, capacity be accepted, and as the importance of this requirement has developed, so has the improvement in methods of lacing advanced, until the essential requirements and features of an endless belt can be duplicated at a minimum cost in materials, labor and loss of vital production time.

World War Hasten Standardization

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From address of Col. E. C. Peck, before Cleveland Engineering Society.

Bureau of Standards Tests on High-Speed Steels

Two series of tests on high-speed steels have been completed by the Bureau of Standards and a third series has been outlined. The tentative program for this work includes performance comparisons of commercial high-speed steels in cutting carbon, nickel, chrome-

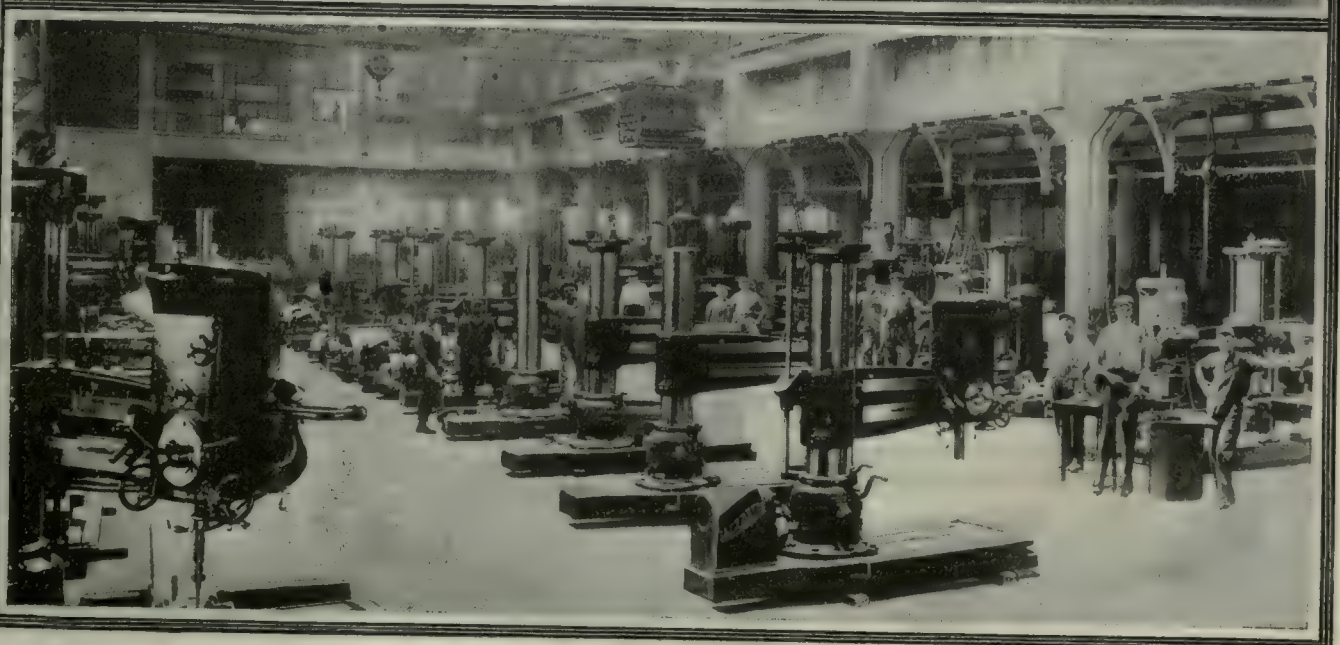


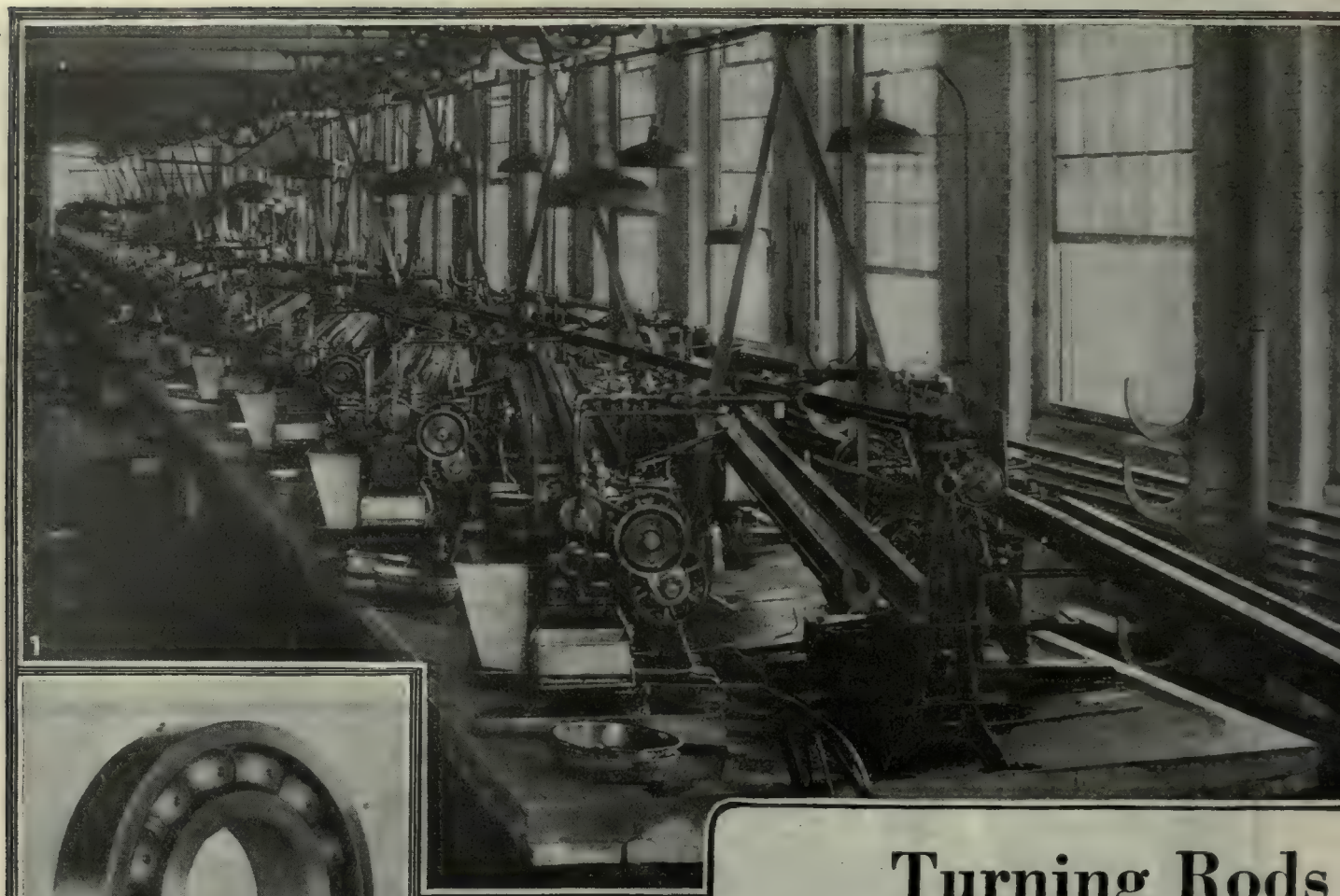
Where Machine Tools Are Made

The American Tool Works Company

Original company (Lodge, Barker & Co.) founded 1880





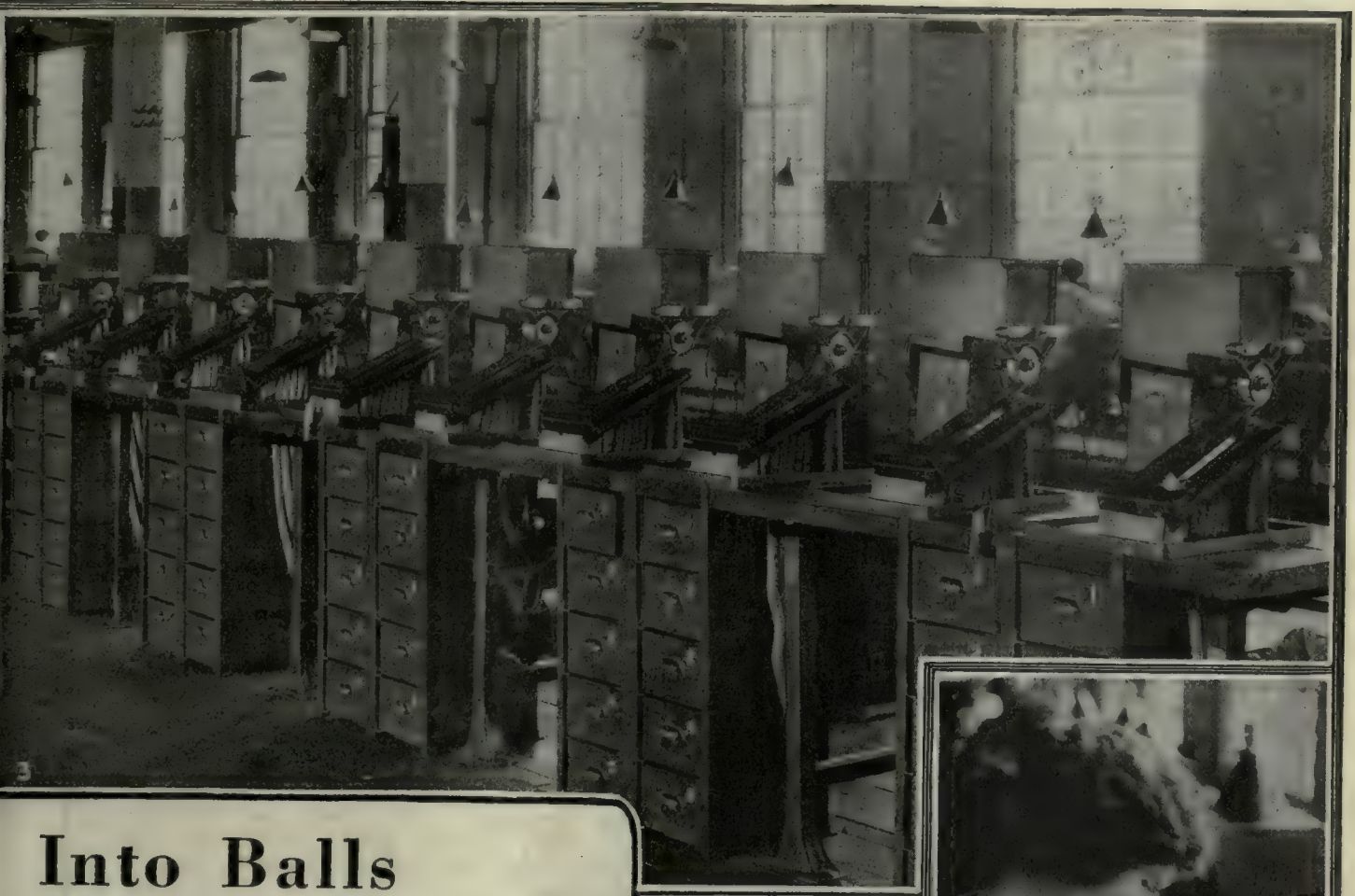




Turning Rods

at the

Fig. 1—Automatic Turning Machines
Fig. 2—Battery of Grinding Machines





Into Balls

Fafnir plant

Fig. 3—Automatic Grading Machines
Fig. 4—The Inspection Department





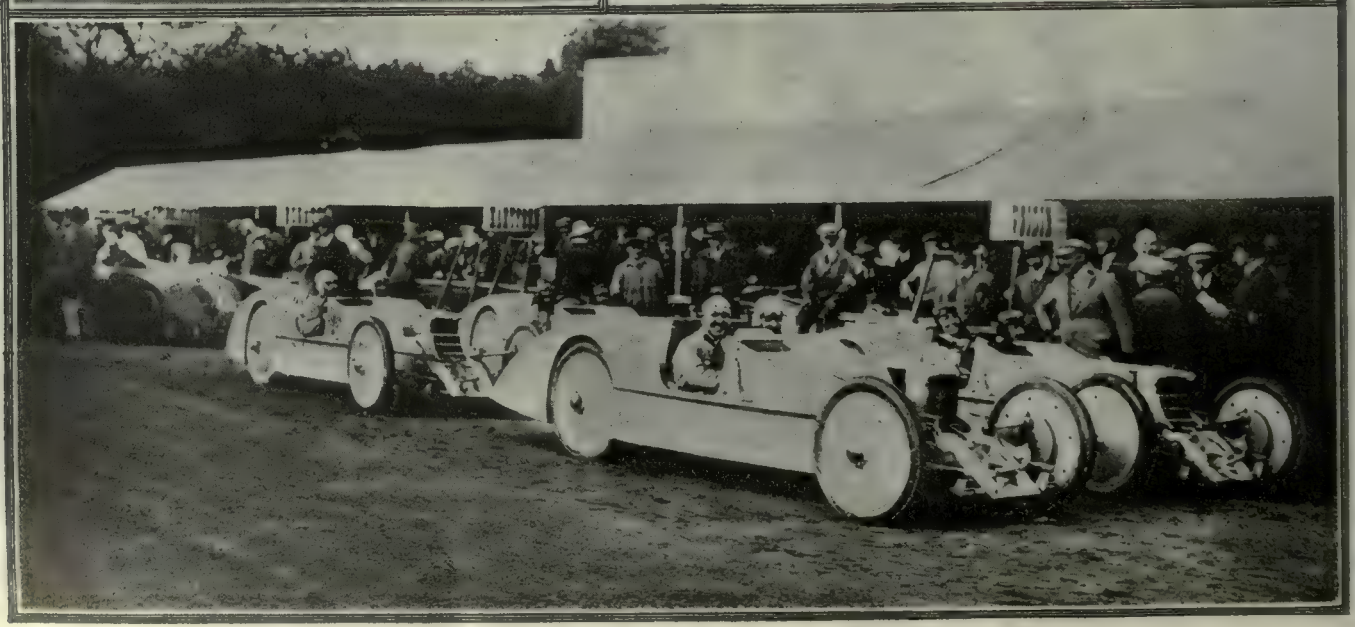
Twenty Years Ago and Now In Automobile Design

In Fig. 1 are shown five ancient motor cars lined up for the start of a race held recently at Stevens Institute, Hoboken, N. J. They are: Panhard Levassor, 1900; De Dion Bouton, 1900; Charron, Girardot et Vogt, 1899; Darracq (age unknown); and Ford, 1904.

That the Ford won was not altogether an unexpected result. In Fig. 2 may be seen the winning car and its driver who is being congratulated by the President of Stevens, Alex C. Humphries.

What a contrast between the ancient chariots and the new type of French racing car shown in Fig. 3, designed to offer the least resistance to the air. The cars shown appeared in the races held at St. Antoine du Rocher.

Photographs for Figs. 1 and 2 by Underwood & Underwood, New York
Photograph for Fig. 3 by Kadel & Herbert, New York



The Mechanical Engineering of Management in the Metal-Working Trades

By ROBERT T. KENT
Consulting Engineer

Good mechanical engineering essential to good management—Correctly designed product, proper arrangement of plant, carefully selected equipment and sound methods necessary for economical production

THE OBJECT of this paper is to show that, in the metal-working industries, before the best management can be attained it must be preceded by good mechanical engineering. This engineering applies to the product, the plant, the equipment, and the methods.

A product designed in accordance with the principles of good engineering can be made with a minimum of machine operations, which in turn means fewer machines, lower capital investment, lower labor costs, less supervision, all of which are indications of good management. Similarly, the plant which has been adapted to its product can manufacture at less expense and with fewer problems of management than the plant not so adapted. It is obvious that the problems of management are simplified where the equipment is so selected and maintained that machine operations can be performed in a minimum of time and with few or no interruptions due to breakdowns or other delaying emergencies.

Engineering Preliminaries to Time Study

Management has in the past ten years become symbolized by certain mechanisms. Among these are time studies, routing or order-of-work schemes, stores systems, piece-work, premium, or bonus plants for wage payment, etc. These, in one form or another, may be quite necessary to the best management in the plant. Their presence, however, does not necessarily indicate that good management exists. Unless the foundation is solidly laid for the use of these mechanisms of management, their presence may do more harm than good. It is the confusing of the idea of management with the means of carrying out this idea that has been responsible for many of the so-called failures of scientific management. As an example, time study and rate setting may be cited. When the attention of manufacturers first became focused on the problems of management, time study, with piece or premium rates set therefrom, was the most spectacular phase of the new movement.

Many manufacturers seized on it as the solution of their troubles, and with little understanding of its fundamentals, put a man with a stop watch in the shop to study the operations as they then were performed, and to adjust rates of pay as a result of the studies. No attention was paid to the preliminaries that should precede the time study itself, nor to the other equally important phases of management which are necessary to the promulgation of its results. It is hardly necessary to dwell on the disastrous effects of such a policy.

Before time studies which are of any value whatever can be made in the average metal-working plant, there are many things to be done which lie in the domain of engineering and shop practice. There is little use in making time studies in operations when the methods are wrong, or the machines are in poor condition or improperly operated. Operation times from such studies are worse than useless and are sure to lead to trouble later. It should be remembered that time study is, in effect, a laboratory experiment, and that no experiment is worth while if the conditions under which it is made cannot be reproduced at any time. To insure accuracy in time studies we must have the machines in perfect order, the cutting tools made to given standards, adequate power, and high-class operation. The first three items are distinctly up to the engineer.

Assuming that the time studies have been made under the proper conditions, their results will be of little value unless these conditions are reproduced throughout the shop. Results obtained with a certain set of cutting tools, supplied with adequate power, cannot be duplicated on a machine with different tools and a deficiency of power. Here again the engineer must function before the mechanism of management may be successfully applied.

No less an authority than Frederick W. Taylor laid down the following sequence to be followed in the installation of scientific management:

a—Establish a stores system
b—Perfect the product
c—Put the shop equipment in proper condition
d—Organize and train a maintenance department
e—Develop the functional organization and the routing system
f—Make time studies and set rates

It is a sorry fact that too often this sequence has been reversed, and that time studies have been started before adequate preparation for them has been made.

Engineering on the Product

The design of the product exercises no little influence on the management problem. Primarily, the design must be such as to make the product readily salable in competition with the product of other manufacturers. This condition having been fulfilled, every

Abstract of paper presented before the Management Division of the American Society of Mechanical Engineers at the Annual Meeting, New York, December 3 to 6.

change in design that simplifies the process of manufacture simplifies the management of the plant. It is quite obvious that a product requiring many individual parts, and a large number of sub-assemblies is much more difficult to route through the shop than the product of few parts.

The problem of the mechanical engineer, then, is to first ascertain whether or not the design can be improved from the standpoint of fewer parts, and secondly, whether the design of the individual parts is such as to permit of the minimum number of machine operations. It must be remembered that every additional operation, be it machine or hand work, requires in the well-managed shop a job ticket, a piece or premium rate, a place on the shop schedule, and the necessary timekeeping, cost, and payroll records. Diminishing the number of operations automatically reduces the labor of management. Furthermore, such reduction in the number of operations will increase the shop capacity with a minimum of capital expenditure.

Engineering in the Plant

Good management is frequently hampered by faulty plant arrangement. Various departments may be so located in reference to each other as to necessitate long hauls of material in process, and often much retracing of the path. Inadequate transportation facilities, such as lack of cranes and hoists, too few trucks, or trucks of improper type, add to the difficulty of moving work. It must be remembered that every movement of work in the shop increases the difficulty of supervision and management, and slows down production. A prolific field for the mechanical engineer in management is the study of the plant layout, and the arrangement of its facilities in the most convenient form. Then, too, in the various departments themselves there may be large opportunity for good engineering. Machines are often so placed that the operators are in awkward positions, that it is difficult to get work into or away from them, that the lighting of them is poor, that they interfere with one another, etc. All these things prevent maximum production.

The question of power bears an intimate relation to production and management. This subject means more than the power plant; it means power actually available at the cutting tools. This takes us back through the machine gearing, the belts and countershafts, lineshafts and motors to the generators, engines and boilers. Unless we can deliver to the tool the full amount of power required by it, we are, from the management standpoint, going to do one of two things. We are going to set a standard of performance for the shop that it can attain only at infrequent intervals and under exceptionally favorable conditions. This means that we will fool ourselves in making schedules and promising deliveries, and we will also be in trouble with the men due to the setting of times on jobs which they cannot meet. Or, on the other hand, we will set a standard that can be met, but which is much below the standard possible with adequate power available. This is unfair to the company and may result in higher prices with consequent loss of business.

Proper maintenance not only reveals the causes of lack of power, but frequently prevents these causes from occurring. It may therefore be proper to list a few of the causes of inadequate power that have come under the author's observation, and which were removed by the establishment of a proper routine of maintenance. These included lack of tension in belts, belts too light for the machinery, excessive lineshaft friction —remedied by the substitution of roller bearings; machine gearing too light for the duty imposed on it; variations in voltage due to improper power-plant operation; the driving from the same lineshaft of machines requiring a relatively constant amount of power and of machines taking heavy drafts of power at more or less frequent intervals.

There is another feature of maintenance which should not pass unnoticed. Nothing upsets production so much as equipment failures. The cost of a belt breaking during working hours far exceeds the cost of repairs to the belt. It includes the cost of idle equipment, of the wages of idle mechanics while repairs are being made, and, perhaps most important of all, the loss of production and the disruption of the shop schedule. The same remarks apply to all other equipment failures. It is worthy of note that equipment failures seldom occur where regular maintenance is a part of the shop routine. Maintenance provides for preventive repairs, and insures against breakdowns. It may be set down almost as an axiom that shop maintenance is one of the fundamentals of good shop management.

Methods and Equipment

The function of the mechanical engineer in laying the foundation for good management is first to devise the best method possible to accomplish the desired end, and then to provide the equipment which will best carry out that method. In the case of a new shop, or a shop with ample funds for changing existing equipment, the task is comparatively simple. Where, however, the engineer is limited to the equipment on hand his ingenuity may be severely taxed. Nevertheless he can accomplish much with a comparatively small expenditure of funds. If a change in method is proposed it must stand the test that the economies effected thereby will pay the cost of the change in a reasonable time, and the new method thereafter return a profit on the investment. The return on the investment need not necessarily result from a lower cost of doing the work. It may come from releasing equipment that can be put to more profitable use.

Neglect of such small details as shape of cutting tools and their proper hardening have an astounding effect on production. The time for completing jobs on lathes has been held by the operators, time and again, to be too low. Investigation has revealed that they were using tools not ground or heat-treated in accordance with the standard used in setting the time. This indicates the necessity of central toolrooms for standard grinding and heat treating the tools, and the determination by the engineer of what these standards shall be.

New Italian Patent Law

The Chamber of Commerce of Milan calls attention to those interested to the royal decree of July 29, 1923, published first in the *Gazetta Ufficiale* of September 29 which brings thereto certain modifications in the law granting Italian patents as affecting the law of October 30, 1859, hitherto in force.

The description of the patent must henceforth be made in the Italian language, the faculty of using French being thus abandoned.

Progress Report on the Present Status and Future Problems of the Art of Cutting Metals

Prepared by Clarence A. Beckett, Secretary of the A.S.M.E. Special Research Committee on the Cutting and Forming of Metals—Presented at the Annual Meeting, December 1923

THE various terms used in the Art of Cutting Metals and about which there is such a wide diversity of opinion, should have a positive definition and a statement of their relative information in this field. We are therefore listing the more important terms that have come into use and whose definition is more or less a matter of personal opinion: namely, (*a*) "Machinability" of work, (*b*) "Cutability" of tools, (*c*) "Lubrication," (*d*) "Cooling," (*e*) "Durability" (Endurance) of tool, (*f*) "Hardness" of tool and work, and (*g*) Tool Performance.

II. State of the art in the design of cutting tools and its relation to the character of the work produced and the time required. Pars. 1 to 28.

III. Progress made to date in the Art of Cutting Metals, and the value of the following factors:

a Material composing the cutting tool. Pars. 29 to 35.
b Material used in testing cutting tools. Pars. 36 to 43.
c The design of the cutting tool. Pars. 9 to 28.
d Performance of cutting fluids with respect to lubrication and cooling action. Pars. 44 to 54.

IV. Present practice and methods of testing cutting tool materials and materials to be cut.

V. Problems to be considered for research work. Recommendations of Committee. Pars. 55 and 56.

VI. Methods of financing the research problems that are to be taken up in the order in which the industry needs them most. Pars. 58 to 61.

VII. Summary of research work on the Art of Cutting Metals, giving methods employed by different experimenters. Pars. 62 to 157.

VIII. Bibliography of the subject. See statement, Par. 56.

The State of the Art in the Design of Cutting Tools

1 The state of the art in the design of cutting tools and its relation to the character of the work produced and the time required, is practically where Dr. Taylor left it twenty years ago.

2 The following, broadly speaking, are the four objects to be kept in mind in the design of a standard tool.

a The necessity of leaving the forging or casting to be cut with a true and sufficiently smooth surface;
b Removing the metal in the shortest time;
c The adoption of that shape of tool which shall do the largest amount of work with the minimum combined cost of grinding, forging and tool steel;
d Ready adaptability to a large variety of work.

3 However, as we go further into this subject the nature of the conflict between these four objects and of the sacrifice which each element is called upon to make by one of the others is apparent. To illustrate the nature of these compromises:

4 Generally speaking, we have been obliged to adopt as our standard shape a tool which can be run at only about, say, five-eighths of the cutting speed which our knowledge of the art and our experiments show us could be obtained through another tool of entirely different shape if no other element than that of cutting speed required consideration.

5 We have been obliged to sacrifice cutting speed to securing smaller liability to chatter; a rather truer finish; a greater all-round convenience for the operation in using the tool; and a comparatively cheaper dressing and grinding. The most important of the above considerations, however, is the freedom from chatter.

6 On the other hand, we have been obliged to adopt a rather more elaborate and expensive method of dressing the tools than is usual in order to provide a shape of tool which allows it to be ground a great many times without redressing, and also in order to make a single Taylor-White heat treatment of the tool last longer than it otherwise would. And again, the shape of the curve of the cutting edge of the tool which we have adopted—first, to insure against chatter, and second, for all-round adaptability in the lathe—calls for much more expense and care in the grinding than would be necessary if a more simple shape were used. This necessitates in a shop either a specially trained man to grind the tools by hand to the required templets and angles or preferably the use of an automatic tool grinder.[1]

7 Now, keeping the four objects mentioned above in mind, let us consider the elements affecting the cutting speed of tools in the order of their relative importance.

8 The cutting speed of a tool is directly dependent upon the following elements. The order in which the elements are given indicates their relative effect in modifying the cutting speed, and in order to compare them, we have written in each case figures which represent, broadly speaking, the ratio between the lower and higher limits of speed as affected by each element. These limits will be met with daily in machine-shop practice.

a The quality of the metal which is to be cut; i.e., its hardness or other qualities which affect the cutting speed.
Proportion is as 1 in the case of semi-hardened steel or chilled iron to 100 in the case of very soft low carbon steel.
b The chemical composition of the steel from which the tool is made, and the heat treatment of the tool.
Proportion is as 1 in tools made from tempered carbon steel to 7 in the best high-speed tools.
c The thickness of the shaving; or, the thickness of the spiral strip or band of metal which is to be removed by the tool, measured while the metal retains its original density; not the thickness of the actual shaving, the metal of which has become partly disintegrated.
Proportion is as 1 with thickness of shaving $\frac{3}{16}$ of

[1] On the Art of Cutting Metals, Frederick W. Taylor, Trans. A. S. M. E., vol. 28 (1907) pp. 101, 102.

an inch to 3½ with thickness of shaving ⅛ of an inch.

d The shape or contour of the cutting edge of the tool, chiefly because of the effect which it has upon the thickness of the shaving.

Proportion is as 1 in a thread tool to 6 in a broad-nosed cutting tool.

e Whether a copious stream of water or other cooling medium is used on the tool.

Proportion is as 1 for tool running dry to 1.41 for tool cooled by a copious stream of water.

f The depth of the cut; or, one-half of the amount by which the forging or casting is being reduced in diameter in turning.

Proportion is as 1 with ⅛-in. depth of cut to 1.36 with ¼-in. depth of cut.

g The duration of the cut; i.e., the time which a tool must last under pressure of the shaving without being reground.

Proportion is as 1 when tool is to be ground every 1½ hours to 1.207 when tool is to be ground every 20 minutes.

h The lip and clearance angles of the tool.

Proportion is as 1 with lip angle of 68 deg. to 1.023 with lip angle of 61 deg.

i The elasticity of the work and of the tool on account of producing chatter.

Proportion is as 1 with tool chattering to 1.15 with tool running smoothly.

Designs of Tools Used by Different Experimenters

9 Taking these elements as a base and knowing that more might be added, it is well to consider what sizes and shapes the different experimenters have used or developed.

10 *Taylor Tools Used on Trials.* Size varied, Feed and speed varied. Lip angles as follows:

Chilled iron or semi-hardened steel, 86 to 90 deg.

Tire steel (back slope, 5 deg., side slope, 9 deg.), 74 deg.

Mild steel, 61 deg.

11 The following are the conclusions arrived at regarding the angles at which tools should be ground:

a For standard tools to be used in a machine shop for cutting metals of average quality: Tools for cutting cast iron and the harder steels, beginning with a low limit of hardness, of about carbon 0.45 per cent, say, with 100,000 lb. tensile strength and 18 per cent stretch, should be ground with a clearance angle of 6 deg., back slope 8 deg., and side slope 14 deg., giving a lip angle of 68 deg. These angles are used in the tools illustrated on Folder 5, Figs. 21a and 25e.

b For cutting steels softer than, say, carbon 0.45 per cent having about 100,000 lb. tensile strength and 18 per cent stretch, tools should be ground with a clearance angle of 6 deg., back slope of 8 deg., side slope of 22 deg., giving a lip angle of 61 deg. These angles are used in tools illustrated in Folder 5, Fig. 25b.

c For shops in which chilled iron is cut a lip angle of from 86 deg. to 90 deg. should be used.

d In shops where work is mainly upon steel as hard or harder than tire steel, tools should be ground with a clearance angle of 6 deg., back slope 5 deg., side slope 9 deg., giving a lip angle of 74 deg.

e In shops working mainly upon extremely soft steels, say, carbon 0.10 per cent to 0.15 per cent, it is probably economical to use tools with lip angles keener than 61 deg.

f The most important consideration in choosing the lip angle is to make it sufficiently blunt to avoid the danger of crumbling or spalling at the cutting edge.

g Tools ground with a lip angle of about 54 deg. cut softer qualities of steel, and also cast iron, with the least pressure of the chip upon the tool. The pressure upon the tool, however, is not the most important consideration in selecting the lip angle.

h In choosing between side slope and back slope in order to grind a sufficiently acute lip angle, the following considerations, given in the order of their importance, call for a steep side slope and are opposed to a steep back slope:

1 With side slope the tool can be ground many more times without weakening it.

2 The chip runs off sideways and does not strike the tool posts or clamps.

3 The pressure of the chip tends to deflect the tool to one side, and a steep side slope to correct this by bringing the resultant line of pressure within the base of the tool.

4 Easier to feed.

5 The following consideration calls for at least a certain amount of back slope: An absence of back slope tends to push the tool and the work apart, and therefore to cause a slightly irregular finish and a slight variation in the size of the work.[1]

12 *Breckenridge and Dirks' Tests of High-Speed Tool Steel.* The shape of the tools used in these trials conformed to those recommended by Prof. J. T. Nicolson who says: "Tools should therefore be ground for maximum endurance in the cutting of cast iron in ordinary shop practice so that their true cutting angles are about 81 deg.; or if they are allowed 6 deg. clearance for working on the level of the lathe centers, they should have an included angle of 75 deg."

13 Therefore the tools selected were:

Sizes: ½ in. by 1 in., ¾ in. by 1¾ in., ¾ in. by 1¼ in.

Front clearance angle, 12½ deg.

Top rake, 10 deg.

Side rake, 10 deg.

14 *French and Strauss, Bureau of Standards Trials.* In the experiments conducted at the Bureau of Standards by French and Strauss the size of the tools used was ½ in. by 1 in.

15 Conditions of Test:

	Tests run		
	1	2	3
Desired cutting speed, (ft. per min. at bottom of cut)	67	61	6
Feed, inches per revolution	0.045	0.045	0.045
Depth of cut, inches	1/16	1/16	1/16
Tool angles (degrees):			
Clearance	6	6	6
Back slope	7½	8	8
Side slope	12	14	14
Nose radius, inches	1/16	1/16	1/16

16 *Manchester Association of Engineers Trials.* The tools used in the trials run by the association's Lathe Tools Research Committee were 1¼ in. by 1¼ in. The following is a summary of the first 16 trials.

Desired cutting speed, ft. per min. at bottom of cut	92.2 to 106
Feed, inches per revolution	0.0625
Depth of cut, inches	1/16
Tool angles (degrees):	
Clearance	6
Back slope	14½
Side slope	14½
Nose radius, inches	½

17 The second trials were conducted in the same manner as those mentioned above except that the cutting speed in feet per minute was increased to 115.3. Eighteen subsequent trials were run with the following changes:

Feed and depth of cut: { 3/32 in. deep by ½-in. traverse; 3 in. deep by 1/16-in. traverse; 15/128 in. deep by 1/16-in. traverse }

Nose radius, ¼ in.

Plan angles, 30 deg., 45 deg., 60 deg., 65 deg. and 90 deg.

[1] On the Art of Cutting Metals, Trans. A. S. M. E., vol. 28 pp. 115-116.

18 *French, Strauss and Digges Tests.* The tools used in these tests were ¼ in. by ½ in.

Desired cutting speed, ft. per min. at bottom of cut..	70
Feed, inches per revolution	0.028
Depth of cut, inches	5/16
Tool angles (degrees):	
Clearance	6
Back slope	8
Side slope	14
Nose radius, inches	¼

Size and Proportion of the Body of the Tool

19 Twenty-five years ago it was perhaps the more general custom in this country to make the cross-section of the body of lathe and planer tools square, and this practice still generally prevails in England and upon the Continent. In fact, in the report of the Manchester experiments, in which the tools of eight of the leading engineering establishments were placed in competition, all of the tools illustrated have square shanks.

20 It may be said, however, that the more general practice in this country at the present time is to make the depth of the body of the tool considerably greater than its width.

27 Now, considering the tables previously mentioned, it is evident that the design of cutting tools has changed very little even in the last twenty years, and that the tools recommended by Taylor are accepted as standards.

28 However, one change has taken place and that is the chemical composition of the material used in the cutting tool. The tables given by Mathews on Modern High-Speed Steel—Am. Soc. Testing Materials, and his summary cover the subject very well from our viewpoint.

[Note—Paragraphs 29-34 inclusive deal with chemical compositions of modern tool steels and those of 20 years ago.]

Material Used in Testing Cutting Tools

35 One of the important factors entering into experimental work with cutting tools is the chemical composition and physical properties of the material to be cut. On this point there is a wide diversity of opinion among experimenters.

36 In the early trials of Taylor and Nicolson and those at Berlin a wide variation in the choice of metals is apparent, for mild steel, medium steel, hard steel, soft cast iron, and chilled cast iron were all experimented with. Later we find an experimenter who recommends the use of chilled cast iron or hard steel as a material to be used in testing cutting tools, because of the fact that the tool would "fall down" quicker, and thereby the expenditure of both material and time would be lessened.

37 We can condemn this method on the facts already established and known, that a tool which will perform in a very satisfactory manner on mild steel will not be at all suitable for hard steel, and vice versa.

38 Two of the late experimenters, French and Strauss, chose a comparatively low-nickel steel for their lathe breakdown tests, while Schwartz and Flagle in their trials on tool temperatures used malleable iron, stove iron, gray iron, Armco iron, cold-rolled steel, and cast steel. In the latter experiments curves were plotted showing the average relation between temperature, rate of removal of metal, and energy input for the materials mentioned.

39 This subject of tool temperature is one about which very little has been established. In their paper, mentioned above, Schwartz and Flagle state it as their belief that the life of a given tool is a function of its working temperature, and hence that the temperatures reached under given cutting conditions in varying materials are an indication of their machineability or cutting hardness; however, in these trials a lubricant or coolant was not used.

40 The effect upon the cutting speed and also upon the cutting edge of a tool is a subject open to wide discussion. Taylor states that a heavy stream of water (3 gal. per min. for a 2-in. by 2½-in tool) will increase the cutting speed about 40 per cent.

41 The Manchester Committee in their trials on this subject used tools with ¼ in. nose radius and 6 deg. clearance angle, the cuts selected being ⅜ in. deep by 3/32 in. traverse and 1/128 in. deep by 1/10 in. traverse. The results show that with a cooling medium the appropriate cutting speed is increased by about 20 ft. per min.; also, as far as the results go, the cooling medium does not appear to affect the angle of greatest durability.

42 Both of the above experimenters are concerned only with water as a coolant, and it is therefore of interest to note Kingsbury's observations.

Lubrication and Cooling

43 *Kingsbury's observations.* About 1895 Prof. Albert Kingsbury took the trouble to observe through a microscope the formation of a chip by the parting tool in a lathe, using mild steel. In this manner an important discovery was made. He found that a crack always preceded the point of the cutting tool. This crack develops in the direction of the circumference of the finished work below the tool. It forms the actual surface of the final work except when the tool is very dull, in which case this surface is rubbed or burnished by the tool itself. The circumferential crack which goes in advance of the cutting edge develops in a straight line for a certain distance and then turns off at 45 deg. with the original direction, branching out toward the surface of the chip, thus permitting the chip to unwind from the stock and slide out along the top of the tool. Immediately afterward a new crack is developed again in the circumferential direction, forming the next segment of the finished surface of the cut. These segments are recognizable in the ordinary cross-banded finish of the work as left by the cutting-off tool. Now the better the lubrication, the narrower are these bands.

44 Therefore Professor Kingsbury further observed just how the lubricant found its way between the chip and the top of the tool. It is sucked into the crack above the tool by the partial vacuum created when the crack first opens; the lubricant then adhering to the under side of the chip, serves to lubricate the passage of the chip over the top of the tool. It is at just this point, namely, on the top of the tool, that the greatest friction of the chip takes place, and the lubricant must have such properties that it will reach this surface.

45 With a very viscous lubricant, or with a wide cut or with a high speed, the lubricant does not find its way in quickly enough, and under such conditions it is familiar practice to use some very thin lubricant such as soda water or thin emulsion of other non-viscous cutting fluids.

46 *Proposed experiments.* It might be of interest to subject Professor Kingsbury's conclusions to a quantitative test as well as to carry out more complete photographic or moving picture observations of chip formation and lubricant flow under the microscope. For the

capillary flow of lubricants having a constant viscosity, we should expect to realize the same degree of lubrication (evidenced possibly by the same degree of finish in the cut) when a cut three times as wide as another is produced by turning the work at one-third the speed of the other, and so on. More generally, should we not expect to find an equivalent result whenever the product of the viscosity by the width of the cut by the speed of the work has the same numerical value? Proper allowance for change of viscosity due to temperature and pressure presents a difficult problem of course, and directs attention to another line of possible experiments.

47 A second group of desirable experiments would consist evidently in actual determinations of the temperature and pressure at the point of a cutting tool. It is specially desirable that these conditions should be determined under the chip on top of the tool. The pressures at this point are probably of the order of 100,000 lb. per sq. in. when cutting steel and the temperatures may be several hundred degrees centigrade. The possibility of measuring these temperatures by employing the tool and the work material as parts of a thermocouple circuit was suggested by Dr. L. J. Briggs of the Bureau of Standards. Successful qualitative results (not yet reduced to exact numerical values) were obtained in this way by Mr. E. W. Butzler of the Physical Laboratory of the Bureau of Mines about six months ago. At this point Mr. Henry Shore, of the present senior class at the Massachusetts Institute of Technology, took an interest in the problem and hopes to have opportunity to work on it during the next few months, and in fact has already made a beginning.

48 Among recent attempts to measure the temperature at the point of a cutting tool, may be mentioned those described by H. H. Schwartz and W. W. Flagle in a paper entitled Significance of Tool Temperatures, presented at the Atlantic City meeting of the American Society for Testing Materials last June (address the Secretary at 1315 Spruce Street, Philadelphia, Pa.). The temperature near the cutting surface on drills was observed by means of thermocouples brought into the interior of the drill with the junction located near the cutting surface.

Research Problems

54 It is evident that this question of lubrication and cooling should receive considerable attention due to its apparent value. However, the committee feels that other factors are of greater importance at present and lists them below in the order of their relative value.

55 *a* The development of a standard method for testing tool material and material to be cut.

b The development of a standard heat-treating method.

c The development of standard tools.

d The development of methods for testing tool performance.

e The development of a method for testing cutting fluids (lubricants and cooling agents).

f The formulation of a definite basis for specification of work material, tool material, and cutting fluids.

g Experimental research to establish, gradually, the general and fundamental laws governing the relation between tool performance (in its several aspects) on the one hand, and the numerous independent variables on the other, such as the various factors of tool design and adjustment (form and rigidity of tool, side slope, back slope, clearance angles, etc.), speed of work, depth of cut, feed, nature of materials concerned (tool, work, and fluid), temperature, and methods of lubrication and cooling.

56 The value of a bibliography on the art of cutting metal is well appreciated by the committee. In fact, a start has been made toward compiling one. The value of such a list, however, will be increased as manufacturing firms and individuals who are doing experimental work send us their reports and the results of their tests.

Suggested Methods of Financing the Researches to be Planned by this Committee

58 At the present time many of the machine-tool builders and users and perhaps all of the steel manufacturers are carrying on research to some extent. While these researches are intended primarily to serve the individual commercial interests of the firms in question, the committee believes that much can be done to avoid duplication of work and its attendant delay and economic loss. By complete co-operation between the committee and the industry projects will be undertaken by those best able to handle them and the results will be made available to all for the good of all.

59 In adition to the individual firms many organizations are already at work in this field. Notable among these are the American Society of Steel Treaters, the National Machine Tool Builders' Association, the National Research Council, the Bureau of Standards, organizations in foreign countries, and the technical schools and colleges of the United States.

60 All of these organizations will have from time to time funds in varying amounts which they intend to devote to studies in the different parts of this field. The Committee hopes to be able to so serve these organizations that these moneys will be wisely expended for the good of the greatest number. The A.S.S.T. secures funds for research from its contributing memberships. The members of the N.M.T.B.A. are more and more realizing the dollars-and-cents value of research to their industry. Through the Bureau of Standards certain limited Government funds become available for use on this subject, and in addition members of the regular staff make studies for the various Government departments. In the past many of our technical schools have been supplied with funds by individual firms or groups of firms for researches on specific parts of this subject. The Committee hopes to assist in this work by suggestion and by contributing data, and in turn to be permitted to disseminate the results.

61 It may reasonably be expected that a show of results accomplished by the Committee will in time bring about direct contributions to the A.S.M.E. from some of its generous friends for the support of this particular research work. In the absence of such needed funds it is submitted as the opinion of this Committee that the Society can foster, direct, and co-ordinate such work, wherever done, by co-operating with the societies, institutions, and firms doing research work. In this manner we may reduce duplication of effort and assure maximum results from such funds as are available. Where the necessary funds for any particular project recommended for research are lacking, the Society through a properly constituted committee might with propriety undertake the solicitation of contributions for that specific purpose.

[Note—An interesting historical review follows. Complete copies of the report may be secured from the Secretary, A. S. M. E., 29 West 39th St., New York.]

Recommended Practice for the Design of Worm Gearing

Reduction of number of worm gear hobs carried in stock—Provision made for using hobs already in existence—Recommendations for new designs

IT IS the object of the Worm Gear Committee of the American Gear Manufacturers Association in offering this recommended practice to try to reduce in number the worm gear hobs which are carried in stock by the various member companies. It is well known that there are hundreds, and perhaps thousands, of hobs in use when most all cases would be covered if

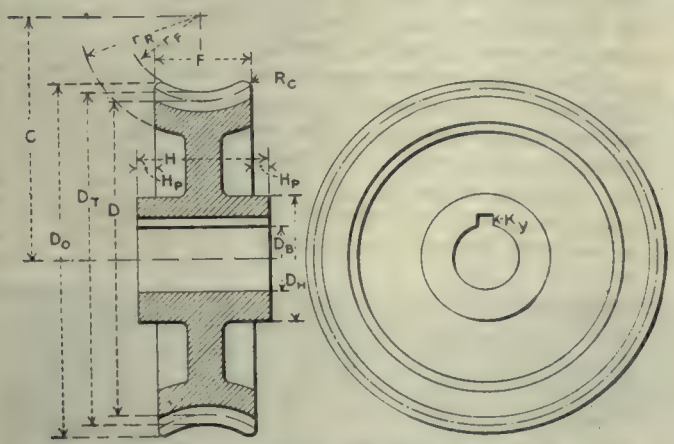


FIG. 1—A.G.M.A. RECOMMENDATIONS FOR FUTURE DESIGN OF STANDARD WORM GEARS IN THE GENERAL INDUSTRIAL RANGE

Terms	Symbols	Single and Double	Triple and Quadruple
Number of teeth	N	.....	.....
Circular pitch	P_c	.....	.....
Pitch diameter	D	$N \times 0.3183\ P_c$	$N \times 0.3183\ P_c$
Throat diameter	D_T	$D + 0.6366\ P_c$	$D + 0.573\ P_c$
Outside diameter	D_O	$D_T + 0.4775\ P_c$	$D_T + 0.3183\ P_c$
Hub diameter	D_H	$1.875\ D_B$	$1.875\ D_B$
Min. bore diameter	mD_B	.....	.....
Keyway	K_y	A.G.M.A.	Standard
Hub length	H_L	$1.5\ D_B$	$1.5\ D_B$
Face	F	$2.38\ P_c + 0.25$	$2.15\ P_c + 0.2$
Hub projections	H_P	$\frac{1}{4}\ D_B$	$\frac{1}{4}\ D_B$
Radius of face	r_F	$0.8817\ P_c + 0.55$	$0.9135\ P_c + 0.55$
Radius of rim	r_R	$2.2\ P_c + 0.55$	$2.1\ P_c + 0.55$
Center distance	C	$(D + d)\ 0.5$	$(D + d)\ 0.5$
Radius at edge of face	R_c	$\frac{1}{4}\ P_c$	$\frac{1}{4}\ P_c$

these thousands were reduced to hundreds, and the committee's report not only makes recommendations for new designs but also makes recommendations for use in connection with hobs already in existence which might not be just right for the recommendations as made by the committee.

The tables, given in conjunction with Figs. 1 and 2, offered and recommended for the design of worm gearing, represent an endeavor to compromise in a commercial, practical and scientific manner, those elements of design and manufacture that affect the efficient performance of worm gearing that is used for average ordinary industrial service.

In studying the problem of standardization of worm gearing it was found advisable to divide the gearing into groups and the group covered by these present recommendations may be defined as follows:—

Linear pitches .....¼-in. *P* to 2-in. *P*
Multiplicity of threads.....Single to quadruple
Gear ratios .....10 to 1 to 100 to 1

This group includes the worm gearing demanded by the trade for general commercial uses, where the gearing is furnished without bearings or housings and does not include the gearing of units, shaft worms, smaller or larger pitches than that mentioned, worms having more than four threads, gear ratios greater than or less

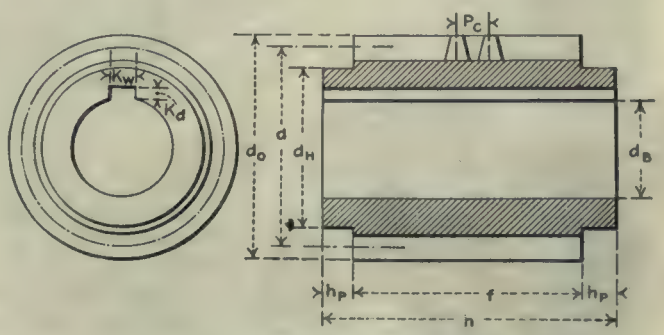


FIG. 2—A.G.M.A. RECOMMENDATIONS FOR FUTURE DESIGN OF STANDARD WORMS IN THE GENERAL INDUSTRIAL RANGE

Terms	Symbols	Single and Double	Triple and Quadruple
Circular pitch	P_c	.....	.....
Pitch diameter	d	$2.4\ P_c + 1.1$	$2.4\ P_c + 1.1$
Outside diameter	d_o	$3.036\ P_c + 1.1$	$2.937\ P_c + 1.1$
Root diameter	d_r	$1.667\ P_c + 1.1$	$1.741\ P_c + 1.1$
Hub diameter	d_H	$1.667\ P_c + 1$	$1.741\ P_c + 1$
Bore diameter (max.)	d_B	$1.75\ \sqrt{P_c}$	$1.75\ \sqrt{P_c}$
Face length	f	$P_c\left(4.5 + \frac{N}{50}\right)$	$P_c\left(4.5 + \frac{N}{50}\right)$
Hub projections	h_P	P_c	P_c
Hub length	h	$f + 2\ P_c$	$f + 2\ P_c$
Keyway width	K_w	A.G.M.A.	Standard
Keyway depth	K_d	.....	.....
Addendum	a	$0.3183\ P_c$	$0.2865\ P_c$
Normal thickness	t	$0.5\ P_c \cos \Theta$	$0.5\ P_c \cos \Theta$
Whole depth of tooth	td	$0.6866\ Pc$	$0.6179\ Pc$
Angle of thread	Θ	$\text{Cot} = \frac{d\,\pi}{\text{Lead}}$	$\text{Cot} = \frac{d\,\pi}{\text{Lead}}$

Adopted at fall meeting of American Gear Manufacturers Association, October, 1923.

than that specified, gearing with the axis other than 90 deg. or where the duty required or quantity involved justified a further refinement of design than that used in the case of these general purpose worms and gears.

In conjunction with the proportions recommended it is further recommended:

(a) That the thread form to be regarded as standard will be the form produced by a straight-side milling cutter having a diameter not less than the outside diameter of the worm nor greater than 1½ times the outside diameter of the worm, the sides of the cutter having an angle of obliquity of 14½ deg. in the case of single- and double-thread worms and an angle of obliquity of 20 deg. in the case of triple- and quadruple-thread worms.

(b) That single- and double-thread hobs may be fluted parallel to the axis.

(c) That triple- and quadruple-thread hobs should be fluted normal to the thread angle reckoned from the outside diameter of the hob.

(d) That the following linear pitches be regarded as standard for this group: ¼ in., ⅜ in., ½ in., ⅝ in., ¾ in., 1 in., 1¼ in., 1½ in., 1¾ in., 2 in.

Worms of the foregoing linear pitches having one,

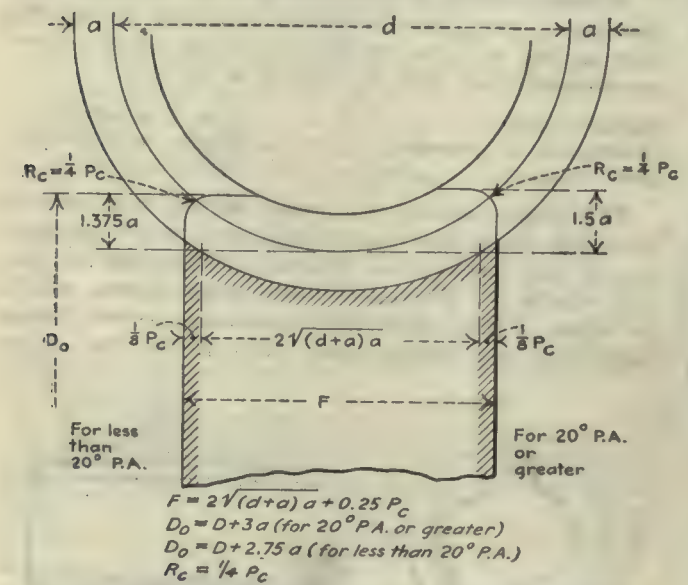


FIG. 3—FORMULAS FOR WHEELS ENGAGING WITH TRIPLE AND QUADRUPLE THREAD WORMS

two, three and four threads give a series of 44 worms from which it is thought gearing for almost any ordinary service can be selected.

The fact is recognized that in the case of worm gearing a longer period of transition from present haphazard methods of designing to standard methods may be expected and in order that best results may be obtained from existing facilities, the following recommendations are made for the use of existing hobs:

FACE OF WHEEL

For wheels engaging with single- and double-thread worms the width of face should not be greater than the chord of the worm outside circle which is tangent to the worm pitch circle plus one-half the linear pitch.

For wheels engaging with worms having triple and quadruple threads a face width of ¼ *Pc* less than the above is recommended. See Fig. 2.

OUTSIDE DIAMETERS

For the use of existing hobs it is recommended that the outside diameters of worm gears be made larger than the pitch diameters by the following amounts:

For wheels meshing with single- and double-thread worms,

$$D_o = D + 3.5a.$$

For wheels meshing with triple- and quadruple-thread worms, where the pressure angle is 20 deg. or greater,

$$D_o = D + 3a.$$

For wheels meshing with triple- and quadruple-thread worms, where the pressure angle is less than 20 degrees,

$$D_o = D + 2.75a.$$

RADIUS AT EDGE OF RIM

In every case a radius at the edge of the wheel rim equivalent to ¼ *Pc.* is recommended.

Stresses in Welded Riveted Steel Tanks

A description was given in Technical News Bulletin No. 71 of the work carried out at the Bureau of Standards last winter on stresses in welded and riveted steel tanks under hydrostatic pressure. The results of this investigation have now been published as Technologic Paper No. 243, for sale at the Superintendent of Documents, in Washington, at 5c. per copy.

Four steel tanks, 4 ft. in diameter and 10 ft. long, made of ⅜-in. mild steel plates, and designed for a stress of 16,000 lb. per sq.in. at 200-lb. working pressure, were used in these tests. Two of the tanks were butt-welded, one was lap-welded, and the fourth was of the ordinary lap-riveted construction. The ends of the tanks were spherical, having a radius of 4 feet.

Strain gage measurements were made at various portions of the tanks and at pressure increments of 50 lb. per sq.in. until failure. The results of the hydrostatic tests proved rather unsatisfactory as a comparison of the relative strengths of the different types of construction. Due to secondary failures, such as leaks around the fittings, the possible strength of the tanks was not reached. In fact, the secondary failures were responsible for failure in each case. In one tank the failure was at the weld around a 2-in. pipe outlet, in the second at the manhole, in the third at the end transverse weld, and in the riveted tank at the end transverse riveted joints.

The first two failures might have been obviated by better welding of the pipe fittings and manhole saddle to the shell. Extra reinforcement at the junction of the spherical end to the cylindrical shell would have reduced the stresses at the junction where the other two tanks failed.

As the results of the analysis of the deformation and distribution of stress in these tanks, the following general conclusions seem warranted:

(1) The commonly accepted theory for the design of tanks is for all practical purposes sufficiently accurate, provided the computed stresses are not influenced by secondary stresses.

(2) For thin tanks, the measured stresses, based upon the two-dimensional formula, are in close agreement with the design stresses computed by the common-pressure formulas, provided the former are not affected by secondary causes. This conclusion is borne out by the results obtained at the center of the end.

(3) Secondary stresses resulting in high stress intensities were caused by (a) faulty design of the attachment of the spherical end to the cylindrical shell. (b) non-conformity of the shell to an accurate circular section, and (c) discontinuities in the shell for the manhole and fittings. These conditions may produce a possibly dangerous condition if present near a welded or riveted joint or seam.

(4) The stresses were increased by the presence of a seam.

A 30-Ft. Lathe Built in San Francisco in 1865

By FRED H. COLVIN
Editor, *American Machinist*

LATHES that will swing 30 ft. are not common in any part of the country, so that it was a bit surprising to run across one in San Francisco, and particularly to find that it had been on the job since 1865. Its existence emphasizes the fact that we do not, as a rule, appreciate the work undertaken on the Pacific coast in the early days of its development. Similar lack of attention existed during earlier developments in the middlewest so we are at least running true to form.

The lathe illustrated herewith is, so far as known, the only one on the Pacific coast having such a capacity, and as a result, very large work from the entire section has to be shipped to the shop where it is located. The name of the designer seems to be unknown but it was built in the shop of the Miners Iron Works in 1865 and is, consequently, 58 years old. It is still in the same shop, although the name of the firm has been changed to the Golden State and Miners Iron Works, and the shop is still located in the same place, on First Street.

In spite of having gone through the great fire, this lathe is still in service and is quite frequently called upon to handle work that taxes its capacity. Two such jobs, done during recent years, are shown in Figs. 1 and 2. In Fig. 1 is shown a large propeller, of the solid type, mounted for boring. This illustration shows the size of the face plate (12 ft.) of the lathe and also the gap in which the large work swings. It likewise shows the cone on the countershaft, and the electric motor by which it is driven. The motor is, of course, a modern feature added since the lathe was first installed.

The method of holding the propeller on the face plate in the proper centralized position for boring, is rather interesting, as showing the contrast between the use of jigs and fixtures and the methods used in contract shop work. The hub is held centrally by the screw stops *A* and *B*, acting against the wooden blocking shown. The clamping is done both by the hook bolts shown toward the edge of the face plate and the straps near the center. The main problem is to locate the propeller centrally and square for boring, as it is an awkward shaped piece to handle. The toolblock support, with the block removed, is shown at *C*.

Another large face plate job is shown in Fig. 2,



FIG. 1—BORING A BIG PROPELLER

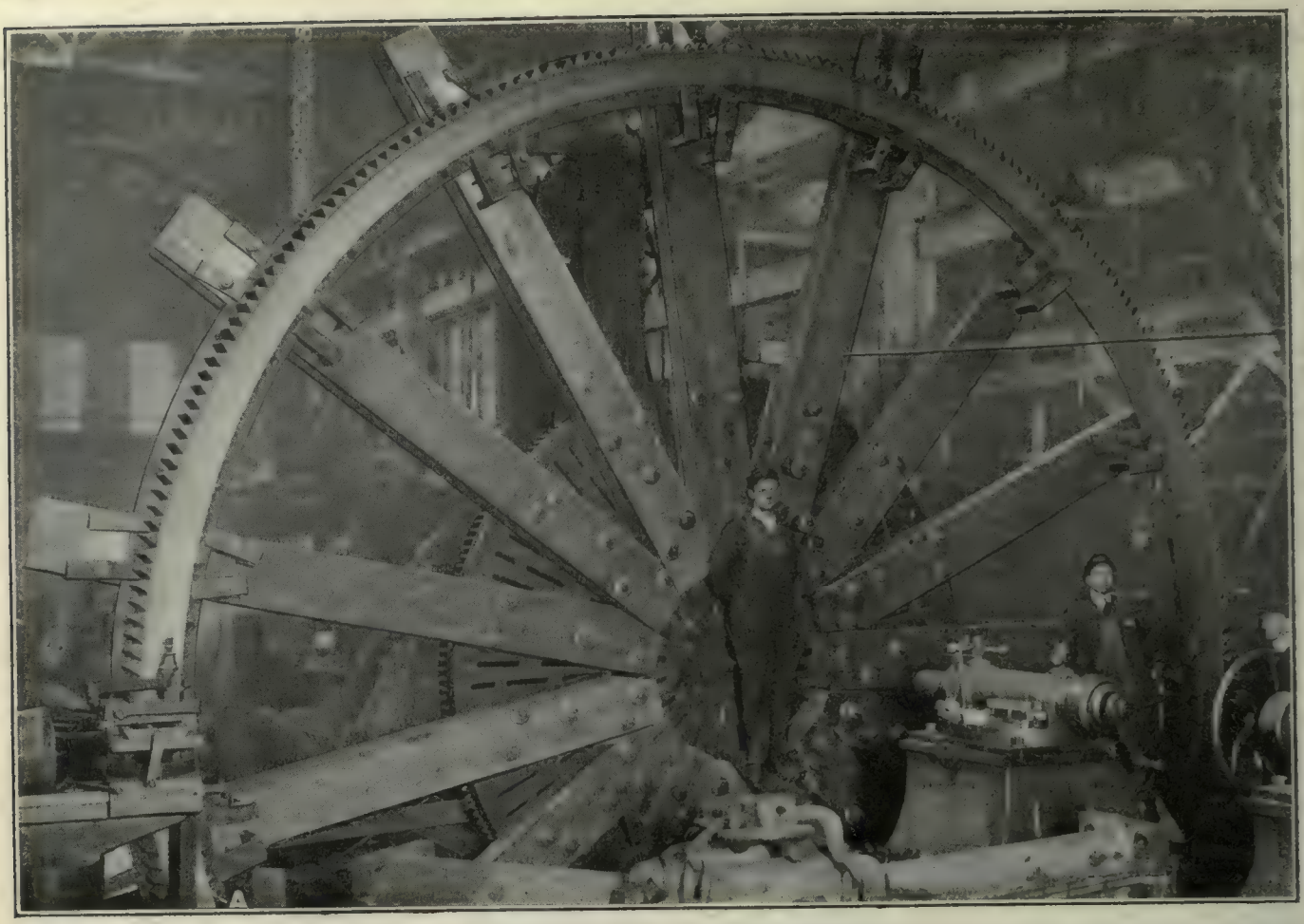


FIG. 2—TURNING A GEAR FOR DRAWBRIDGE

This job taxes the capacity of the lathe to about its limit, the arms, built of heavy wooden beams, being extended beyond the ring gear in order to assist in clamping it on the outside. With the arms bolted in place on the faceplate it is a comparatively easy matter to hold the work with the clamps shown. Centering a gear of this size, is, however, a job which takes skill and patience. The bar *A* is really a screw jack for supporting the tool.

The gear is for swinging the drawbridge at Nicolaus, Calif. The bridge is a combination of wood and steel and it was built by Kyle & Co., to whom the writer is indebted for this illustration.

A more complete view of the lathe itself is shown in Figs. 3 and 4, taken when the lathe was out of use. Both of these illustrations were taken from the front of the lathe and show that it was provided with two heads, one at each end of the bed so as to reserve the gap, with its large capacity, for special work, and at the same time use the head at the other end for smaller work. This lathe is one of the veterans in the machine tool line and it is extremely interesting in many ways.

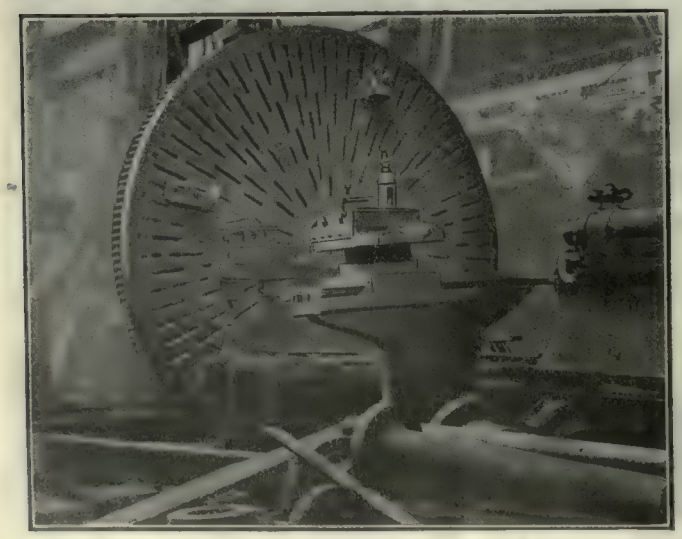


FIG. 3—THE GAP END SHOWING THE LARGE FACEPLATE

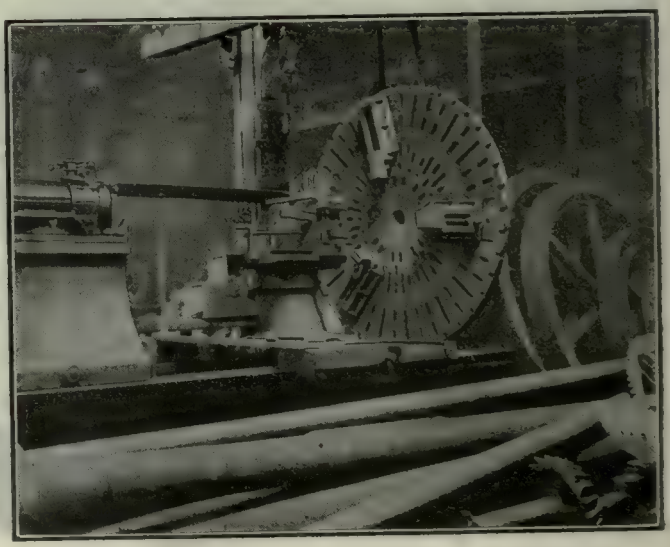


FIG. 4—THE END WITH THE SMALL FACEPLATE

Commercial Possibilities of the Airplane

THE two brothers, Archibald and Donald Black have utilized the data they have been collecting for a number of years to present a most interesting paper on the commercial possibilities of the airplane before the American Society of Mechanical Engineers.* Their calculations deal with investment and operating costs, advertising for business, etc. The estimates provide for night flying, which is necessary to compete with railways on long trips, include provision for beacons every 5 miles, emergency landing fields every 25 miles or less, and other similar expenses.

Curves are presented to show that the rapid drop in operating costs with increased traffic would make possible drastic cuts in rates. The data indicate that the carrying of mail and packages will come before passengers as the latter cost will be high until the volume of business increases materially. Figures show that for distances up to 1,200 miles, a sufficient number of night letters could be carried cheaper than by telegraph.

For package transportation the time saved would much more than offset the excess cost of air service over rail. Packages could be accepted in New York as late as 6 P.M. and be delivered in the business section of Chicago before 8 A.M. the next morning, saving a day or two over present express, when on schedule.

The amount of traffic makes a tremendous difference in the cost of transportation. If, for example, the number of planes flown per day can be increased to 30 each way, the cost can be cut to one-third that for a single plane. The cost does not drop materially beyond this limit but the tendency is downward.

The authors believe that the railroads are the logical organizations to develop commercial aviation both for replacing the extra fare trains and for express service. It is believed that the experiences of railway men make them best fitted to handle this newer method of transportation, for the authors feel that the airplane is sure to take over the fast passenger work, such as is now carried on de luxe trains, at greatly increased fares.

*Presented at the Annual Meeting of the American Society of Mechanical Engineers, December, 1923.

Standards for Steel Flanges for High Pressures Definitely Planned

A comprehensive program of standardization of steel flanges and flanged fittings was launched at an open meeting of Sub-Committee No. 3 held in the rooms of The American Society of Mechanical Engineers on October 26. This sub-committee is a sub-division of the Sectional Committee on the Standardization of Pipe Flanges and Fittings, which was organized under the procedure of the American Engineering Standards Committee. The three sponsors for the project are the Committee of Manufacturers on Standardization of Fittings and Valves, the Heating and Piping Contractors' National Association, and The American Society of Mechanical Engineers.

The meeting was attended by fifty engineers, manufacturers of this product and users as well. The following important actions were taken:

Range of Pressures for Steel Flanges. The maximum steam pressures for which these standard flanges and flange fittings shall be developed are 250, 400, 600, 900, 1,350, 2,000 and 3,200 lb. per sq.in. The maximum temperature which they are to be designed to withstand was set at 750 deg. Fahrenheit.

250 and 400 lb. Steam Standards. These two steel standards are to have the same bolt circle and number of bolts as the present American cast-iron standard for 250 lb., except that the 2 and 2½ in. sizes for the 400 lb. standard will have eight bolts instead of four. The other dimensions of these flanges are, however, to be modified to meet the conditions set for each.

600 lb. Steam Standard. The sub-committee further decided to use as the basis of the dimensions of this standard the bolt circle and the number of bolts of the present 800 lb. Hydraulic Standard developed by the A.S.M.E. Committee and published in December, 1918.

900 lb. Steam Standard. The basis for this new steam standard flange is to be the bolt circle and the number of bolts of the present 1,200 lb. Hydraulic Standard developed by the A.S.M.E. Committee and published in December, 1918.

Standards for 1,350, 2,000 and 3,200 lb. Steam Pressures. Flanges to withstand these pressures and the corresponding superheats are to be developed after the completion of the first four of the series. It will be noted that the seven maximum pressures selected form a geometrical series between the terms 250 and 3,200.

Action on Screw Threads Report

From the *Journal of the Society of Automotive Engineers.*

At the meeting of the Screw Threads Division in September, it was recommended that the report of the ectional Committee on the Standardization and Unification of Screw Threads should be approved by the Society as a joint sponsor.

The Sectional Committee on the Standards and Unification of Screw Threads was organized under the rules and regulations of the American Engineering Standards Committee to review the report of the National Screw Thread Commission, on which the American Society of Mechanical Engineers and the Society of Automotive Engineers are the two civilian participating organizations, with a view of establishing a definite report which could be adopted as an American Standard.

In accordance with the rules and regulations of the American Engineering Standards Committee, the report of the Sectional Committee must be approved by the sponsor organizations, the A.S.M.E. and the S.A.E., before it can be acted upon by the Main Committee of the American Engineering Standards Committee. The A.S.M.E. has already approved the report of the Sectional Committee and, as a result of the action of the Screw Threads Division, the matter of approval by the S.A.E. will be brought up for action at the annual meeting of the society.

Inasmuch as the report of the Sectional Committee covers classes and fits that are not used in the automotive industry, such as the loose-fit class for screws with the neutral zone definitely placed, the Screw Threads Division will recommend at the Standards Committeemeeting certain parts of the Sectional Committee Report for adoption as S.A.E. Standard. The Society members will therefore have available in the "S.A.E. Handbook" all screw thread data applicable to automotive engineering.

It is recognized that the Sectional Committee Report does not cover all possible screw thread applications, but is intended primarily for fastening units such as screws, bolts, studs and nuts. The Screw Threads Division is therefore working concurrently with the National Screw Threads Commission in developing a recommendation for tolerances for lengths of engagement up to 3 inches.

Uncle Bill Discourses on Management

By John R. Godfrey

SO YOU want to know all about management, do you son? Well, you're a modest lad but you're a poor picker when it comes to a teacher.

"But you ran a shop of your own, Uncle Bill."

"Sure—and if I'd known all about management I'd be running it now instead of working in the Johnson Motor Shop. But I can tell you a few things and you can dig up some more dope from someone else.

"There's so dern many things that go to make up management, that it's hard to begin. First you've got to manage to get enough money together to make a start; to manage to get men and to manage 'em after you get 'em. You've got to pick the right machinery and the right product, to keep the material coming in, to keep the machines busy, to ship the product on time and last, but not least, to get your money for it.

"Just take this new motor that's beginning to come through now. The old man had to decide that there was a good market for such a motor. Then he had to get it designed and to watch the design so it could be built at the right price.

"Next he had to pick machines and tools to be used in building the motor, so as to keep the cost down. And that isn't all—he had to plan out emergency stunts in case some of the machine builders fall down on deliveries, or the machines get tucked away on some sidetrack. That's why he's having Jim go over those old radial drills, to have them in order in case the new multiple spindles don't show up in time. Of course, the radials won't do the work so fast but they will keep production moving through the shop instead of tying it all up in a knot."

"But the old man doesn't do all that, Uucle Bill! He has Tom, and foreman and planners and others to do most of it."

"Of course he does, son. But the man at the top has to decide. He either decides himself, or decides to let some one else decide. But he's the real goat when anything goes wrong.

"The boss has to decide on how much machinery to buy and what is best for the job—how much surplus capacity to have—and whether he needs an extra set of milling cutters for that special job and a thousand other things that we don't think of. And not only the ordinary things but emergencies.

"He may know that one set of cutters will be ample for a certain job and so he hesitates to spend several hundred dollars for a duplicate set. And then some careless cuss, perhaps with a shot of bootleg under his belt, throws the wrong lever, ruins the cutters and jimmies up the machine into the bargain. That's one of the things that put me out of business.

"Of course he didn't mean to, and the best of us make mistakes, but it busted me and there's no comeback—that's a risk you take when you hire men. If it wasn't for expenses like that, the boss could pay us all more money. As it is we have to help pay for the mistakes of the other fellow, even if we don't make any ourselves—and all of us do once in a while—or oftener.

"Then there's the little question of getting material, supposing you have the necessary cash, or credit, to get it. Someone has to know where the stuff is to be had, whether from the maker or dealer. Someone not only has to order it but see that it is delivered on time. He has to order in advance to allow for delivery before we need it. If it is held up by railroad wrecks, or for any other reason he has to get other material somehow or we can't build the motors. And remember, son, he can't wait till the stuff is due before he begins to chase it up either. He has to know beforehand whether the maker is going to be able to ship, or not, and find out by long distance or otherwise, just how things stand. If we don't get material to work with we're out of luck and feel sore. But think what it costs the old man to have even our department stand idle.

"So, when you see that little chap that we call a stock chaser running around and looking excited, don't get either envious or fresh with him. He may not look it, but he's doing a big job and if he falls down we loaf a few days till he can find material somewhere else. It looks like an easy job but if you think you have troubles now, just tackle his job for a few days.

"That's only a few of the many details of management, son. Of course the old man don't chase the stock but he has to choose the stock chaser in a way, just as he does all of us. When he makes an error, and he does sometimes like the rest of us, the old man has to decide where it is cheaper to keep him or fire him. A new man might easily ball up the whole works while the old man knows that Thompson will probably never make that particular mistake again. That's one less chance of making a bull than a new man will have.

"Son, if you've got any fool notions in your head about managing a shop being a cinch, just forget 'em. I don't say you can't ever do it. Some of our best managers grow up out of the shop and it's a big help both ways when they do. But don't kid yourself into thinking it's an easy job, because it isn't by a long ways.

"S'pose you take any part of our job and do a little planning on your own hook. Try to figure out how you'd do it if the old man put it up to you. Figure out what the costs would be, what machines you'd use, where you'd get the material and all about it. You may not think it's as interesting as playing pinochle or shooting Kelly pool, but its a heap more likely to get you on your way to that shop manager's job.

"And don't think the old man will know how good you are even if you guess right. He isn't a mind reader although he does seem to know a lot without any visible reason for it. But if you spend some of your time this way you are sure to take more interest in your work and sooner or later your chance will come to show that you really have something worthwhile under your hair.

"The most I know about management, son, is to know that I'd rather the old man should do it than to tackle it myself."

Ideas from Practical Men

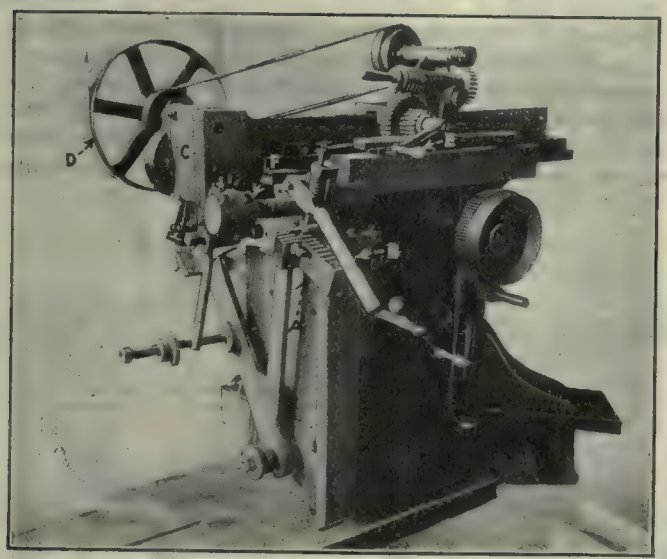
Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Old Shaper Becomes a Gear Cutting Machine

By Jack Williams

The machine shown in the illustration was once a shaper but has been transformed into a gear cutting machine because of the necessity for such a machine to cut the teeth in large gear segments that are a part of the shop's regular product. The transformation did not take place all at once, but rather—like Topsy—it "grew."

In the first place the knee of the shaper was removed and a special saddle, carrying the indexing sector *A*,



GEAR CUTTER MADE FROM OLD SHAPER

was made to take its place. The sector swings upon a stud in the face of the saddle, the position of which stud is determined by the radius of the segments to be cut. The lugs and setscrews at the upper end of the sector are for fastening the segments in place to hold and index them while planing the teeth. A latch, operated by the lever *B*, engages the notches in the upper end of the sector and takes care of the indexing.

At this stage the machine might have been called a gear shaper, for the teeth in the work were planed with roughing and finishing tools shaped to conform to a templet, and the work required all the time and attention of a skilled mechanic, with a pretty good chance of spoiling the job. After using it in this way for a time it was decided that the cost of further changes would be compensated for by the saving of an operator's time, and so the additional parts were constructed.

The reciprocating lever and other parts of the ram movement were taken out and discarded. The swivelling head was taken off the ram and the box *C*, which has a cutter arbor, back-gear train and driving shaft, was put in its place. The slow forward movement of the ram necessary to feed the cutter to its work is accomplished by means of a rack, attached to one of the gibs, and a worm reduction train mounted above the middle of the ram.

The action of the machine is not difficult to trace. All the power is delivered by the vertical belt to the pulley *D*, which, of course, moves with the ram. The movement does not, however, materially affect the belt tension for the reason that the power is taken from a countershaft located some distance above the machine and midway of the normal movement of the ram.

The small second belt drives from the pulley shaft to the two-step cone on the first member of the feed train, and through the latter to the stationary rack beside the ram. Quick hand movement for positioning is obtained by means of the small hand crank *E* on the squared end of the pinion shaft. The second worm may be lifted out of engagement with its wheel to allow the pinion shaft to be rotated.

The part *F* is a screw back-stop to oppose the thrust of the cutter.

The original cross-rail of the shaper provides vertical adjustment for depth of cut. The special saddle still may be moved along the cross-rail by the original screw to obtain a sidewise adjustment and the movement of the ram in its guides provides the feed, so that all the requirements of a gear cutting machine are met.

Instead of demanding the exclusive attention of a skilled operative the machine has only to be set up, when it can be run by an unskilled workman; and the services of the latter are needed only to run the ram back upon the completion of each cut, index the sector along one notch, and throw in the feed.

Grinding Small Marine Motor Cylinders

By Robert Mawson

The two cylinder grinding operations illustrated herewith are from the shop of the Johnson Motor Co., South Bend, Ind., which recently has developed a small motor of the two-cycle, opposed type for use in small boats and canoes. The cylinders are 2 in. bore by 1½ in. stroke, and the grinding operations are somewhat out of the ordinary.

Before coming to the operation shown in Fig. 1, the cylinder is bored and reamed to 1.991 in. and the spark plug hole at the top drilled and tapped concentric with the bore. The necessity for this concentricity will be understood when we note that the cylinder is located for grinding from the spark plug hole.

A special plug *A*, threaded on the end to fit the spark plug hole, and the body ground to a good sliding fit in the lathe spindle, is screwed into the spark plug hole of the cylinder and used to locate the cylinder for grinding the bore. The cylinder flange is supported in the plate *B*, the whole fixture being fastened to the face

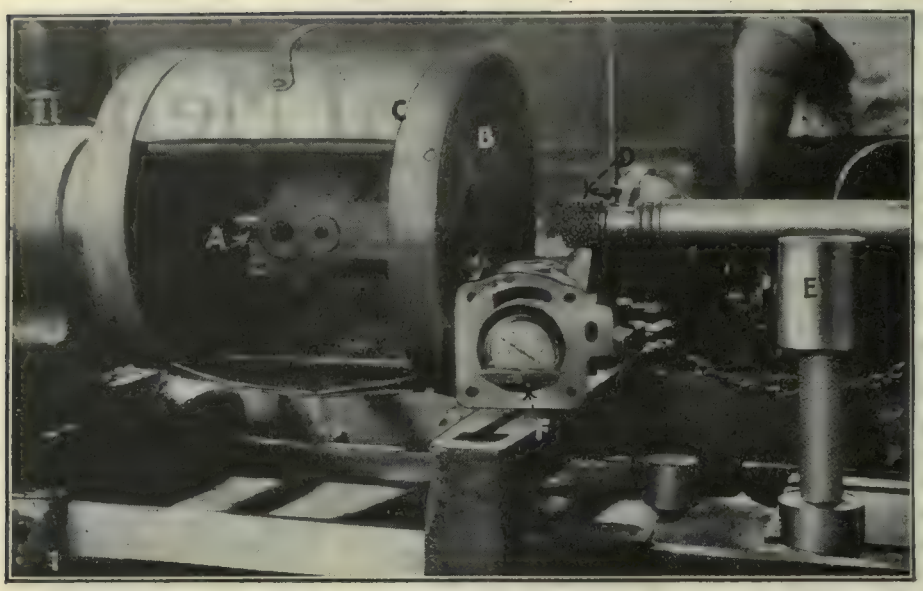




FIG. 1—UNUSUAL FIXTURE FOR GRINDING CYLINDER BORE. FIG. 2—GRINDING THE FLANGE

plate of the lathe and revolving inside the sheet metal case *C*. When the cylinder is finally located in position, the opening at the front is closed by means of the sliding cover and the cylinder ground with the wheel at *B*.

The cylinder flange is held against the plate *B* by means of hydraulic pressure applied to the inner end of the plug *A*, this arrangement serving as a quick acting chucking device which holds the cylinder positively in position while being ground. The limits are 1.9995 to 2.0005 in. The bore is tested by the plug gage shown at *E* and also by the gage carrying the dial indicator, as at *F*.

As the motor in which this cylinder is used is of the two-cycle type, it is necessary to keep the crank case tight, so that the face of the flange which bolts against the crank case must be ground smooth and square with the cylinder bore. In this operation, the cylinder is held on an expanding mandrel, as shown at *A*, Fig. 2, while the wheel *B* faces the flange square with the bore. The finished cylinder flange is shown at *C*. In addition to this, the flange face is lapped on a cast iron plate which tests the accuracy of the grinding.

An Automatic Valve Grinder

By W. Burr Bennett

The accompanying sketches show a design for a motor valve grinder which automatically applies the maximum pressure as the speed of rotation reaches the maximum and decreases the pressure to zero as the direction of rotation is reversed. It is important that a bracket be used, as shown in Fig. 1 at *A*, in connection with the grinder *B* in order that the grinder be held at a fixed distance from the face of the cylinder block. The proper distance can be obtained by adjusting the two collars shown at top of bracket.

A complete section of the grinder is shown, in Fig. 2 of which *A* is the shank and body. Fastened to *A* with round head cap screws is a cylindrical casing *C*. The cylindrical and cup shaped head *B* with its keyseated shaft extension, slides through casing *C* and is compelled to oscillate with it by means of a pin *D*. The actual driver *E* is swiveled in the end of the shaft and is of such shape as will suit the various designs of valves. The compression spring *H* forces *B* upward and against the two steel balls *F*, which are kept in a straight plane by means of a slot in the body *A*, as shown in section at *G*.

As the grinder is rotated in either direction, and proportional to its speed, centrifugal force causes the two balls to move outward and against the inclined faces of the cup. The outward movement of the balls forces the cup *B* downward against the spring and ap-

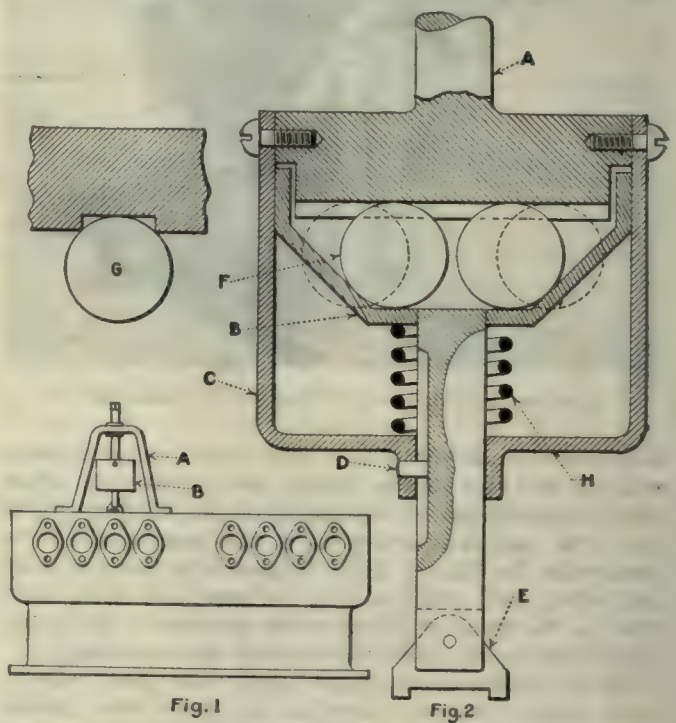


FIG. 1—HOW THE VALVE GRINDER IS USED. FIG. 2—DETAILS OF THE VALVE GRINDER

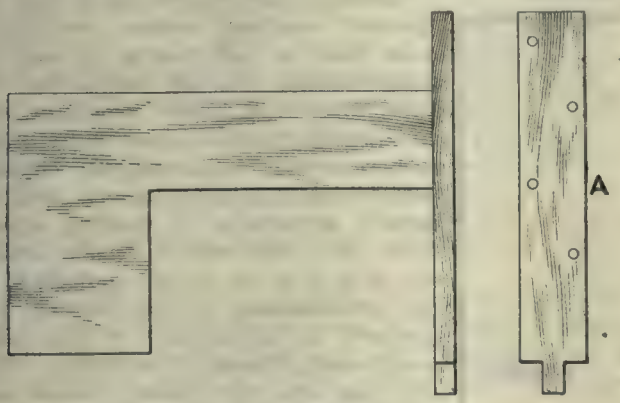
plies pressure on the valve seat. As reversal of the rotation movement occurs, the spring lifts the cup and the two balls come together.

This device works best with an electrical motor grinder at fairly high speeds or on a factory machine grinder of the Foote-Burt type. Increasing the speeds increases the pressure, and the spring *H* need only be strong enough to lift the cup and bring the two balls together.

Sweeping Small Cores

By James McLachlan
Birkenhead, England

Small cores of 6 in. diameter or thereabouts for which a corebox has not been made are often needed in the foundry and, if not too deep, they may be swept



DEVICE FOR SWEEPING CORES

by means of the simple rig here shown. The principal reason for not using the sweeper method is because of the room taken up by the spindle, and this trouble is avoided to some extent by the use of this device.

Procure a strip of iron about $\frac{3}{4}$ in. wide by $\frac{1}{4}$ in. thick and drill and countersink several holes in it as shown at *A* for wood screws. File one end of the strip round to form a pilot, which is to fit into a hole in an iron drying plate. This spindle can be kept in the foundry as a standby and is always ready when a single core is to be made, as it is but the work of a few minutes to make a suitable sweep and the always undesirable necessity for making a corebox for a "one off" job is thereby avoided, thus saving considerable time and expense.

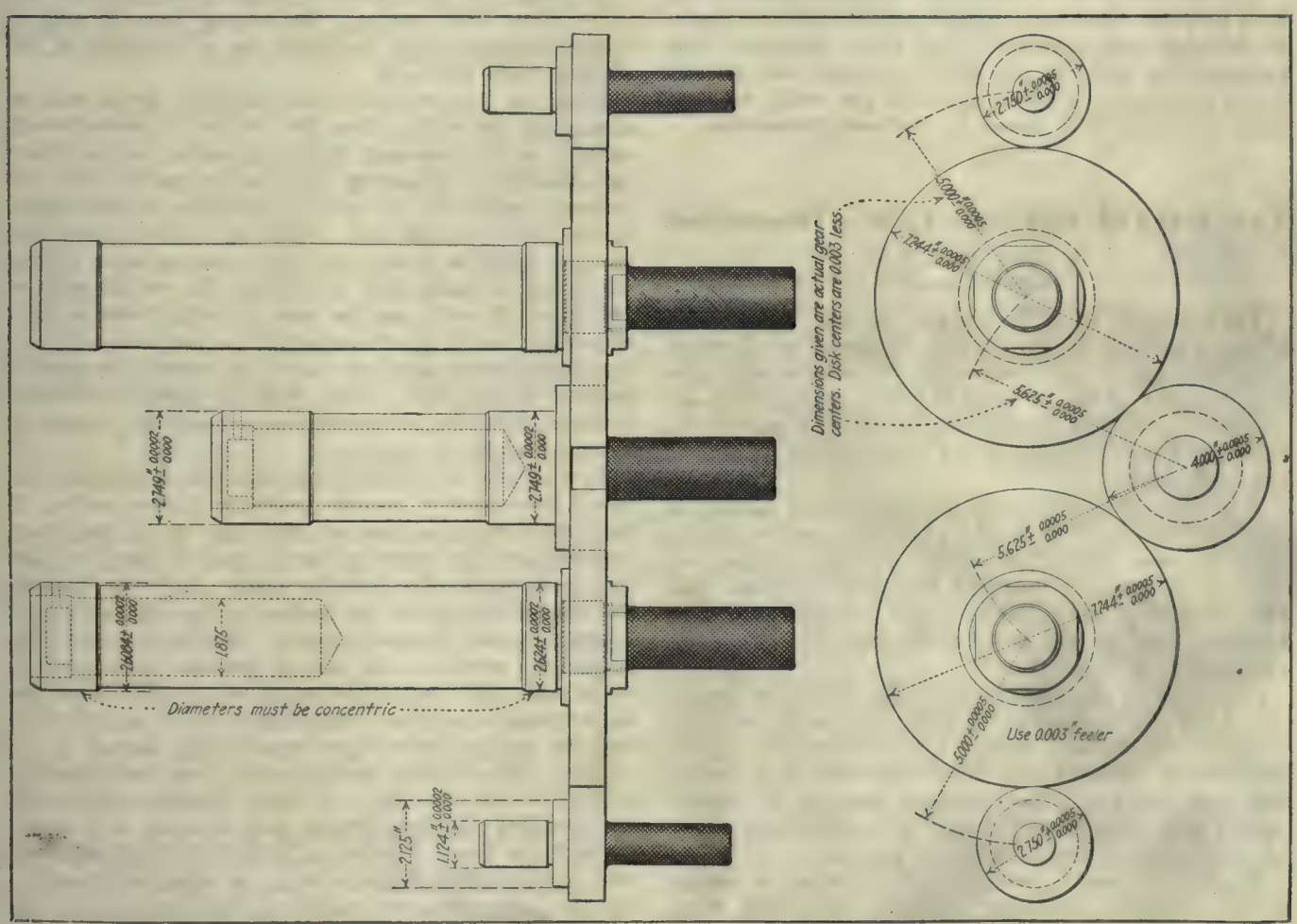
By using a larger plate with several holes for the pilot, a number of cores may be swept up at the same time and dried without removing them from the plate.

Testing Gear Centers

By I. B. Rich

Motor quietness depends so much upon accurate gear centers that the testing of motor crank cases for center distances of various bearings is decidedly important. The Pierce-Arrow Motor Co., of Buffalo, N. Y., uses standard plugs or shafts which carry hardened and ground steel disks whose diameters represent the pitch lines of the gears used. The layout of these plugs and disks is illustrated herewith.

The various shafts fit the different holes in the crankcase. It is, of course, necessary to exercise great care to have these plugs or shafts concentric at each end where they go into two bearings and also to have the disks, representing the pitch line of the gears, concentric with the plugs or shafts. The disks are made 0.003 in. smaller than the actual pitch diameter of the gears, and feelers are used in testing the relation of the different holes, as indicated on the drawing.



STANDARD BARS AND DISKS FOR INSPECTING GEAR CENTERS

Insuring Safety in Setting Up Machines

By W. J. Fisher, Jr.

A great many accidents are caused by starting a new machine that is not properly guarded, or one that has been moved to a new location with which the operator is not familiar. The accompanying illustration shows

Date.....

TO.....

MACHINE NO.....

.....

LOCATED.....FLOOR OF BUILDING NO.....

READY FOR.....HOUR.....

.....FOREMAN

SAFETY GUARDS.....IN PLACE.

.....SAFETY ENGINEER.

FORM FOR PERMISSION TO OPERATE A MACHINE AFTER MOVING OR INSTALLING IT

a form in use in one plant when a new or moved machine is ready for operation.

The form is sent to the chief engineer after it has been properly filled out by the foreman who has charge of erecting the machine. The chief engineer then forwards the form to the safety engineer who decides if the machine is properly guarded and ready to start work, and when O.K. issues the necessary clearance.

Two Ways of Making a Core – Discussion

By F. C. Edwards
Birmingham, England

The statement of M. E. Duggan, on page 152, Vol. 59, of the *American Machinist*, that "there is no standard to be followed in the construction of patterns and coreboxes" is susceptible, perhaps, to a little modification and amendment, and in support of my claim I submit the following statements which are based on my judgment and experience:

It is true that stereotyped methods cannot always be followed, for, even upon jobs of similar nature, variations in size often necessitate radical changes of method. Indeed, in different foundries castings that are identical in every respect may be produced from patterns that to the uninitiated seem to bear little resemblance to each other.

Difference in the equipment of the respective foundries is the usual cause of the difference in the patterns required. In a "loam shop," for instance, one or two loam boards together with sundry brackets and flanges that may cost but a few shillings, may be all that is needed to produce a casting that in another shop might require a pattern costing as many pounds.

To grant the above, however, is by no means to concur in Mr. Duggan's previous statement that "the word 'proper' does not apply to the making of patterns." Rather, I hold, does it prove that for every pattern (taken in conjunction with the set of circumstances under which it is to be used and making due allowance for what we may call "foundry idiosyncrasies") there is but one proper method of construction. The term "proper" in this sense I take to mean "peculiarly applicable," or applying to one particular case.

Naturally, the originating of this one "proper" method implies something more than a high degree of skill in woodworking. The old saying that "to know everything about something one must know something about everything" is here clearly explained, for efficient patternmaking depends upon a comprehensive knowledge of molding operations. Even the creative faculty, essential as it is to the mental equipment of the patternmaker, can function but imperfectly in the absence of that basic constituent—foundry knowledge. The why and wherefore must precede and govern the creative action.

I quite agree with Mr. Duggan, and for the reasons stated by him, that a solid pattern is preferable in molding the 10-in. diameter sheave wheel. I would suggest, however, that a further improvement could have been effected by giving a substantial taper to the outside, as shown at *A* in Fig. 1 accompanying this article. Turning this taper on the pattern would not require any more time than turning the square face *B*, and it would unquestionably facilitate the withdrawal of the pattern from the mold.

With the square-faced print there is great risk of damaging the mold unless the molder is exceptionally careful, and a damaged print impression would lessen the possibility of setting the core properly, with the probable result that the groove would not be concentric, or run true with the rim. With the tapered print, the corebox would be made with corresponding taper, taking no longer to make and facilitating the withdrawal of the core. Finally, as the core is being lowered into the mold there is no danger of disturbing the sand and carrying it down upon the face *C* to prevent the proper seating of the core, since there is always clearance between core and print-impression until the former is actually bedded in position.

It would have simplified the job, too, I suggest, and would have been of no real detriment to the casting, if the small round corner on the rim at *D* had been ignored and the coreprint made the full depth of the job, as shown in Fig. 1 to the right. After the molder has rapped the top of the pattern a few times (a contingency easier to guard against than to prevent) this projection would, I am afraid, become more or less unshapely. To make it as suggested would render the patternmaking somewhat easier and would require only that the corebox be made correspondingly deeper.

Again, Mr. Duggan shows the top boss well tapered, as at *E*, for an "easy lift." I would eliminate the lift-off by dowelling the boss loosely and allowing it to come up with the cope. Further, a large amount of taper at this point might not prove to be an unmixed blessing, for the patternmaker's mental horizon should not be entirely bounded by the foundry; he must ever antici-

pate possible machining operations, and an excessive taper may be a decided nuisance in subsequent chucking. A loose boss would also expose a convenient place on the solid web to locate a good rapping plate, shown at *F* in the illustration.

Machining operations sometimes play a dominant part

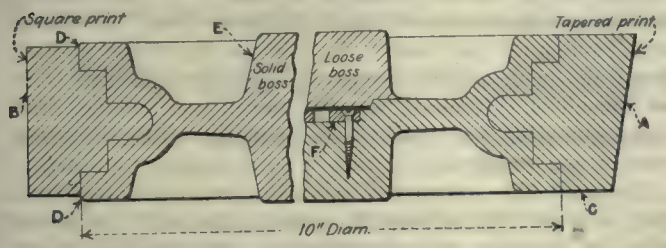
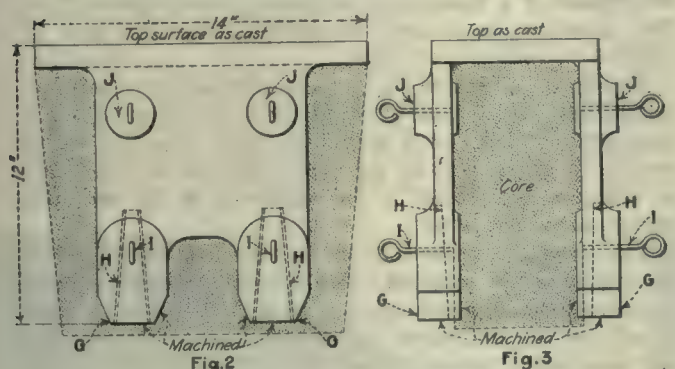


FIG. 1—SUGGESTED CONSTRUCTION OF CORE PRINT

in deciding the method of pattern construction and molding. A good illustration is presented in Figs. 2 and 3, which represent the front and side elevations of a double-bearing pedestal. The pattern was originally made to mold on the flat (as if Fig. 2 were the plan) and the percentage of rejects was high because of imperfections at the point *G* that might well have been overlooked had they occurred at any other place on the casting.

The decision to mold the pattern in the manner shown was based upon the well-known tendency of dross and impurities to rise to the uppermost part of the mold, leaving sound and clear metal at the bottom. In such a case, therefore, "proper" pattern making may require that the immediate interests of the foundry be made subservient to those of the machine shop.

The change in molding method necessitated the use



FIGS. 1 AND 2—FRONT AND SIDE ELEVATIONS OF PATTERN AND MOLD

of loose bosses on the outside of the pattern. The lower bosses were held in place by the dovetails *H* and the wires *I*. The upper bosses were held only by the stout wires *J* passing through the center of each.

It might reasonably be asked "why not carry each upper and lower boss in the same vertical line upon one dovetail?" This would be quite possible, but the withdrawal of the single loose pieces from the side of the mold is accompanied by less risk of disturbance of the latter than would be the case if two or three pieces were strung together on one dovetail.

The inside of the job is cored, thus making the mold much stronger than if the pattern left its own core, and also facilitating the withdrawal of the loose pieces. The requirements of both foundry and machine shop are thus fulfilled, and, with the pattern made cheaply enough for a "one off" job and at the same time sufficiently durable to produce a thousand castings if desired, it is not, perhaps, a misuse of the English language (which is, happily, practically identical here and in the U. S. A.) to say that the construction in quite "proper"—that is, peculiarly fitted for the particular purpose it is intended to serve.

Extension Shanks for Small Drills—Discussion

By Tommy Weeks

Every little while somebody writes to the *American Machinist* and tells how to put an extension on the shank of a small drill. The latest example is from J. F. Cavanagh, published on page 525 of the current volume.

Without meaning to cast reflections on Mr. Cavanagh



EXTENDING A SMALL DRILL

or any of the other estimable fellows who undertake to prescribe for this operation, I want to say that in ninety-nine cases out of a hundred when a man wants an extension on the shank of a small drill, he wants the extension to be no larger in diameter than the drill—else there would be no occasion for an extension. In practically all of the cases described, this contingency is not met.

If there is an electric welding machine in the shop, the man who wants his drill extended has only to procure a piece of drill rod of the requisite size, take it, with the drill, to the operator of the welding machine and say "here." If there is no welding machine handy the following method is almost as good and requires but little more time.

Put the piece of drill rod in the collet of the bench lathe and drill a hole endwise into it for a distance of half an inch with a drill several sizes smaller than the one to be extended. Put the drill (to be extended) into the same collet, with the shank end outward, and turn it down for an equal distance until it is a push fit in the hole in the rod. Don't file, or otherwise finish it—leave it rough.

Heat the hollow end of the rod and the shouldered end of the drill in a gas flame apply plenty of flux and solder and push them together. When the job has cooled you have a drill with a shank as long as you please; and the weakest part of that drill is the *flutes*—not the joint.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors
December 6, 1923

What is the Best Driving Box Practice?

THE COMMENTS on the article on crown brasses and wear plates show that the subject is of real importance to every railroad shop. The diversity of practice as indicated by the letters from different railroads points out the need for careful consideration of the subject with a view to determining which method is best for railroads in general.

The casting of crown brasses and wear plates into the driving box is evidently more economical than the usual method of machining both the box and the crown brass. But first cost is by no means the only consideration as the loss of earnings when a locomotive is out of commission may easily make the cost of the part being repaired an insignificant item.

As an example we may cite the case of the Ford railway, where hardened and ground vanadium steel hub plates run against a hard bronze wear plate on the driving box. The first cost of this is high but we are informed that locomotives so equipped have been running twenty months and are still far inside the limit for lateral play. Tire wear now brings their locomotives into the shop, while lateral wear has been eliminated from their list of troubles.

A careful study of the experience of different roads should make it possible to determine the most economical method. If tires must be returned every 50,000 miles it might be possible that cheap hub and wear plates to last the same length of time would be the most economical. If, on the other hand the expensive plates wear enough longer to pay for the cost, they are the ones to use.

The main object is to keep the locomotive in service as many days a year as possible. And when it is in the shop, this means that repairs should be made in the shortest possible time. The type of crown brass, wear plate or hub plate which will not take the locomotive out of service and which can be installed at the minimum net cost is the one that deserves careful consideration. Keeping the locomotive on the job is of first importance in determining the best practice in any kind of railroad work.

The Importance of a First Impression

HOW MANY owners and managers of shops, or businesses of any kind, really understand the importance of the first impression of their place of business upon the prospective customer? If they ever do much visiting of other shops, perhaps they do. If they are stay-at-homes we wish they could take a short vacation some time and call at one of the big Detroit automobile factories in which we recently spent several hours.

The reception room is large and the chairs are comfortable. Excellent taste marks the decorations but the real secret of the remarkably favorable impression made on the visitor is the pleasant cordiality of the courtly gentleman who comes forward to greet him. We shall long remember the kindly feeling we had toward that hospitable soul and his company. We actually felt that we owned it. Even if we had never got beyond that outer guardian we should have been favorably disposed toward his employers.

Contrast this reception with the one you often get from a growling bulldog of a man who wants to know what in thunder your business is and who you want to see. The chances are that after he is through questioning you, you don't much care whether you see anybody or not.

First impressions *are* important. Our hat is off to the occupant of the reception desk at that Detroit plant.

Elections in Engineering Societies

ELECTIONS in engineering societies are usually cut and dried affairs which attract very little attention and correspondingly few votes. Names are selected by a nominating committee, of such men as, in its judgment, will serve the society in the various capacities. Suggestions as to nominees are asked for in many societies, but as in the case of voting, brings little response.

In most cases only one nominee is selected for each office so that an organized effort is necessary for a minority, or for any one holding other opinions as to the fitness of a candidate, to secure votes against him. This practice is largely responsible for the lack of interest in society elections.

Those who advocate the present method feel that they should not ask a man to stand as a nominee with the possibility of his being defeated. The objection seems puerile in every way as no man wants to be elected to an office in his society if the majority of its members prefer some one else.

The greatest objection to the system, however, is that when a few members feel strongly enough against a nominee to organize against him, it becomes an open attack on his character to a far greater degree than any massing of votes against one of two or more nominees. The difficulty of organizing an opposition gives the impression that the society is in grave danger or the effort would not be made.

Such a case arose in the recent election of the American Society of Mechanical Engineers for one of its vice-presidents. The nominee who was opposed is one of the best known engineers in the country, who has served the society faithfully and has endeavored to lead it in the path of progress regardless of tradition. There is no question as to the ability or integrity of the man proposed as a substitute nominee and subsequently elected. If both men could have appeared on the ballot the members would have had an open choice. As it was, it became necessary to attack the regular nominee.

The present system is bad and should be changed without delay. The members should know the facts about each candidate and vote for the one they prefer.

Shop Equipment News

Morison Speed Reduction Gear

A speed reduction gear, in which the shafts are kept in line and which uses no toothed gears for ordinary speed ratios, has recently been introduced by Geo. Smith Morison, 609 Chamber of Commerce Bldg., Pittsburgh, Pa. This gear has been built to give a reduction as high as 90,000 to 1, and can be made to give any ratio desired. Even in the gears of higher ratios, in which an epicyclic gear train is incorporated, there is no toothed gearing at the high-speed end of the mechanism and all toothed wheels run at slow speed.

The feature of this mechanism and the part which constitutes the entire reduction apparatus for the lower ratios is shown diagrammatically in Fig. 1. The high-speed driving shaft *A* revolves in contact with either three or four rollers, depending on the design and the reduction desired. For the smaller ratios three rollers are generally used, *C*, *D* and *E*. Enclosing these rollers and also in contact with them is a ring *F*, which is kept from rotating by the hinge link shown in Fig. 2 in the lower part of the casing to which one end of the link itself is attached.

The roller *C* has a greater diameter than the others and the ring *F* is therefore always eccentric with respect to the line of centers of

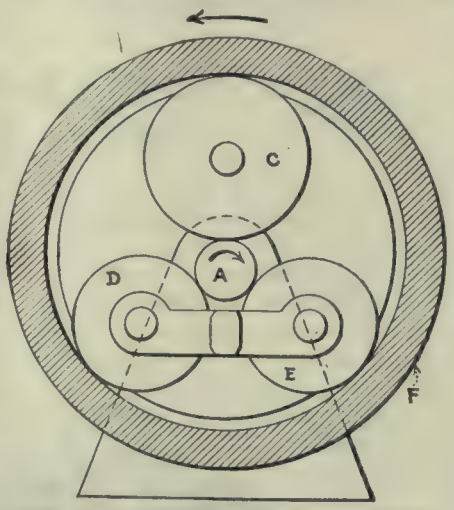
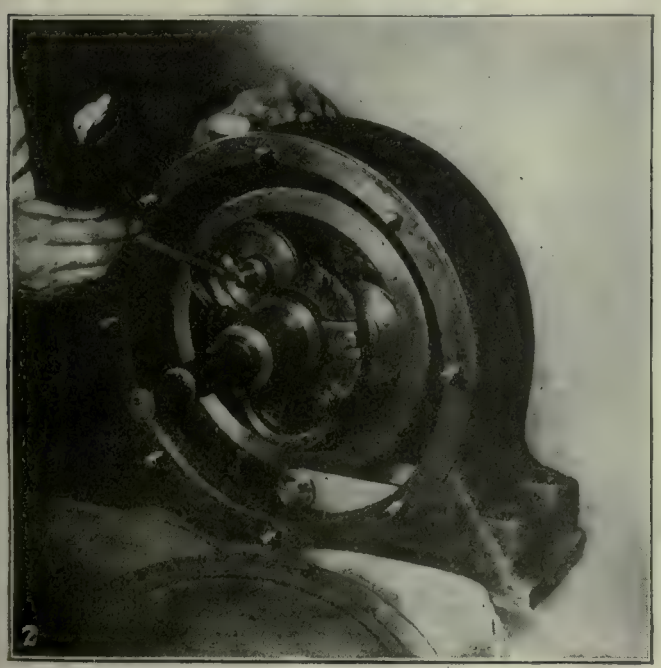


FIG. 1—DIAGRAM SHOWING PRINCIPLE OF MORISON GEAR

the shafts. The smaller rollers, *D* and *E*, are carried in a cage or spider which is attached to the slow-speed driven shaft. The larger roller is called the wedge roller since, as it rotates due to the rotation of the driving shaft *A* and in contact with the non-rotating ring *F*, it tends to pull the ring tightly into contact with the smaller driving rollers.

It is evident that the rotation of the driven shaft is accomplished by the planetary motion of the driving rollers as they roll around the inside of the ring. The ring also moves around the line of shaft centers in a circle whose radius is the eccentricity caused by the difference between the diameters of the wedge and driving rollers, but this eccentric motion of the ring is not utilized in a gear such as the one illustrated in Fig. 2, where the driven shaft is moved by the rollers directly. The ring motion is, however, taken advantage of for the higher ratios, as will be explained later.

The use of rollers alone is effective for ratios up to about 10 to 1. The difference in diameter of the rollers in such gears is not arbitrary and may vary from $\frac{1}{8}$ to 1 in., but it is dependent to some extent on the power to be transmitted. The parts are comparatively small and make a compact mechanism. A 1-in. driving shaft and a 4-in. ring will give a reduction of 5 to 1; a 1-in. shaft and a 5-in. ring reduces the speed



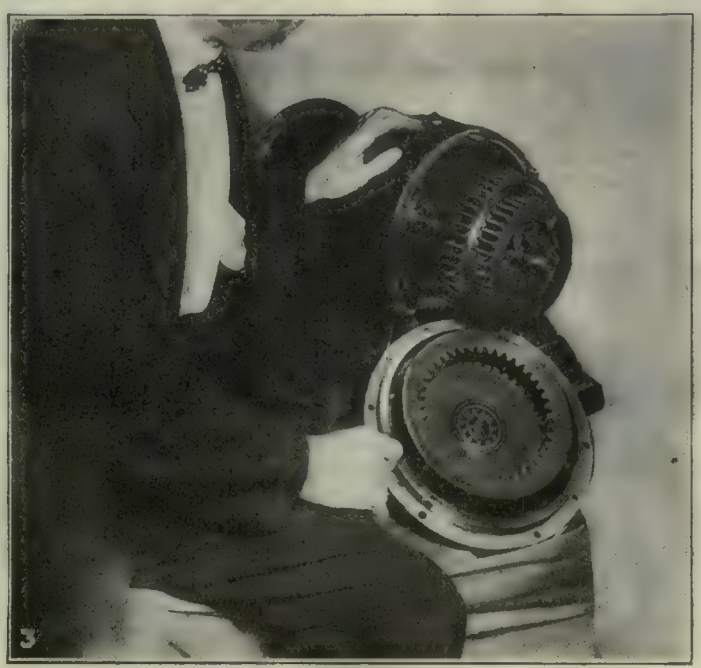


FIG. 2—MORISON GEAR WITH A 9 TO 1 RATIO. FIG. 3—MORISON ROLLER-EPICYCLIC COMBINATION; 1,000 TO 1 RATIO

in the ratio of 6 to 1; and other ratios are in proportion.

The whole mechanism revolves in a bath of oil, and with properly designed parts for a given load there is no slippage of the rollers, so the wear should be comparatively small. Wear of shaft, rollers, or ring does not impair the efficacy of the device as the wedge roller simply takes up a position somewhat further from the vertical center line in Fig. 1, and continues to hold the ring in contact with the driving rollers, but the ratio of the gear may be very slightly changed due to the change in diameters of the shaft and ring.

In Fig. 3 is shown a gear for a speed reduction of 1,000 to 1 and in this gear the eccentric motion of the outside ring is utilized. The rollers rotate between shaft and ring as before but are simply positioned in relation to each other by suitable spacers and are not connected to the driven shaft. The hinge link for stopping the rotation of the ring is omitted.

On the outer periphery of the ring, gear teeth are machined as shown in Fig. 3, so that the ring is in reality a combination of two gears of different diameters. The front one of the pair meshes with an annular gear which is rigidly held in the cover of the casing, and the other meshes with another annular gear carried in a spider which is attached to the slow-speed shaft. This gearing is similar in principle to the high-reduction type of gearing used in cyclometers.

As the high-speed shaft revolves, the planetary motion of the rollers causes the ring to revolve about the line of shaft centers, due to its eccentricity. The fact that the ring also meshes with the stationary annular gear causes it to rotate also about its own center and this rotation is transmitted to the slow-speed shaft through the other annular gear. The whole mechanism is, in effect, a double epicyclic train, one of which is composed of rollers instead of gears.

It will be noted from Fig. 3 that this gear has four rollers instead of three. Two of the rollers are large and two are small and all are held in proper relation to each other by links connecting their center pins. It should also be stated that the four roller combination is also used for straight roller drives when a reversing action, such as in a hoist, is necessary.

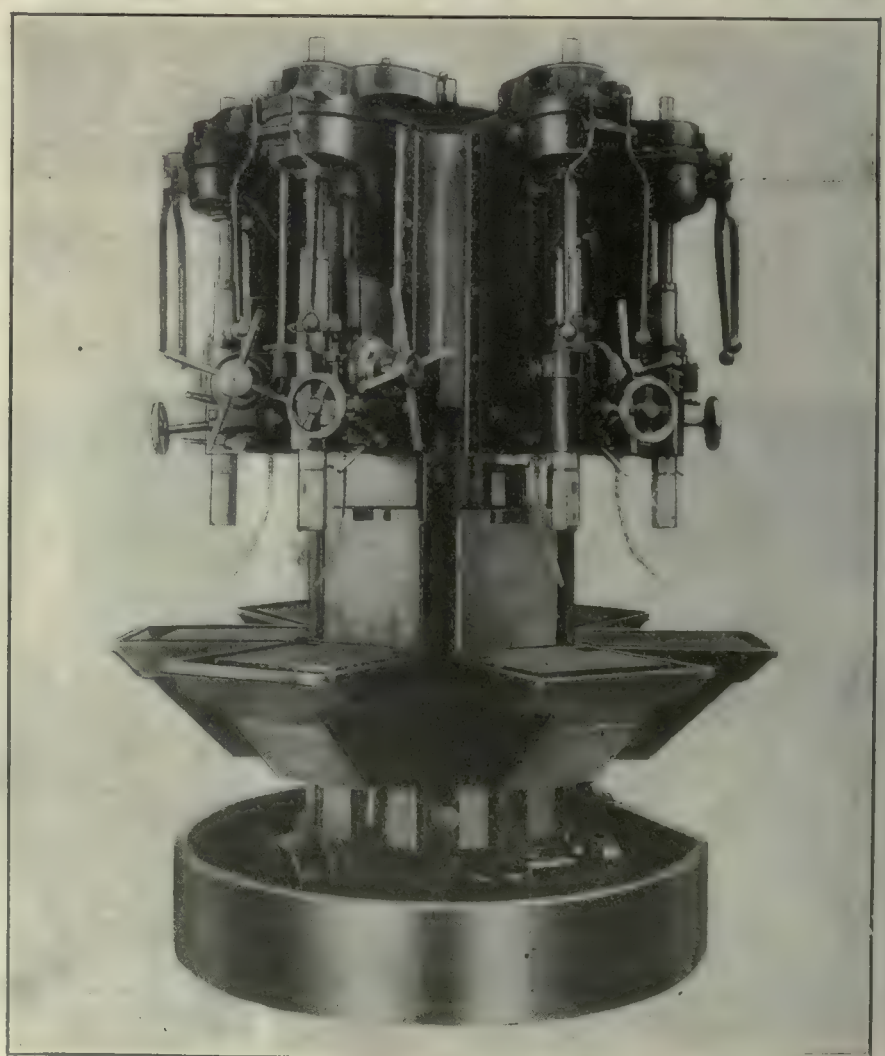
In the double epicyclic type of drive the difference in the diameters of the rollers must be carefully determined and cannot be selected at random between limits, as before. The eccentricity of the ring which must be produced by the rollers is determined by the proportions of the toothed gearing.

The gears having ratios higher than 100 to 1 are self-locking and cannot be run backward by the load when the power is shut off. No brakes are necessary to hold the load at any point.

The Morison gear has been in use in Australia for a considerable time. Tne 90,000 to 1 ratio gear was constructed to give the required slow motion to the conveyor of an annealing lehr for glassware. An electric power station uses an 80 to 1 gear on its coal hoist; a packing house conveyor is driven by a 46 to 1 ratio apparatus; a reduction with a ratio of 1,000 to 1 is used in connection with the electrode raising mechanism for an electric furnace in a steel plant. These instances serve to show the scope and availability of he device, and the great variety of ratios possible.

Baker No. 123 Rotary Drilling and Boring Machine

A single-purpose, high-production rotary drilling and boring machine has recently been brought out by Baker Bros., Toledo, Ohio. The machine, designated No. 123, is shown in the accompanying illustration and is essentially a combination of six Baker single-spindle machines rotating continuously about a center column. This arrangement adapts the tool for use on high-production work where the occupation of a minimum amount of floor space is desirable. The No. 121 single-



BAKER NO. 123 ROTARY DRILLING AND BORING MACHINE

spindle machine manufactured by this company was previously described on p. 652, Vol. 55, of the *American Machinist*.

The continuous rotation of the units about the center is accomplished through change gears and worm gearing. By means of these change gears the cycle of the machine may be timed to suit the requirements of the work being done, the time of the cycle being sufficient to allow the operator to exchange a blank for the finished piece and reengage the feed, in addition to the time required for the actual machining.

Each spindle has four speeds, obtained by means of sliding gears. The spindles will handle up to a 1¾-in. drill in steel and the general design of the spindle drive and feed mechanism is the same as that employed on the single-spindle machine noted above.

The entire machine is driven from a horizontal drive shaft located in the base. This shaft may be fitted with tight and loose pulleys for belt driving or geared to a motor. Besides the gearing for the rotation of the machine, already mentioned, the drive shaft is connected through change gears to a vertical shaft in the center column from which the various spindles are driven. All the speed gears are made of hardened alloy steel and provision is made to run the gears in oil. The shafts are mounted in ball bearings.

This machine should not be confused with the indexing type of machine in which the work is moved from one spindle to another since, when the work is once chucked, it is under the same spindle throughout the cycle. The effect is the same as placing six single spindle machines around a center column and giving them a constant angular rotation. The machine is so constructed that its functioning is not interfered with in any way by the temporary stopping of one spindle for grinding tools or minor repairs, except that the total production of the machine is decreased.

The distance from the centers of the spindles to the face of the column is 11 in. and the length of feed is 15½ in. The diameter of the spindle is 1¾ in. and it has a No. 4 Morse taper. The floor space required for the belt-driven machine is 61x104 in. and the weight is 16,000 pounds.

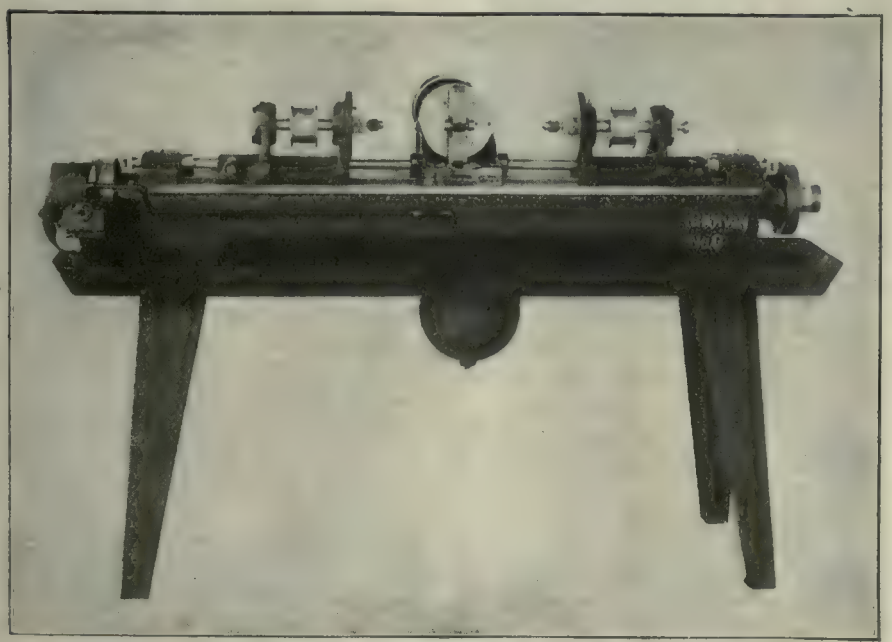
Garvin No. 0 Duplex Horizontal Drilling Machine

The Garvin Machine Co., Spring and Varick Sts., New York, N. Y., has recently placed on the market a No. 0 duplex, horizontal drilling machine. This machine is similar in many respects to the machines previously described on page 193, Vol. 38, of the *American Machinist*, the additions and improvements being along the line of automatic operation.

The heads slide longitudinally on the bed, the motion being derived from cams at either end of the machine. A spring which keeps the cam roller against the cam is enclosed in each head. Two sets of cams and change gears are furnished, giving a production of 11 and 16 pieces per min., respectively.

An automatically operated air chuck is mounted on the bed between the heads. The air valve which operates the chuck is shown in front of the cam at the left end of the machine, and the air pipe extends along the front of the bed to the center.

The machine will handle drills up to ½ in. in diam. in cast iron. The spindles are mounted in ball bearings and 3,000 r.p.m. is the maximum speed.



GARVIN NO. 0 DUPLEX HORIZONTAL DRILLING MACHINE

Federal Thickness Gage

A thickness measuring gage, designed especially for the use of inspectors and others to determine accurately and quickly the thickness of cardboard, rubber, fiber, or sheet metals, is now being marketed by the



FEDERAL THICKNESS GAGE

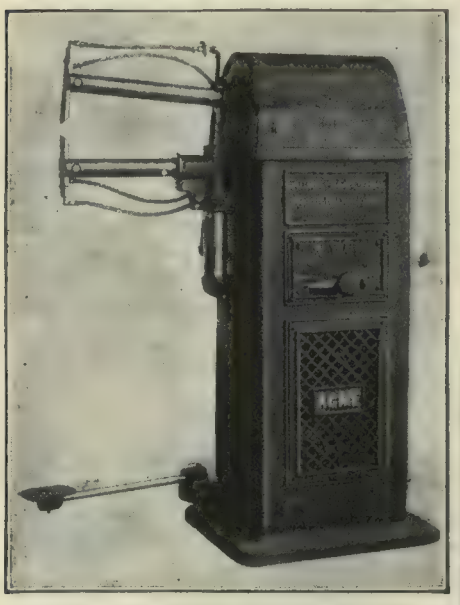
Federal Products Co., 15 Elbow St., Providence, R. I.

The frame is of aluminum and made in a shape which lends itself readily to one-hand manipulation. By pressing the thumb upon the button at the top of the dial, the measuring points are opened to their maximum capacity. The gage is not a comparator, but a direct measuring instrument, and measures any thickness up to 0.100 in. upon a dial which is graduated to read in thousandths. Adjustment to compensate for wear is obtained by turning the lower contact point, which is screwed into the frame. The contact points are bevelled for convenience and the gage is remarkably compact in design.

Acme Electric Spot Welder

An electric spot welder which contains many improvements over its former models is now being marketed by the Acme Electric Welder Co., Los Angeles, Calif. This machine which is designated Type D, is designed especially to meet the requirements of manufacturers of cabinets, boxes and similar products which require welding in the corners, and for a variety of other work.

Both the upper and lower horns revolve in their holders and the lower horn swivels on the column. The upper horn can be moved in and



ACME ELECTRIC SPOT WELDER

out and both ends of each horn are machined to hold electrodes, one end of each horn holding the electrode square, and the other in an angular position. The lower horn is arranged to slide vertically on the column and each adjustment of horns or electrodes is made by the loosening of one screw at the point where adjustment is required.

The regulation of voltage at the welding points is accomplished by the handle at the side of the casing, permitting the welding of materials of different thicknesses and also increasing the speed of operation.

The electrodes are 1 in. in diam. and both plain and water-cooled electrodes are furnished with the machine, together with the necessary water connections. The water-cooled electrodes have six welding tips; plain, off-set and center points.

The treadle is swiveled to allow the operator to work the welder from either side and the mechanism is counterbalanced. An adjustment screw is provided for setting the opening between the electrodes.

All working parts and electrical connections are enclosed in the base of the welder. The transformer is located close to the rear of the horns and will safely stand a heavy overload without ill effects. The machine is built in 6-, 12- and 15-kw. sizes. The depth of throat varies from 12 to 30 in., and the drop of the lower horn on the column from 8 to 24 inches.

Federal Thread-Lead Test Gage

The Federal Products Co., 15 Elbow St., Providence, R. I., has recently placed on the market a thread-lead test gage. The instrument is used to verify all leads upon threaded pieces up to 2 in. in diam., at points 1, 2, 3, 4, 5 and 6 in. apart. The right-hand test point is removable and interchangeable in any one of the above positions in order to measure short screws.

The body of the tool is made of



FEDERAL THREAD-LEAD TEST GAGE

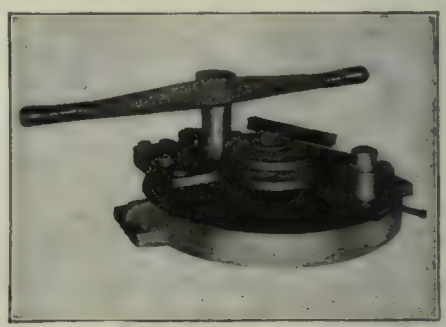
aluminum and of convenient shape to be grasped and applied by hand. In use the finished upper surface of the long slide is brought into contact with the screw to be tested and adjusted up or down, by means of the knurled adjusting screw, until the gaging points are exactly radial with the work.

Thumbscrews in the body of the tool regulate the tension of the gaging springs and also limit the range of movement through which the pointer may move, preventing violent and extreme fluctuations of the pointer when the gage is applied to or removed from the work. The dial is graduated to read to 0.020 in. plus or minus. The gage is one of comparison only and must be set to correspond with a master screw of known accuracy.

Pedrick Pipe and Tube Bender

A bending apparatus which will handle thin copper and brass tubing, as well as commercial pipe of various materials, is now being marketed by the Pedrick Tool & Machine Co., 3638 North Lawrence St., Philadelphia, Pa.

The essential features of the bender are shown in the accompany-



PEDRICK PIPE AND TUBE BENDER

ing illustration. A faceplate with teeth cut on its periphery revolves inside an outer casing, being moved by a pinion, to the shaft of which a hand lever is fitted. The drive ratio is sufficiently large so that comparatively little manual labor is required to bend materials within the range of the machine.

The resistance stud is mounted in the steel plate which is attached to the casing and is seen at the left in the illustration. Several holes are provided in the plate so that the stud may be properly located. The faceplate also carries a stud near its periphery, radially adjustable by means of a setscrew, and fitted with a roller to reduce the friction on the pipe or tube being bent.

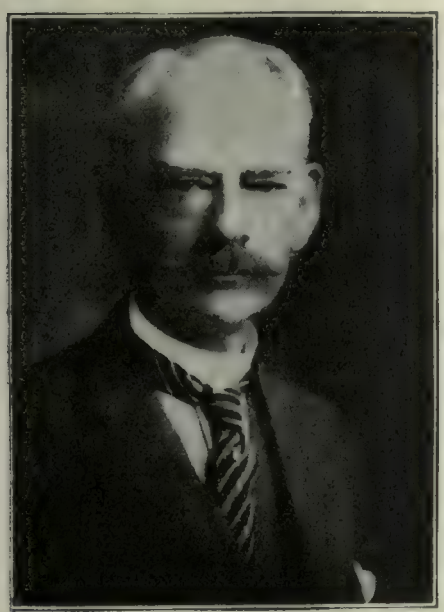
On a heavy stud at the center of the faceplate is mounted a grooved roll of the correct size for the material being bent and of the proper radius for the shape desired. The degree or angle of the bend is determined by the angle through which the faceplate is turned and, since this can be controlled closely, it is comparatively easy to make any number of identical shapes. Short pieces can be handled, and may be cut and threaded before bending.

The machine is built in a variety of sizes which will handle pipe and tubing up to 4 in. in diameter, and may be bolted in any convenient position on a stand, bench or stanchion. It is claimed that thin tubes of large diameter can be bent without buckling or upsetting.

News Section

Medals Presented at Opening Session of A. S. M. E. Annual Meeting

At the opening session of the annual meeting of the American Society of Mechanical Engineers held Dec. 3 to Dec. 6 in New York City, Frederick A. Halsey and John R. Freeman were each awarded the Society Medal. Mr. Halsey's medal was for the year 1922 and Mr. Freeman's for this year. Each year the A.S.M.E. presents a medal to some member who has contributed



FREDERICK A. HALSEY

some notable invention or some improvement to industry.

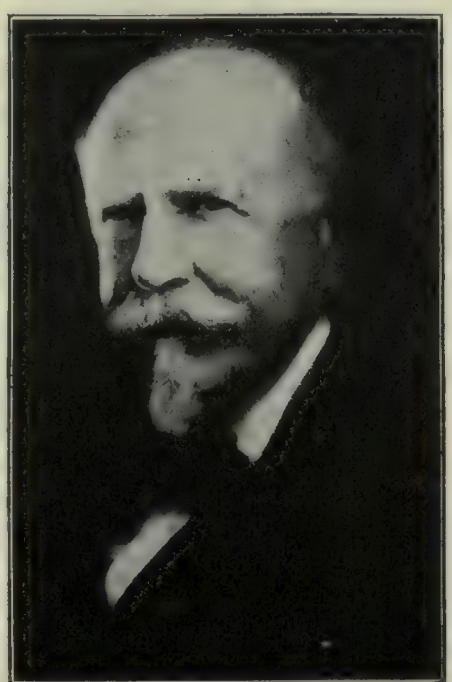
To Mr. Halsey the medal was awarded for his paper presented before the society at the Providence meeting in 1891, in which the premium system of wage payments was told in detail. Since that time the system has been thoroughly tried out and found to have a most harmonizing effect on the workers and employers.

The premium system consists in establishing a standard task to be completed within a given time. When there is any saving in time, this saving is divided between the employer and the workman in accordance with some agreed-upon basis, usually an equal division. The result is that the workman receives a greater wage for a given time, while the employer gets the output at a lower cost. Mr. Halsey's system has been highly commended by industrial engineers in all parts of the country.

Mr. Freeman's Achievement

For Mr. Freeman's laudable work in connection with fire prevention and the preservation of property, the society awarded the 1923 medal. Mr. Freeman, who is a past-president of the society, has long been identified with fire prevention and insurance work. He became associated with the Factory Mutual Insurance Co. in 1886 and in the succeeding years carried on a series of experiments on fire streams toward the perfection of an efficient nozzle. The results of these tests, made at Lawrence, Mass., in 1888, were later tabulated and published as the fire stream tables. These tables are the standards used by all engineers having to do with flow of water through nozzles or hydrants.

Next, Mr. Freeman made a study of



JOHN R. FREEMAN

reciprocating duplex pumps and developed the designs for the Underwriters' steam fire pump. Later on the details of rotary fire pumps were improved and standardized. Mr. Freeman also improved the automatic sprinkler system and contributed many important devices and systems making industrial buildings safer for the workers by being nearer to fire proof.

Lectures on Safety in Baltimore

Machine shop superintendents, foremen and others employed by industrial plants in and around Baltimore, have been invited to attend a series of safety lectures which has been prepared by Paul F. Stricker, director of the Baltimore Safety Council. In addition to the lectures entertainment features have been arranged. The meetings probably will be held in the auditorium of the Western High School.

The meetings will start on Dec. 14. The address of welcome will be delivered by Henry F. Baker, general chairman of the Baltimore Safety Council. John A. Ortel, director of safety for the Carnegie Steel Co., will speak on "Why Safety Work Pays." F. S. Benedict, of the Norwich Wire Works, Providence, R. I., will speak at the meeting on Jan. 4, his subject being "The Design and Construction of Safeguards." "Safety as a Community Asset," will be the subject of A. S. Goldsborough, secretary of the Baltimore Merchants and Manufacturers' Association, on Jan. 18. Frank E. Morris, of the Liberty Mutual Insurance Co., Boston, will speak on "Where You and I Fit in the Promotion of Safety Work," on Feb. 1. The speaker for Feb. 15 is to be announced but the subject will be "Organizing the Industry for Safety." "Plant Conditions, Arrangement Order, Lighting, Sanitation," will be discussed by E. S. Chapin, of the Pennsylvania Railroad, Philadelphia, on Feb. 29. The speaker for March 14 also is to be announced, but the subject will be "The Foreman, the Keystone of Modern Industry."

Texas Expects Active First Quarter

Members of the Texas division of the Southern Metal Trades Association held an important meeting at Waco, Tex., the latter part of November, G. C. Holmgreen, vice-president of the Alamo Iron Works, of San Antonio, presiding. The principal address was by W. C. Trout, president of the Lufkin Foundry & Machine Co., of Lufkin, Tex., and vice-president of the Texas division.

Discussing business conditions and the outlook, manufacturers in the foundry and machine shop field think the first quarter of the coming year will witness marked activity in the district, though conditions have been quiet of recent weeks.

Dallas was selected for the next meeting which will be held in March.

Closed Car Record in November

Production of Paige 6-70's and Jewett sixes by the Paige-Detroit Motor Car Co., was 90 per cent closed cars during the month of November, according to the schedule now in force.

This, Paige officials say, perhaps is the largest percentage of closed cars that any manufacturer has scheduled for building during any month in the past year. Paige and Jewett production for October was 80 per cent closed cars.

Milwaukee Manufacturers Preparing for Busy January

With railroad systems generally practicing retrenchment in shop operations and reducing working forces to the bare minimum required to keep locomotives and rolling stock in order during the strenuous Winter traffic season, the outlook for extensive sales of machinery is less encouraging. At the same time automobile shops are making a seasonal reduction in operating schedules. In a general way, users of metalworking equipment are engaged in the customary paring down of production as the year comes to an end.

Temporarily, therefore, neither inquiry nor sales give much evidence of activity, but the local tool trade does not look for anything akin to a complete interruption of buying. In fact, inquiry is again reported to be picking up since the end of November. Buyers as a rule are occupied with framing specifications of tool requirements for the new year, and already are asking for figures and delivery dates predicated upon January and February needs. Some of this business doubtless will be placed on makers' books before the end of the year in order that production may take its proper course and the equipment be ready for delivery after inventories have been taken, usually between the holidays.

While the machinery industry engaged in the manufacture of sawmill and woodworking machinery has experienced a favorable year, prospects are regarded as even better in 1924. The most conspicuous order placed with the American woodworking machinery trade this year, and probably the largest single contract ever placed, is that taken by the Filer & Stowell Co. of Milwaukee for the equipment of a new fir mill at Longview, Wash., for the Long-Bell Lumber Co. This is to be supplemented during the coming year with a large resaw mill and thereafter with a duplicate of the sawmill now under construction. Together, this represents the most notable sawmill project undertaken in at least a decade. An idea of the size of the initial order taken by the Filer & Stowell Co. is that specifications call for 420 Westinghouse motors, ranging in size from 5 hp. to 500 hp.

Automobile body shops, furniture and musical instrument factories, and millworking concerns are still buying extensively of machinery of all descriptions, and with the prospect for a continuance of the remarkable home and apartment building movement, needs are expected to be well sustained.

Public garage and repairshop construction in Milwaukee and Wisconsin is being carried on in large measure, with several exceptionally large works being undertaken that call for a good aggregate of new and used machinery.

Manufacturers of units and parts for the automobile trade have specifications requiring steady operations until the holidays, but machine shop forces as a rule are showing some slackening in production schedules. Automobile needs seem to dominate the general foundry situation, which has brought about a more spotted character of operations when bookings refer to other than such outlets.

Chicago Market Is Holding Steady

Machine tool dealers in the Chicago district report straggling orders for single machines from industrial buyers, but very little railroad business this week. The Ryerson company sold four lathes to the Southern Pacific R.R. and the same railroad ordered a 7½ ton Shaw electric crane. The Pennsylvania R.R. placed an order with the McMyler Interstate Co. for 33 jib cranes for freight handling. The Wabash R.R. placed an order with Industrial Works for a 25-ton 50-ft. boom locomotive crane. The Denver & Rio Grande Western R.R. has purchased a 90-in. wheel quartering machine. The Pennsylvania R.R. has purchased a 6-ft. radial drill. Some dealers report business for November as being the lowest thus far this year while others report sales as being about the same as in September. Although not much improvement is expected during December it is anticipated that railroads and industrials will enter the market for a number of tools after the first of January. The used machinery market has shown greater activity this week.

Steel buying is heavier in the Chicago territory, prices are firmer and production shows a slight increase as compared with a week ago. About 15,000 tons of steel were involved in structural contracts placed during the last few days. The largest calls for 573 tons for state highway bridges in Minnesota, the tonnage being divided between the Illinois Bridge Co., the Clinton Bridge Co. and others. A power house and electrical engineering building for Purdue University at Lafayette, Ind., will require 361 tons to be furnished by the Rochester Bridge Co. Other awards include: 263 tons, warehouse and office building for the Central Steel & Wire Co., and 216 tons, Northeastern Power Co., Wis., hydro-electric power plant and dam to the Worden-Allen Co.

Practically every line in both iron and steel is active and further important steel buying is anticipated. Railroads have placed only a small part of the 80,000 cars expected and some important news from this source can be looked for. If the present car buying is continued steel mills will be in a favorable position before the turn of the year. Increased production and higher prices are anticipated.

Better Business in Buffalo

Machine tools of the smaller variety now seem to be selling in sufficient volume throughout the Buffalo territory to give considerable encouragement to the dealers. Among the sales reported is one of five No. 3 and No. 4 oil gear broaching machines to an automotive firm in Syracuse, which is one of several small sales in the automotive field that indicates an anticipation of a better demand for automobiles immediately after the first of the year.

There was a strong rumor in this city that the Pierce-Arrow Motor Car Co. would bring out a new model, a more moderately priced pleasure car, in the Spring and consequently would be in the market for more machinery soon. However, Myron C. Forbes, president of the company, has stated that he knows nothing definite about it and that there was no official foundation for the statement.

One machinery sales organization reports the sale of considerable small woodworking machinery to local shipyards: drills, lathes, shapers, planers, etc.; also a lively inquiry from such firms for more machinery for Spring delivery.

Schools Buying

Some machinery is being purchased by the Buffalo public schools for technical training departments. There is considerable demand developing for concrete mixers and other road building machinery. Demand for power plant equipment is still extremely light.

Most of the orders which are being received by Buffalo machinery offices are for single machines for replacement purposes. The inquiry for such machines is stronger than ever and there is a general feeling among the sales offices that many firms have been holding off so long that they will be compelled to place orders within the next few weeks to keep their shops running to capacity. Some firms which came into the market for replacement tools at least two months ago are just closing at this time.

Work is coming to general manufacturing plants in better volume this month than last and an encouraging factor, for example, is that in several shops automatic screw machine jobs which have been on eight hours for several months are now on nine hours and many of them go to full time next week.

However, according to well informed observers, while business is better now and undoubtedly will continue to improve, no big improvement is looked for in the next two quarters. There is too little confidence in the future on the part of manufacturers, jobbers and retailers alike to bring about a return to rush conditions. The railroads are preparing large orders for next year.

Two Philadelphia Men Are Decorated

Two Philadelphia inventors have received high honors from the Franklin Institute, according to an announcement made recently. They are Albert Kingsbury, who has perfected a highly important type of thrust bearing to be used in hydraulic machinery, and Harry S. Parks, originator of a tank gage used in measuring the depths of liquids.

Mr. Kingsbury will receive from the institute the Cresson medal, second in importance to the Franklin medal, which is awarded annually. Mr. Parks will receive the Longstreth medal, awarded for meritorius work in art and science and for inventions of high order that develop and improve mechanical operation.

Canadian Trade Quiet but Confidence in Future Still Firm

Buyers of machine tools and other steel products in Canada are still pursuing a cautious policy, and the majority of sales and inquiries have been for single units only. While this condition of trade appears to be fairly general throughout the country some machine shops, particularly in Montreal and Toronto, report good business. These dealers state they are receiving a good number of small orders. There is very little demand for used machinery, the reports in this respect from all parts of the country being entirely unsatisfactory. Conservative buying is being influenced to a large extent by the approaching inventory-taking season. In most cases manufacturers and jobbers are being forced to hold the stocks, guaranteeing, as they do, good delivery.

The collapse of the European market and the present weakness of foreign exchange are the principal contributing factors to a condition of business hesitancy, although domestic conditions are undoubtedly sound and there is no cause for any pessimism regarding the future. That industry will, in the near future, enjoy considerable expansion is the belief of George Smart, of the Smart-Turner Machine Co. of Hamilton who, in a recent interview, said:

"We secured considerable business during the Spring and Summer of this year, and the past several months will compare very favorably with the same period last year. There is, in my opinion, room for optimism, and my view of the possibilities of the immediate future is quite hopeful. The present condition is not customary at this time of the year, hence my belief that it is but a passing wave."

During the past couple of weeks there has been a substantial tonnage of semi-finished steel products ordered for delivery after the first of the year. Structural steel producers have been showing more interest in the market and a fair tonnage has already been placed for January delivery.

While fair improvement has been shown during recent months in such Canadian industries as steel and equipment, and many miscellaneous industries, the backbone of business activity in the country has been pulp and paper, mining and building. The production of pulp and paper has been very heavy, newsprint production being estimated to approximate 1,200,000 tons during the current year, a new high record in this industry.

The really bright spot is that the total trade of the Dominion continues to show big increases. There was a betterment of nearly 173 million dollars in the trade during the first seven months of the present fiscal year. There were increases in both imports and exports, but the rise in imports was much greater than in exports. The total trade for the seven months ending October was $1,094,564,000, as compared with $921,699,000 for the corresponding period in the previous year. For the month of October by itself, 1923 figures show an increase of about seven millions over 1922.

Inquiries Increase in New York

The month of November proved to be a fair month for machine tool dealers in the New York district, and December opened up with an encouraging number of inquiries but a falling off in actual sales. This condition was foreseen and not unexpected, and it is not anticipated that December will measure up to November or October. However, the consolation is found in making a comparison of 1923 with the business done in 1922, when it is generally conceded that a healthy increase is recorded. Predictions for the future extend as far as the first quarter only, and all dealers agree that the first fiscal period of the new year should bring in a return better than the first three months of the present year, and some are optimistic enough to further state that a record quarter is sure to result.

With railroad buying slightly off this month, it is reasonable to expect an improvement in this line in January. Lists that have been out for some time will be closed then, according to rumor. The New York Central R.R. and the Delaware, Lackawanna and Western R.R. are both purchasers at the present time and, while in both cases the business is spread over a large territory, the New York district is getting its share. Automobile makers are not in the market except for immediate needs but, like the rails, they are expected to be heavy purchasers during January.

Improvement of general industrials has been noticed during the last month and some purchasing is anticipated from this quarter.

Dealers in used machine tools report a fair business with no difficulty in obtaining good machine tools, but with some obstacles met in disposing of them.

The export business has improved beyond expectations and shipping has been made easier by the exceptional warm weather that has been experienced in New York this season.

Detroit Awaits 1924 Auto Schedules

Somewhat reduced production schedules will prevail in the majority of Detroit's motor plants until the first of the year. Among the factors contributing are the normal seasonal decline in demand, stock taking, and the usual preparations for the coming auto shows.

This decline in production is having its effect upon the machine and machine tool industry, although leaders in the field are not anticipating any serious curtailment in this line. A slight falling off in business is always expected at this time of year in this automotive center, and executives are prepared for it. There appears to be a prevalent belief that with Jan. 1 the industry will experience one of the best Winters in its history.

Recent statements of automobile executives to the effect that next year's business will come to the concern which recognizes the need for steady improvements is taken to indicate that the opportunity for the machine tool industry during the coming months will be great.

Hupp produced more closed cars in November, both in number and in percentage of total output than during any previous month in its history. Two thousand five hundred "all-season" cars were turned out.

Order for the Maxwell club sedan are the largest the company has ever enjoyed for any single model. The factory is turning out these jobs as fast as possible and is still far behind orders.

The Cadillac October business was the second best October in history and the third largest month on record for the company, being exceeded only by October, 1919, and April of this year.

Studebaker is one of the first to disclose plans for next year. That the company is confident of a continued good demand in 1924 is evidenced in the production schedule for the first quarter of next year, which calls for an output of 40,000 cars in this period. If this fact is accomplished it will constitute the largest first quarter's production in the history of Studebaker. In the first quarter of 1923 production was 37,500; first quarter of 1922 total was 26,665; first quarter of 1921 totaled 10,983.

Immigration Views Are Varied

Demands from widely-conflicting interests for changes in the immigration laws which will be made at the forthcoming session of Congress, are forecast in the requests received during the past few days for places on the program of the National Immigration Conference to be held at the Hotel Astor in New York on Dec. 13 and 14. Arrangements for the conference are in charge of the National Industrial Conference Board of 10 East 39th St., and practically all the available assembly space in the hotel has been reserved.

These will be representatives of all phases of American social, industrial, economic and political activity, and inasmuch as the conference will be a public forum, the conflicting views of the country on immigration, which have acted in the past to render consideration of the whole subject highly controversial, will be put on record with the expectation that they may form a means of guidance in any projected new legislation. The present per centum limit act expires next June, and Congress will be called on at this session to enact a substitute. The National Industrial Conference Board, which has been making a study of the subject for over a year past, has called the conference to put on record the needs of the nation in framing a definite immigration policy. Economists of the board have reported that the whole question should be considered on broad humanitarian grounds. An interpretation of what these grounds should be is vitally desired by Congress and industry, and the expressions reaching the board, as the time for the conference approaches, furnish a remarkable indication of the divergence of views in different sections.

Personals

BURTON E. CARPENTER, formerly in charge of the Philadelphia territory for the Garvin Machine Co., New York City, is now manager of the midwest territory for the same company, with headquarters in Chicago, Ill.

ROBERT R. HIRSH has been made district manager at Buffalo for the SKF Industries, Inc. He was formerly in the Philadelphia office of the concern.

ALBERT O. RIORDAN has been made special tool and machine designer at the tool plant of the American Car & Foundry Co., Detroit.

THOMAS D. WEAVER is now with the Worthington Pump & Machinery Corp., Cincinnati.

H. CLAY BECKWITH is general manager of the Byers Machine Co., Ravenna, Ohio.

JOHN W. HOLT is with the Parker Wheel Co., Cleveland, Ohio.

G. M. WILLIAMS has been made president of the Wire Wheel Corp. of America, Buffalo, N. Y. He was formerly general manager of the Dayton Wright Co., Dayton, Ohio.

L. R. BROWN has been appointed manager of the transformer division of the new central station department of the General Electric Co., Schenectady, N. Y.

E. L. BECKWITH has been appointed district manager at the Chicago office of the Detroit Stoker Co., Detroit.

G. G. JETER, H. F. MCRELL and CLINTON JONES have been appointed sales managers in the transformer division of the General Electric Co., central station department, Schenectady, N. Y.

HARRY MEACHEM has recently become vice-president and general manager of the Rider-Ericsson Engine Corp. and the Delamater Iron Works, Indianapolis, Ind. He was formerly with Dean Brothers.

W. RAWSON COLLIER, formerly with the Georgia Railway & Power Co., will have charge of the Atlanta office of Dwight P. Robinson & Co.

HARRY ROSS JONES, formerly president, the United Alloy Steel Co., Canton, Ohio, has joined the board of the Dominion Alloy Steel Corp., which firm contemplates the erection of a large plant at Sarnia, Ontario.

DR. THOMAS T. READ, supervising mining engineer of the Bureau of Mines, Department of the Interior, has been awarded a gold medal and a commemoration diploma by the government of Brazil. Dr. Read was the representative of the Department of the Interior with the United States Commission to the celebration of the 100th anniversary of the independence of Brazil at Rio de Janeiro, last year, and was also the special delegate of the American Institute of Mining and Metallurgical Engineers, and the Federated American Engineering Societies to the International Engineering Congress held in connection with the celebration.

E. H. WELKER who has been in charge of the Detroit district for the Le Moyne Steel Co., Pittsburgh, has been made vice-president in charge of sales.

GEORGE W. DUNCAN, JR., has become a member of the firm of Coddington & Duncan, consulting mechanical engineers, San Francisco, Calif.

CHARLES H. PARR, one of the founders of the Hart-Parr Co., Charles City, Iowa, manufacturer of tractors, tendered his resignation and has accepted the position of engineer with the Elgin Street Sweeper Co., Elgin, Ill., manufacturer of motor driven street cleaning apparatus.

Business Items

The plant and machinery of the Standard Pulley Co., Cincinnati, have been purchased by Elmer Ritter, J. F. Jewett, Jr., and J. F. Jewett, 3rd. The company will be reorganized with the above men as officers. A new machine shop will be built. The sale price of the plant and machinery was $30,000.

The Marx Brass Works, Detroit, for the past few years known as the Grant-Marx Brass Works, again is operating under the original firm name, under which it began activities in June, 1916, doing business at 688-692 Meldrum Avenue.

An important sale of foundry and machine shop properties of the W. J. Oliver Co., Knoxville, Tenn., will be held Saturday, Dec. 15, it has been announced by James B. Crumbliss, receiver, appointed some time ago.

The Merit Equipment Co., Cleveland, Ohio, has been chartered with a capital of 3,000 shares, no par value designated to manufacture, buy, sell and deal in machinery, equipment and metal specialties. The incorporators are: Charles Folleth, Ashley M. Van Duzer, F. J. Perkins, L. C. Wykoff, and Walter H. Nye.

Plans for immediate and extensive expansion have been announced by the Chandler & Taylor Co., manufacturers of steam engines, Indianapolis, in connection with the filing of an application with the state securities commission for permission to increase the common stock of the company from $100,000 to $400,000. A considerable amount of new machinery will be placed in the company's plant in South Addison St.

The Canadian National Railway officials have set aside $92,000 in their 1924 budget for improvements to the Canadian National Railway-Wabash shops in St. Thomas, Ontario.

The General Electric Co. has purchased at Los Angeles, Cal., five acres on the Southwest corner of Santa Fe Ave., and 52nd St., with a frontage of 420 ft. on Santa Fe Ave., and 520 ft. on 52nd St. There is now located on the property a two-story reinforced concrete building which will immediately be modified and converted into a fully equipped service shop in which all kinds of electrical apparatus will be rebuilt and repaired. Later a large warehouse will be built on the property and eventually there will be a factory.

Baker Brothers, Toledo, Ohio, have just completed an addition to their machine shop which will add approximately 50 per cent to the capacity of the plant. The addition is of the one-story and balcony construction.

The Charlotte Supply Co., 20-24 East Fourth St., Charlotte, N. C., machine tool and supply distributors in the Southern territory, will construct a new four-story building at Mint and First Sts., in that city, to be used as Southern warehouses and general offices.

The Steel Products Corp. of Sheboygan, Wis., a new $100,000 corporation organized by Fred Zschetzsche, A. G. Stuedeman and W. B. Collins, recently is taking over the automobile bumper activities of the Jenkins Machine Co., Sheboygan.

The Townsend Co., Janesville, Wis., has filed articles of incorporation. It is authorized to manufacture and deal in engines, tractors, vehicles, mechanical devices and appliances. The principal is R. F. Townsend, formerly connected with the Townsend Mfg. Co., Janesville, tractor manufacturer. Mr. Townsend acquired the machinery, patents, etc., and for the past six months has been developing a new industry of similar character.

Obituary

B. J. MCCARTHY, for many years manager of the foundry department for the Phillips & Buttorff Manufacturing Co., of Nashville, Tenn., died the latter part of November at his home in that city at the age of 81 years.

Railroads Report Big Earnings

Of forty railroads in all parts of the country which have published their October reports to date, the total net income is $70,149,444, equal to an increase of 25 per cent, compared with the total for October a year ago. Gross revenue was $390,396,797 for October, against $365,375,743 in the corresponding month of 1922.

The majority of the reports added to those already published, showed an increase in net income over September and above October of last year. On the forty railroads the gross income for the ten months' period totaled $3,534,857,903, while the net operating income was $553,609,237, or more than 20 per cent in excess of the first ten months of 1922.

Outstanding in the reports, as showing that the improvement extends to the Northwestern railroads, was the report of the Great Northern. The net operating income of that road was $5,294,338, the largest in its history. It compares with $2,721,327 in the same month last year, $3,987,774 in 1921 and $2,303,274 in October, 1920. This brings the net income of the Great Northern for the ten months' period this year up to $18,569,505, as compared with $12,805,569 in the same period of 1922.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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AN INCLUSIVE summary of last week's news of domestic business would contain the following items: Cotton is above 37 cents in New York and still higher prices are talked of if the government crop estimate on Dec. 12 supports the reduced private estimates now current. Meantime exports are somewhat smaller, a few New England mills are shutting down or threatening to close, the buyers of cotton goods are becoming very circumspect and the speculation in futures is necessarily restricted by the narrowness of the market and the large margins demanded. Coffee, though dull, is ruling around 10 cents for near deliveries and well informed merchants say that higher prices for the distant positions are likely.

Tin has advanced sharply. So have lead and zinc. Copper is the only metal of commercial importance that is a laggard in the movement toward higher price levels. Bituminous coal is lower, especially in the West, and some Illinois mines have closed down. No one will grieve that the high prices at which coal has been held for so long are now working their natural result. There are many who hope that something of the same kind will happen to the market for anthracite coal.

A slight advance in woolen blankets was asked on the new lines opened by the largest producer last week, and raw wool appears to be higher all over the world. The department stores in the New York Federal Reserve district report that their October sales show an increase of 9½ per cent over last year. The Federal Reserve Board reports that October trade was larger than last year in all Federal Reserve districts. The increase ranged from 2 per cent in the Kansas City district to 20 per cent in the Dallas district.

Henry Ford announces that he will be able to make 10,000 cars a day by Feb. 1, and most of the other motor manufacturers claim to be preparing for an increased output in anticipation of an increased demand. This may explain the recent advance of from 2 to 4 cents in crude rubber.

Most of the Federal Reserve Banks take a cheerful view of the situation and the Federal Reserve Board notes an October increase of 3 per cent in "basic production," whatever that may mean. Lumber and building materials are moving normally at unchanged prices. Twenty-five cities show a gain of 28 per cent in new construction for the ten months ending with October.

Food products in the raw form comprise about the only group of commodities in which there has been any decline. Corn is slightly lower. Wheat has been difficult to rally and hogs and turkeys are cheaper on the large offerings incident to the Thanksgiving season.

The production of petroleum is still in excess of the immediate demand, but the surplus supply is getting into strong hands and the oil stocks are looking up.

The world's sugar crop for 1923-24 is estimated at 19,145,500 tons, the largest on record and 6.7 per cent over that of the previous season. Some decline in prices is expected later on, but the present market is surprisingly steady.

The Erie Railroad net earnings for the first ten months of 1923 show an increase of 396 per cent over 1922 and nearly all the roads report big gains in October gross and net. Therefore it is not surprising that the low priced railway shares should be attracting speculative attention. There are many who believe that discriminating purchases of the cheap railroad stocks will show large profits within a year, but the less confident investors prefer to wait until it is known whether the railroad bill that Senator Cummins is incubating will be mandatory or simply permissive in the provisions which relate to consolidation.

"A remarkable improvement in Austrian trade is reported. Mexican bonds are higher and trade reports from Australia and East India are distinctly cheerful. It now takes less than 30 days to go from New York to Moscow and travelers from Russia bring most encouraging accounts of the economic recovery there since the Soviet government has permitted private traders to resume business."

As a whole, the stock market has been resilient and more responsive to good news than to bad. The investment demand for "odd lots" shows a decided increase. It may be a partial reflection of the gain in savings bank deposits which amounted to more than $1,000,000,000 for the year ending June 30, 1923. The total of these deposits is now $18,373,000,000.

Looking abroad it is much the same story. Despite the confusing political campaign in England, British trade appears to be improving and sterling has lost part of its recent advance on free offerings of bills drawn against American exports. The Irish government is to issue an internal 5 per cent loan for £10,000,000 at 95, and an external loan for the same amount is also being planned.

Manchester is distinctly active and a cable from the London Stock Exchange says that "the resumption of new issue activity indicates that the public is not worrying excessively about the election." A remarkable improvement in Austrian trade is reported. Mexican bonds are higher and trade reports from Australia and East India are distinctly cheerful. It now takes less than 30 days to go from New York to Moscow and travelers from Russia bring most encouraging accounts of the economic recovery there since the Soviet government has permitted private traders to resume business.

The foregoing is a fair statement of present conditions as they are set forth in the newspapers and trade reports on both sides the Atlantic. It is cheerful, as are the facts, and yet the London *Times* prints an editorial in which it says "The condition of Germany is infinitely worse today than since Germany became an empire. . . . The plain fact is that she is breaking up. . . . France has had her way. Her curiously systematic and coldly logical effort is nearing its goal. A new political and economic entity is making its appearance in Europe, molded and dominated by France."

In pre-war times this pronouncement from such an authority would have given pause to enterprise all over the world. Today it is hardly noticed and the markets are almost buoyant as merchants prepare for new adventures and industrialists plan for increased production.

What is the explanation of the seeming paradox? The only one that I can offer is that we are feeling the factitious stimulus of inflation. The value of paper money in Europe and of gold in America is declining. On both sides the Atlantic more of the currency in use is exacted in return for human energy and its products. When this happens we say that prices are going up and we feel the illusion of prosperity created by an apparent increase in the value of the things we own.

If this depreciation in the value of money or appreciation in the value of labor and its products is to continue those who are forehanded will naturally try to exchange their money for property that is easily convertible and can be readily bought and sold.

This is what is happening at present. Shares of stock in prosperous companies and merchandise for which there is a wide market have commenced to feel the levitation of inflation. It will gradually extend itself to other things for which the market is less mercurial and it may by attrition lift the price of bonds, although it should not as bonds are simply contracts for the future delivery of the depreciating money in which they are payable.

German Efficiency a Thing of the Past

Labor and its demands too much for industry it is claimed—The great army of "Invisible Unemployed" soon to be plainly discernible—Pre-war wages seen in offing

By OUR BERLIN CORRESPONDENT

THE termination of the Ruhr war has not ended the business crisis, which had arisen during the last months of the resistance, but rather brought it to a climax. The financial props which supported industry, enabling it to keep the works going, having been withdrawn, the manufacturers of the Ruhr and of the other occupied parts were thrown upon their own resources. With no business in hand, all orders having been completed and none in sight they had no choice but to close their shops and disband their working force. They declared that they had no funds to pay wages and salaries and were unable to raise any on credit. This was no doubt a gross perversion of fact at least in the case of the big industrialists as the latter are now credited with more money than they possessed prior to the Ruhr occupation. The inside truth is that manufacturers have no desire to invest their money in produce, which under existing conditions would be too expensive for any market of the world. Moreover, many lines of industry are, at least temporarily, cut off from their regular supply of raw material. No one could honestly expect a sacrifice at a grand scale from the Rhenish industrialists in the interest of the working classes especially when looking back upon the many months of bitter strife between the two parties.

After an almost complete stagnation of business, with no improvement possible for the present, the stoppage of production seems the inevitable course. The dismissed workmen are receiving full payment from the unemployed aid, which leaves the financial strain on the country very much as it was during the Ruhr war. The leaks which sapped the country's life blood during the passive resistance have remained open and the sharp external and internal conflicts of which the Ruhr and Rhine is the playground, evidently do not allow them to be stopped.

What of the Separatists?

Such conditions are greatly strengthening the centrifugal forces at work in the country—which have to be mentioned as of vital importance to the industry—and paving the way for the separatist movement. The separation of the occupied parts, although politically in a state of suspense is virtually becoming a sure fact. A customs cordon separates the occupied parts from the German interior. The economic union between the two is practically severed. The industrialists of Rhine and Ruhr are forced to take upon themselves the reparations burden, which their government declines or is unable to resume. State obligations are shifted upon private shoulders. The bill for them will doubtless be sent to the German Government in the shape of a self-assumed license to deal with the labor problem as the Western industrialists think fit. The huge conflict arising therefrom is inherent of sufficient motive power to sever the threads by which the Rhine and Ruhr districts are still tied to the German State.

The sinister course which developments have taken for the German industry has again put the labor problem in the foreground. Since business is now in such a desperate state, that strikes, riots and even worse have lost much of their terror, the leading quarters of industry seem resolved to have the latent labor dispute decided right now and definitely. The "Marxism" under which name the whole structure of post-war labor legislation is summarized and which is generally blamed for the country's plight has to be routed completely, it is declared, or German industry cannot exist.

Question of Hours

In some part of the country, it is thought the ball will be set rolling. After looking at Bavaria in this expectation it is now considered likely that the development in the occupied parts especially in respect of the reparations question will force the issue. The outcry against the eight-hour day is the signal of the general attack. It is fought under the motto of increased and more economical production, made quite popular by the level that prices have reached at the approach of the gold mark standard. Whereas the trade unions maintain that an improvement of maunfacturing methods and equipment alone will be sufficient to accomplish this end, without touching the so-called labor achievements manufacturers are of the opinion that they have to be battered down and pre-war labor conditions restored. The eight-hour day is to them not the object but the point of attack. It is of course of less consequence how many hours a day are worked than how much is produced every hour. Of equal importance is considered the removal of the demobilization ordinances, the shop council law, the compulsory wages tariff and the restrictions of the pre-war piece work system. The manufacturers are therein governed by the opinion that at gold mark prices, pre-war wages or worse can no longer be stalled off. They are quite prepared to pay pre-war wages and have repeatedly said so, but on the condition of a pre-war efficiency only. Given again a free hand in their works, manufacturers hope to get back to the price level required for their foreign business. That the latter can only be retained by a certain amount of underbidding, is a standard doctrine.

When searching for the organic causes of the rather sudden mounting of prices to double and treble the size of the pre-war average, reduced efficiency is found only one of them. There are several others besides. The present price level bears all the signs of a hot-house growth, facilitated by greatly restricted importation. The prices in every stage of the train of manufacturing include a large safety factor in protection against the depreciation of payment on its way from consumer to producer. This can be readily understood when considering that the 48 hours required for clearing a check had at certain times reduced its concrete value to a half or less.

It may be expected that the inflation of prices due to the wild fluctuations of the mark rate will shrink and disappear entirely as soon as a mode of stable payments is provided.

The item that weighs most heavily on cost of production and which often escapes the attention of observers is the enormously grown rate of unproductive labor which manufacturing carries and the almost equal growth of the personnel. By unproductive labor is generally understood the part of the working force not actually employed in the manufacturing process. In pre-war times the cost of unproductive labor amounted to from 30 per cent to 50 per cent of productive labor. Today it is about three times as much.

The number of productive workers was in March, 1923, about 5 per cent higher than in June, 1914, the production, however, 24 per cent less. The efficiency of productive workers turns out to have dropped to 72 per cent. The large increase of the other working force reduces it however to 49 per cent in the total. In spite of wages rates of a concrete value of about one-third of pre-war rates cost of production was only 30 per cent below that of June, 1914. The weak point in German industry is, therefore, not lack of efficiency of the operative force, but the overgrown number of help and staff.

Plants Over-Manned

This dates back to demobilization times. Cumbersome business methods loaded with a wilderness of red tape, super-organization and other self-assumed burdens have done much to preserve this state of affairs. The manufacturers have had various opportunities to reduce their working force at times of strikes when the whole force was discharged and the new one could be assembled at their choice, but very few have made use of them. They have clearly got into a rut, from which they find it hard to extricate themselves.

The iron heel of necessity will doubtless change this state of affairs. The 20 per cent tax on all wages and salaries has already made manufacturers sit up. The business stagnation will do the rest.

The army of "invisible unemployed" as the vast number of additional workers which since war time had swelled the ranks of industry will now become visible enough. It is chiefly composed of men from all the various abandoned or deteriorated lines of trade. The question is, however, what to do with these men. If they remain unemployed they will be a burden on the state and indirectly on the industry. There is no place for them in industry and the state cannot support them indefinitely.

Big Year Ahead for Iron and Steel

The tide has turned for the better in the iron and steel industry of the country, according to Eugene G. Grace, president of the Bethlehem Steel Corp., at least so far as the business of his company is concerned. The low point in buying, he said, occurred a few months ago, and the volume of business has been gradually increasing since.

"A great many signs," said Mr. Grace, "indicate that 1924 will be a repetition of 1923 and that business conditions in the two years will prove similar." He pointed out that during the current year steel buying was heaviest in the Spring, and he expects that a large demand for steel products would again be witnessed next Spring.

In regard to the expected demand for steel products from the railroads, Mr. Grace said:

"We face the same railroad buying program for equipment and maintenance, patricularly track materials and cars. The railroads have made good money in 1923 and seem assured of another good year. Next year is going to be one of the biggest rail years we have ever had.

"The automotive industry is anything but pessimistic. Motor car makers anticipate that their output in 1924 will be about the same as in 1923. Building construction has held up and indications are it will continue to hold up. The farmer has more money now than he has had in many years. His equipment is depleted and obsolete and he must buy soon. Canning and allied industries are scheduled for 100 per cent operations."

Proposed Standards for Ball Bearings

After years of negotiations, a proposal for international standardization of ball bearings has recently been agreed upon by delegates from the American, German and Swedish Standards Committees. The American delegate, O. R. Wikander, recently returned from conferences abroad which led to the agreement, and has submitted the proposals for the consideration of the interested American committees.

There are 10 proposals in all, the first five being definite and the others tentative. The first proposal is toward a definite agreement on outside diameters of ball bearings up to and including the 220-mm. bore in the light series, the 200-mm. bore in the medium series and the 100-mm. bore in the heavy series. The second proposal sets forth the widths for single row annular ball bearings up to and including the 140-mm. bore in the light series, the 120-mm. bore in the medium series and the 90-mm. bore in heavy series. The third proposal refers to corner radii, the fourth to tolerances and the fifth to double row annular ball bearings. The sixth, seventh, eighth and ninth proposals supplement the first, second, third and fifth proposals respectively and refer to the dimensions for the extension of the series above those in the first proposal. The tenth proposal refers to metric thrust ball bearings.

The sectional committee, together with the ball and roller bearings division and thrust ball bearing subdivision of the Society's standards committee, at its meeting in New York City on Nov. 19 took definite action toward approving the first proposal only, inasmuch as the bearing dimensions included therein are the same as in the existing standards. It was felt, however, that the remaining nine proposals should be given further careful study before they are acted on and they were therefore referred back to the sponsor Societies for this purpose.

Increase in Exports of Machine Tools

Exports of metal-working machinery during October, 1923, with revised comparative figures for October, 1922, as compiled from the returns to the Department of Commerce, were as follows:

EXPORTS

	Oct., 1922 Value	Oct., 1923 Value
Lathes	$57,161	$221,105
Boring and drilling machines	34,262	102,054
Planers, shapers and slotters	38,256	19,954
Bending and power presses	7,179	35,885
Gear cutters	933	10,608
Milling machines	69,389	73,198
Thread cutting and screw machines	7,464	46,890
Punching and shearing machines	14,945	29,021
Power hammers	10,386	8,491
Rolling machines	736	....
Sharpening and grinding machines	78.044	69,300
Chucks, centering, lathe, drill and other	19,102	29,187
Reamers, cutters, drills, taps, dies and other metal working tools	121,944	165,970
Pneumatic portable tools	26,550	38,084
Foundry and molding equipment	41,314	29,504
Other metal working machinery and parts of	374,423	408,325
Metal working machinery	902,188	1,307,576

Pan Americans Will Study Highways

Forty delegates will be brought to this country from Pan-American countries to make an intensive "shirt-sleeves" study of highways and highway transport under the terms of a plan approved by government, automotive, road machinery, road material and banking representatives at a meeting held in New York, Nov. 22.

The proposal as outlined by Assistant Secretary of Commerce J. Walter Drake, T. H. MacDonald, chief of the U. S. Bureau of Public Roads, and Dr. G. Sherwell, secretary-general of the Inter-American High Commission, provides that the men to be invited will be named here, and all of their expenses will be paid by private subscription.

The immediate purpose is to give the delegates a sufficient understanding of developed highway transport to enable them to participate actively in the Pan-American Highway Congress proposed at the last meeting of the Pan-American Union and which will be held as a separate project next year. The ultimate objective is the promotion of closer relations between the United States and the other countries of the Americas.

Will Call Conference on Cast Iron Pipe

The subject of standard specifications for cast iron pipe was discussed at a meeting of a special committee of the American Engineering Standards Committee, held Oct. 4, 1923, at the Engineering Societies Building, New York City, as a result of which it was voted that the special committee should recommend "that the American Engineering Standards Committee call a representative conference on bell and spigot and flanged cast iron pipe and fittings, to consider the development of specifications covering dimensions and materials." This action resulted from a review of two sets of specifications for cast-iron pipe submitted for the approval of the A. E. S. C. one set by the American Gas Association and the other by the American Society for Testing Materials.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Engineering supplies. Birmingham, England. Agency. Reference No. 8272.

Mining machinery including drills, air compressors, hauling, crushing, sieving and classifying machines. Rio de Janeiro, Brazil. Purchase. Reference No. 8248.

Machine tools, especially lathes, drilling machines, filing vises and planing machines. Nates, France. Agency. Reference No. 8245.

Tools for carpenters and machinists. Dublin, Ireland. Agency. Reference No. 8295.

Forthcoming Meetings

American Society of Mechanical Engineers. Annual meeting, Dec. 3 to 6, in New York City. Calvin W. Rice, 29 W. 39th St., New York City, secretary.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8. Headquarters, Grand Central Palace, New York City.

Society of Automotive Engineers. Annual meeting, Jan. 22 to 25, at the General Motors Building, Detroit, Mich. Coker F. Clarkson, 29 W. 39th St., secretary.

American Gear Manufacturers Association. Spring Meeting, April 28, 29 and 30, 1924. Lafayette Hotel, Buffalo, N. Y.

Society of Industrial Engineers. Eleventh annual convention. Buffalo, N. Y. April 30, May 1 and 2. Headquarters, 608 S. Dearborn St., Chicago, George C. Dent, executive secretary.

Southern Supply & Machinery Dealers Association, National Supply & Machinery Dealers Association, and American Supply & Machinery Manufacturers Association. Triple convention, May 19, 20 and 21, 1924, Hotel Cleveland, Cleveland, Ohio. F. D. Mitchell, secretary-treasurer, 1819 Broadway, New York City.

Foreign Trade Council. Eleventh annual convention at Boston, June 4, 5 and 6. O. K. Davis, India House, Hanover Square, New York City, secretary.

The General Committee of Dividion V, Mechanical of the American Railway Association. Convention and exhibits. Atlantic City, June 11-18, 1924.

Railway Supply Manufacturers Association. Exhibit. Atlantic City, June 11-18, 1924.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Pig-iron sales touched million ton mark during November. Market in doubt as to direction in which prices will change. Coke prices firmer. Steel bars continue firm at $2.40 per 100 lb., Pittsburgh. Shapes and plates have been quoted as low as $2.40 for large tonnages; small lots or specified deliveries, however, bringing a minimum of $2.50 per 100 lb.

Advances—General upward tendency in non-ferrous metals. Aluminum ingots up 2c. per lb. in Chicago. Babbitt metal higher in both Cleveland and Chicago warehouses. Solder advanced 1¼c. in Cleveland and 1½c. per lb. in New York and Chicago, during week. Old metals (non-ferrous) higher in Chicago.

Declines—Structurals and cold drawn steel lower in Chicago; Chinese antimony also down ¼c. per lb. Increased discounts quoted on bolts, nuts, rivets and washers in New York and Chicago warehouses.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.05
Northern Basic	24.00
Southern Ohio No. 2	24.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	28.00
BIRMINGHAM	
No. 2 Foundry	22.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.25
Virginia No. 2	28.17
Basic	24.00
Grey Forge	24.00
CHICAGO	
No. 2 Foundry local	24.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	27.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.77
Basic	25.77
Bessemer	26.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.75
Cleveland	4.75
Cincinnati	5.00@7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.00
No. 12	3.10	4.64	3.80	4.05
No. 14	3.20	4.69	3.85	4.10
No. 16	3.40	4.79	3.95	4.20
Black				
Nos. 17 and 21	3.70	4.95	4.45	4.70
Nos. 22 and 24	3.75	5.00	4.50	4.70
Nos. 25 and 26	3.80	5.05	4.55	4.75
No. 28	3.85	5.15	4.65	4.85
Galvanized				
Nos. 10 and 11	3.90@4.00	5.15	4.70	4.85
Nos. 12 and 14	4.00@4.10	5.25	4.80	4.95
Nos. 17 and 21	4.30@4.40	5.55	5.10	5.24
Nos. 22 and 24	4.45@4.55	5.70	5.25	5.40
No. 26	4.60@4.70	5.85	5.50	5.55
No. 28	4.90@5.00	6.15	5.80	5.85

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded.	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0,17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.20
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.70
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	8.35
Floor plates	5.80	5.66	5.80
Cold drawn shafting or screw	4.65	3.90	4.30
Cold drawn flats, squares	5.15	4.40	4.80
Structural shapes (base)	3.64	3.46	3.30
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.10@3.15 at mill)	3.54	3.36	3.20
Tool steel	11.00	.....	.....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 5/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			13.62½
Tin, 5-ton lots, New York			47.50
Lead (up to carlots), St. Louis	6.75@6.80	New York	7.37½
Zinc (up to carlots), St. Louis	6.40	New York	7@7.12½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.20	27.00	28.50
Antimony (Chinese), ton spot	10.00	10.50	10.25
Copper sheets, base	21.00	21.00@21.25	23.00
Copper wire, base	16.25	19.00	16.25
Copper bars, base	20.00	22.50	19.50
Copper tubing, base	23.50	27.25	23.00
Brass sheets, base	17.75	22.00	18.75
Brass tubing, base	22.00	27.00	20.50
Brass rods, base	15.50	18.00	15.75
Brass wire, base	18.25	22.00	.....
Zinc sheets (casks)	10.25	10.45	.....
Solder (½ and ½), (case lots)	32.50	31.75	30.00
Babbitt metal (83% tin)	52.00	68.00	48@52
Babbitt metal (35% tin)	25.00	18.00	22@25
Nickel (ingot and shot)	29.00	.....	.....
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00

Shop Materials and Supplies

METALS—Continued

Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.75	11.00	11.50
Copper, heavy, and wire	10.75	10.50	10.75
Copper, light, and bottoms	9.50	8.75	9.75
Lead, heavy	5.75	5.25	6.00
Lead, tea	4.75	4.00	5.00
Brass, heavy, yellow	7.00		7.25
Brass, heavy, red	8.75	9.25	9.00
Brass, light	6.25	5.00	6.25
No. 1 yellow brass turnings	7.00	5.75	6.75
Zinc	3.75	2.75	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$25.10	$22.85	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.40	18.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	13.00	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.14
Cotton waste, colored, per lb.	.08@.13	.12	.10½
Wiping cloths, 13¼x13¼, per lb	11.00	36.00 per M	.16
Wiping cloths, 13¼x20½, per lb		52.00 per M	.16
Sal soda, per 100 lb.	2.40	2.25	2.65
Roll sulphur, per 100 lb.	3.60	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.95	1.00	.94
Lard cutting oil (50 gal. bbl.) per gal	.55	.50	.67½
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.297	.35	.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30–10%	30–10%	30–10%
Heavy grade	20–5–2½	30%	20–5–2½%
Rubber and duck:			
First grade	50–10–5%	50–10%	40–10%
Second grade	60–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton		4.00@4.25
Coke, prompt foundry, Connellsville	per net ton		5.25@5.75
White lead, dry or in oil	100 lb. kegs		New York, 14.00
Red lead, dry	100 lb. kegs		New York, 14.00
Red lead, in oil	100 lb. kegs		New York, 15.50

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0354	$0.0354	$0.0304
Cold finished shafting	per lb.	0.0465	0.0465	0.039
Brass rods	per lb	0.155	0.1525	0.17
Solder (½ and ½)	per lb.	0.325	0.295	0.265
Cotton waste	per lb.	.10@.13	.10@.13	.09@.11½
Washers, cast iron (½ in.)	per 100 lb.	6.50	6.50	6.00
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.02
Lard cutting oil	per gal.	0.55	0.55	0.55
Machine oil	per gal.	0.297	0.297	0.33
Belting, leather, medium	off list	30–10%	30–10%	40–5%
Machine bolts up to 1x30 in.	off list	45%	40–10%	40%

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	45%	60%	50–5%
1⅛ and 1¼x3 in. up to 12 in	15%	50–5%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	30%	$3.50 net	
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	35%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	
Hex. head and hex. nut bolts	List net		65–5%
Lag screws, coach screws	45%		60–5%
Square and hex. head cap screws	60%	70%	70–10%
Carriage bolts, up to 1 in.x30 in.	35%	50%	50–5%
Bolt ends, with hot pressed nuts	45%		55%
Tap bolts, hex. head, list plus	35%		
Semi-finished nuts, 9/16 and smaller	65%		
Semi-finished nuts, ⅝ and larger	60%	70%	80%
Case-hardened nuts	50%		
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$4.00
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	4.00
Washers, round plate, per 100 lb. Off list	1.50	4.00	4.00
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.50	3.50
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.50	3.50
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.50	3.50
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.50	3.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	50%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.00	$3.60	$3.75
Cone heads, ditto (net)	5.20	3.80	3.85
1⅛ to 2-in. long, all diameters, *EXTRA* per 100 lb.	0.25		0.15
⅝ in. diameter *EXTRA*	0.35		0.15
½ in. diameter *EXTRA*	0.75		0.50
1 in. long, and shorter *EXTRA*	0.75		0.50
Longer than 5 in. *EXTRA*	0.50		0.25
Less than 200 lb. *EXTRA*	0.50		0.50
Countersunk heads *EXTRA*	0.45		$3.70 base

New and Enlarged Shops

Machine Tools Wanted

Calif., San Francisco—L. S. Leavy, City Purch. Agt., Room 270, City Hall—machine shop equipment, tools and woodworking equipment for Mission and Galileo High Schools and for Hamilton and Crocker Junior High Schools.

Colo., Carbondale — Rocky Mountain Marble Co.—one 20 ton crane, tools and equipment for machine shop.

D. C., Wash.—Bureau of Supplies & Accounts, Navy Dept.—receiving bids until Dec. 18 for five electric grinders for Mare Island Navy Yard, Calif.; three electric drills for Navy Yard at Hampton Roads, Va.

Ind., Indianapolis—L. B. Millikan, Barton Hotel—equipment and gasoline pumps for proposed $50,000 garage.

Kan., Pittsburg—Joplin-Pittsburg Ry. Co., F. Schoolley, Purch. Agt.—drill press, lathe, wood lathe, belting, Universal saw, planer, hangers, sander, pulleys, bearings, shafting, cutting off machine and trip hammer.

Me., Brunswick—Thomas Plow Co., address purchasing dept.—woodworking and machine shop equipment, including large lathe, planer, shaper, small tools, band and circular saw, shafting, pulleys and belting.

Mass., Cambridge — Columbia Cornice & Skylight Co., 268 Elm St. (steel sash makers and tinsmiths)—machine shop and tinsmith's tools for proposed $20,000 metal working plant.

Mich., Detroit — R. C. Silver, 521 Free Press Bldg. (machinery) — heavy duty punches, shears and cold saw for steel shop, also bandsaw.

Mch., Gladstone—H. J. Norton—boring machine and emery grinder for garage.

Mo., Joplin—Amer. Sign Wks., 114 North Main St., A. J. Russell, Purch. Agt.—4 ft. metal cutter, also metal bender, both for 20 gage or heavier.

Mo., Joplin—Auto-Metal Bearing Co., A and Joplin Sts., C. A. Cotton, Purch. Agt.—connecting rod rebabbiting and reboring machine, also shim cutting machine.

Mo., Joplin—J. H. Buckingham, 615 West A St.—24 in. lathe and valve facer for automobile repairs.

Mo., Joplin—Missouri Battery Co., 9th and Main Sts.—12 in. x 6 ft. lathe.

Mo., Joplin—Pat-C Auto Signal Mfg. Co., 1823 Main St., C. J. Clark, Purch. Agt.—metal sanding machine, 12 in. x 3 ft. lathe, also spring roller and cutter.

Mo., Joplin—South Joplin Auto Co., 2401 Main St., J. J. Jolberck, Purch. Agt.—milling machine.

Mo., Kansas City—Park Chevrolet Co., 4529 Troost Ave.—jack, small hand tools, vise, drill press, belting, shafting, hangers, pulleys, bearings and lathe.

N. Y., Batavia—E. A. Hemphill, 1 Madison Ave.—repair tools and equipment for new garage repair shop.

N. Y., Brooklyn—Doeler Die Casting Co., Court and 9th Sts., L. H. Pillion, Secy.—machine tools and equipment for new plant at Batavia.

N. Y., Buffalo — S. Green, 100 Lutheran St.—equipment for garage repair shop.

N. Y., Watertown—Godkin & Thompson, 567 State St.—equipment, tools and emery wheel for garage.

O., Fremont—Herbrand Co., East State St. (manufacturer of automobile accessories)—machine tools, including autodrilling and milling machines, also equipment for plant expansion program.

O., Greenspring—R. Kistler—press, tools and equipment for repair department of garage.

O., Lisbon—Fife & Crubaugh Auto Co., W. Crubaugh, Purch. Agt.—lathe, presses, tools and repair shop equipment for proposed $20,000 garage.

O., Miller City—Kern Garage—small lathe, press and repair shop equipment.

O., Mount Gilead—Hydraulic Press Mfg. Co.—No. 33 Lucas precision horizontal boring, drilling and milling machine.

O. St. Marys—Boos Oil Engine Co.—machine shop equipment, tools and machinery to replace fire loss.

O., Youngstown—McKay Machine Co., Rayen Ave. and Foster St., (manufacturer of sheet leveling machinery) T. L. Thomas, Genl. Mgr.—complete machinery and equipment for proposed machine shop addition.

O., Youngstown—Truscon Steel Co., Albert St., J. Kahn, Pres.—machinery and equipment for proposed $400,000 addition to plant.

Okla., Miami—M. W. Anderson, 116 North Main St.—bench lathe for repair shop.

Okla., Quapaw—Caldwell Used Car Exch., R. F. Caldwell, Purch. Agt.—lathe and drill press (used).

Okla., Quapaw—Gardner Bros.—lathe for garage (used).

Pa., Johnsonburg—W. C. Myers, 3rd St.—tools and equipment for garage, to replace fire loss.

Pa., Scranton—S. Prichard, Tripp St. and North Main Ave.—tools, press, vise and equipment for new garage.

Tenn., Knoxville—C. McCoy, et al., 211 West Clynch Ave. (automobile bus terminal and repair shop)—machinery and equipment.

Tex., Jacksonville—Perrys Garage—16 or 20 in. shaper and a 24 in. drill press.

Va., Ashland — Rawlings Motor Co.—catalogues and prices on automobile repair tools.

Va., Richmond — Evans & Kramer, 932 West Broad St. (machinists)—drills and lathes.

Va., Richmond — C. Long, 1011 West Broad St.—catalogues and prices on lathes and vise for garage.

Va., Richmond—F. B. Schluter, 922 West Broad St.—catalogues and prices on lathes and drill press for automobile repairs.

Va., Roanoke—Norfolk & Western R.R., J. H. Clemmett, Purch. Agt.—two 72 in. and one 48 in. plain radial drills; 3 spindle vertical mdependent drill; semi-automatic nut facing machine; one 20 in. x 6 ft., one 20 in. x 3 ft. 6 in. and three 16 in. x 3 ft. 6 in. centers heavy duty lathe and chuck; grinder for milling cutters; lathe center grinder; No. 5 vertical milling machine; two 24 in. and two 36 in. vertical turret lathes; 36 in. draw cut shaper; 16 in. swing, 22 in. centers external grinder and chuck; Sund Strand heavy duty radius internal grinder, all complete with motors. Requisition 769.

Wis., Cumberland—R. L. and G. Kuenzli Co.—automobile repair machinery, gasoline tanks and pumps for proposed service station.

Wis., Lancaster—H. Mink—drill press, emery wheel and stand.

Wis., Milwaukee—School Bd., 10th and Prairie Sts., F. Harbach, Secy.—automobile shop equipment and printing presses for Technical High School.

Wis., Ridgeland—Ridgeland Auto Co., H. Erickson, Purch. Agt.—drill press, air compressor, gasoline storage tank and pump for garage.

Ont., Cornwall—McGillis & Oliver, Water St.—drill press for garage.

Ont., London—W. J. Chisholm, 478 Richmond St.—equipment for garage, automobile repair shop and service station.

Ont., St. Thomas—E. L. Schram, 62 Wilson Ave.—machinery and equipment for automobile repair shop, to replace fire loss.

Que., Montreal—Bisson & Dube, 867 Bordeaux St.—drill press for garage.

Que., Montreal—E. Clavel, 2836 St. Dominique St.—drill press and other tools for blacksmith shop.

Que., Montreal—J. E. Cormier, 1015 Bordeaux St.—equipment for garage.

Que., Montreal—A. Dumas, 2155 Papineau Ave.—tools for welding and repair shop, possibly other machinery.

Que., Montreal—O. Guy, 78 St. Elizabeth St.—drill press and other equipment for garage, later.

Que., Montreal — Jones & Taisne, 654 Drolet St., M. Taisne, Purch. Agt.—automobile repair shop equipment.

Que., Montreal—L. Joyal, 1471 Papineau Ave.—equipment for garage repair shop.

Que., Montreal— L. Labelle, 1769 St. Dominique St.—complete equipment for garage.

Que., Montreal—A. Pigeon, 2460 Papineau Ave.—lathe for garage.

Que., Montreal—F. Sevigny, 2450 Notre Dame St., W.—tools, press, etc., for garage.

Que., Montreal—F. Trifilette, 300 Hurteau St.—automobile repair shop machinery.

Que., Montreal — E. Whalen, 754 St. Lawrence Blvd. — complete equipment for automobile repair shop.

Que., Wakefield—G. Richardson—tools, press, equipment and small bench tools for garage.

Machinery Wanted

Calif., Fresno—Service Rock Co., Valley Bank Bldg., H. W. Jones, Mgr.—equipment for proposed sand and gravel plant, including locomotive crane, three gyratory crushers, etc.

Calif., Pittsburg—B. P. Morgan, c/o Columbia Cafe — equipment for proposed laundry.

Conn., Putnam—Lowell Needle Co.—machinery for proposed $45,000 factory.

Conn., Rockville — School Com. — wood and metal working machinery, including lathes, planers, drills, shapers, reamers, hacksaws, planers, matchers, band and circular saws, benches, pulleys, shafting, belting, etc., for new manual training school.

Conn., Waterbury—Bd. Educ.—manual training equipment, including lathe, planer, drills, matcher, reamers, benches, belting, pulleys, shafting and small tools.

Ga., Rome—Glover Mfg. Co., P. O. Box 118—self feed rip saw, 40 ft. bandsaw, 12 to 14 in. moulder, 12 in. jointer, 24 x 6 in. planer and matcher.

Ill., Chicago—Egan Ice Co., 5931 Ravenswood Ave.—ice manufacturing machinery for proposed $30,000 plant.

Ill., Chicago—Illinois Central R.R. Co., 135 East 11th Pl., J. J. Bennett, Purch. Agt.—coaling equipment for Sioux City, Ia.

Ill., Chicago—Judy Publishing Co., 1922 Lake St.—56 in. Miehle press.

Ill., East St. Louis—East St. Louis Daily Journal, Missouri Ave. near Collinsville Ave., A. Camp, Purch. Agt.—linotype machine, single or double magazine.

Ind., Hammond—Maginot Sales Co., 178 Fayette St. (sheet metal workers)—tinner's brake, cutters, hand tools and perforator.

Ind., Heltonville—A. Endalo—job printing press for high school.

Ind., Marion—Bd. of County Comrs.—receiving bids until Dec. 11 for the installation of two complete refrigerating plants at county institution.

Kan., Arcadia—R. M. Phillips—newspaper press and job printing press with equipment (used).

Kan., Wichita—Cabinet Shop, 115 North Osage St.—6 or 8 in. wood jointer.

Ky., Jackson—Jackson Times—large job printing press.

La., Coushatta—Print Shop, P. O. Box 64—job printing press, belting, paper cutter, hangers and pulleys.

Md., Baltimore—D. C. Elphinstone, 408 Continental Bldg. (machinery dealer)—one bucket handling locomotive crane, 8 wheel, 15 or 20 ton, 50 ft. boom.

Mass., Allston (Boston P. O.) — W. H. Bates, Jr., 49 Gardner St.—large size tilting crucible melting furnace for foundry.

Mass., Boston—International Cotton Mills, 60 Federal St.—machinery and equipment for Imperial Mills, Ltd., Hamilton, Ont.; draper looms for the manufacture of wide sheeting for Lowell Mill, Ltd., Lowell; machinery for the manufacture of tire fabric for Starkes Mills, Ltd., Hogansville, Ga.; machinery for cotton plant, Cosmos Mills, Ltd., Yarmouth, N. S.

Mass., Lynn — J. H. Sutherland & Co., Washington St. (manufacturer of woodworking machinery)—belting, pulleys, shafting, hangers, etc.

Mass., New Boston—O. Mann & Sons Co.—machinery for factory for the manufacture of metal pails and tubs.

Mass., Worcester — Bancroft Wet Wash Laundry, 3 Fruit St., address Manager — laundry machinery, including 2, 4, 6 and 8 pocket washing machines, pulleys, belting and shafting.

Mich., Detroit—Shelby Printing Co., Box 104, 31 East Woodbridge St.—job printing press and type.

Mich., Flat Rock—Flat Rock Chuck Co.—nickel plating dynamo and tanks.

Mich., Hudson—Pet Milk Co., address Manager—factory equipment, including shafting, hangers and pulleys; also machinery and equipment for the manufacture of solder.

Mo., Joplin—Auto Radiator Repair Shop, 1417 Main St., D. Carlton, Purch. Agt.—complete acetylene welding outfit.

Mo., Joplin — Liggett-Pool Battery Co., 821 Main St., J. E. Pool, Purch. Agt.—hand press with 2 in. clearance, quick positive action and die for trimming battery grids.

Mo., Joplin—Main St. Garage, 1521 Main St., F. Pflug, Purch. Agt.—honing process for trueing cylinders on a drill press.

Mo., Lutesville—Lutesville Sand & Gravel Co.—crusher, gyratory or jaw, 150 cu.yd. daily capacity; set derrick irons or derrick complete, 180 hp. fire box or Scotch marine boiler.

Mo., St. Joseph—Penn Oil & Supply Co.—storage tanks, pump and piping.

Mo., St. Louis—The city, Bd. of Public Service, 208 City Hall—receiving bids Jan. 2 for complete refrigerating plant, including 8 ton and 15 ton compressor; 6 x 11 x 21 ft. freezing tank; 5 x 7 x 13 ft. brine tank, high and low pressure ammonia line, etc., for service building at Training School for Feeble Minded. Estimated cost $25,000.

Mo., St. Louis—Roman Art Co., 2704 Locust St.—square shears, 36 or 42 in.

Mo., Springfield—Inland Printing Co., 415 East Olive St.—complete equipment for job printing office.

Mo., Springfield — Toombs-Fay Sash & Door Co, 666 East Pine St.—planers, lathes, moulders and saws.

Mo., Windsor — Booth Co. — two job presses and paper cutters.

N. J., Trenton—Holmes, Inc., 29 Chancery Lane—machinery for proposed $65,000 battery service station and repair shop.

N. Y., Ballston Spa—Ballston Knitting Co., E. Shutz, Mgr.—machinery for knitting and finishing cotton gloves and wristlets for new factory at Stillwater.

N. Y., Buffalo—C. B. Beach, 2 Rustic Pl.—laundry equipment.

N. Y., Earlsville—Borden Co. (milk products), address Manager—bottling machinery, equipment, hangers, pulleys, etc., for proposed plant, to replace fire loss.

N. Y., Hadley—Hadley Paper Corp., R. H. Redlin, Mgr.—3 in. cold rolled steel shafting, nine 3 in. ring oiling pillow blocks and three cast iron solid double belt extra heavy pulleys.

N. Y., Hoosick Falls — C. H. Lovejoy Chaplet Co., R. Brownell, Secy.—one small extractor to remove oil from brass chips from automatic screw machine; machinery for nickel plating very small parts, screws, etc.

N. Y., Malone—Consumers Service Stations, H. L. McIntire, Mgr.—pumps, equipment and tanks, 60,000 gal. capacity, for twenty-five proposed gas stations.

N. Y., New York — Amer. Cellulose & Chemical Co., 15 East 26th St.—equipment, including condensers, filter presses, refrigerating machinery, blenders, mixing machines, tanks, containers, etc., for proposed $500,000 plant at Amcelle (Cumberland P. O.), Md.

N. Y., New York—Bd. of Purchases, Room 527—receiving bids until Dec. 10 for shop machinery and equipment for Dept. of Plant & Structures.

N. Y., New York—J. Rheim, 516 East 8th St. (printer)—plate machine.

N. Y., Orchard Park — Eastern States Package Co.—machinery and equipment for basket plant, to replace that which was destroyed by fire.

N. Y., Oswego—Kitts Steam Specialty Co., 56 East 2nd St. (manufacturer of boiler valves and steam specialties), R. H. Hobbie, Purch. Agt.—machinery and equipment for proposed expansion program.

N. Y., Oswego—Morwear Tire Co., East Utica St.—complete machinery and equipment for tire repair shop.

N. Y., Rochester—Fearless Dishwasher Co., 175 Colvin St.—machinery for the manufacture of special products, to replace fire loss.

N. Y., Rochester—Haydon Co., 320 North Goodman St.—one Daniel surfacer or planer for planing mill, etc.

N. Y., Rochester—F. L. Heughes & Co., Inc., Lyell Ave.—overhead electric crane, 50 ft. span, 10 to 15 ton capacity.

N. Y., Rome—S. Adams & Son, South George St.—foundry equipment to replace fire loss.

N. Y., Troy — Albia Box & Paper Co., Pawling Ave., J. M. Webb, Supt.—expansion type cast iron pulley, 30 in. diameter x 8 in. crown face x 2 7/16 bore, to be expanded while running at 15 r.p.m.

N. Y., Utica—B. Ruddy, 1005 Jefferson Ave.—pumps and equipment for proposed service station.

N. Y., Watertown—Home Refrigerating Co., J. N. Carlisle, c/o Northern Utilities Corp., Purch. Agt.—special machinery and equipment for plant for the manufacture of refrigerator attachment.

N. C., Burlington—Burlington Mills, Inc., J. S. Love, Gastonia, Mgr.—equipment, including 150 looms, for proposed mill.

N. C., Hickory—Hickory Publishing Co.—equipment for job printing shop.

N. C., Hickory—Western Carolina Publishing Co.—job press, Jan. 1, 1924.

N. C., Mooresville — Mooresville Flour Mills—mechanical equipment for flour mill, 200 bbl. daily capacity, to replace fire loss.

O., Bethesda—C. B. Mayhugh Co.—equipment for the manufacture of paving brick.

O., Columbus—Central Lumber & Millwork Co., 640 Jefferson Ave., E. McElravey, Vice Pres.—four 4 in. sash and door machines, one general woodworking machine and tenon machine.

O., Columbus—F. J. Heer Printing Co., 55 East Main St.—equipment for proposed $123,500 plant.

O., Georgetown—News-Democrat—25 x 38 in. two revolution newspaper press.

O., Middle Point—S. Diltz—equipment for proposed blacksmith shop.

O., Rockford—Press—automatic numbering machine, linograph, mailing and eyeleting machine.

O., Toledo—Robinson Housefield Mfg. Co., Cherry and Huron Sts., K. M. Keysor, Purch. Agt.—complete machinery and equipment for the manufacture of small household specialties.

O., Youngstown—J. Pletenik, 800 Franklin St.—conveyors and machinery for the manufacture of building supplies.

O., Youngstown—Valley Cities Brick Co., N. T. Hurd, 214 Fairgreen Ave., Secy.—machinery and equipment for proposed plant for the manufacture of bricks, capacity 1,000,000 per month, at West Austintown.

Okla., Ardmore — Dougherty Sand & Gravel Co.—sand screens and 6 to 8 in. sand pump.

Okla., Cushing—White Ice Cream Mfg. Co., N. O. Newton, Mgr.—equipment for proposed factory.

Okla., Enid — R. Eddleman, 1021 East Bway.—linotype machine.

Okla., Miami—O. T. Dixon Printing & Stationery Co.—Miller feed attached to job printing press (used).

Okla., Miami—Miami Daily Record Herald, E. Martin, Purch. Agt.—newspaper cutter.

Okla., Miami — Miami Hat Wks., 120 North Main St., E. A. Hall, Purch. Agt.—belt driven tumbler and belting.

Okla., Ponca City — Burns of Midwest Creamery Co.—machinery for proposed $60,000 creamery.

Okla., Quapaw—S. B. Joplin (cleaning plant)—tumbler, belting and hangers.

Okla., Quapaw—W. A. Stevens—sander, belting, Universal saw, hangers, lathe, bearings, pulleys and bandsaw for planing mill.

Ore., Portland—Portland Pulp & Paper Co., R. H. Mills, Pres., 815 Broadway Bldg.—machinery for proposed $1,250,000 plant.

Pa., Camp Hill — West Shore Publicity Service—19 in. paper cutter.

Pa., Cresson—Penn Cress Ice Cream Co., Front St., R. J. Trexler, Pres. — mixers, separators and refrigeration plant for proposed $150,000 ice cream plant at Altoona.

Pa., Scranton—Jones Electrical Shop, 916 North Washington Ave., G. M. Jones, Purch. Agt.—electric welding outfits and equipment for proposed addition to shop.

Pa., Scranton—Lackawanna Laundry Co., 308-312 Penn Ave., A. B. Warman, Purch. Agt.—complete machinery and equipment for proposed $100,000 addition to laundry.

R. I., Pawtucket—Manville Jenckes Co.—machinery and equipment for large weaving shed at Gastonia, N. C.

R. I., Warren—Warren Fdry. Co.—foundry equipment.

Tenn., Erin—Rauscher Lime Co.—mechanical equipment, 1,000 bbl. daily capacity.

Tenn., Manchester—Universal Fly Exit Screen Co.—machinery for proposed factory.

Tenn., Nashville—Nashville, Chattanooga & St. Louis R.R., 1000 Bway., J. L. Woods, Purch. Agt.—machinery and equipment for getting out rock ballasting at Cumberland, Ala.

Tenn., Ridgely—Lake County Banner—7 x 11 in. or 8 x 12 in. job printing press, belting, hangers, pulleys and shafting.

Tex., Collinsville—The Shop, P. O. Box 112—pony sawmill, belting, hangers, pulleys, bearings, sander and planing machine.

Tex., Cooper — Review—split magazine for Model 14 linotype machine.

Tex., Dallas—Texas Boiler Wks., 3214 Hickory St., H. H. Sharp, Purch. Agt.—electric welding outfit.

Tex., Dallas—Washington Cotton Oil Co., Maple Ave., W. L. Patton, Mgr.—machinery for proposed $50,000 linter and separating room additions to cotton oil mill. MET

Tex., Midlothian—J. P. Ethridge—anvil, woodworker's vise, belt driven post drill and small hand tools for blacksmith shop.

Tex., Robert Lee—G. Cowan—newspaper press, job printing press, belting, hangers and pulleys.

Tex., San Antonio—Beacon Hill Ice Co., L. L. Stephenson, Pres., c/o Mission Ice Co., 226 Rivas St.—complete equipment for proposed 30 ton ice factory.

Tex., San Antonio—M. Halff & Son, 330 East Commerce St.—12 x 18 in. job printing press, capacity at least 2,000 per hour.

Vt., Bennington—J. A. Shoemaker, Inc.—woodworking machinery for small pieces of hard wood, including one planer and matcher, two planers, five shapers and one lathe.

Vt., North Pownal — Pownal Lime Co., Inc. (limestone fertilizer), W. Lawless, Mgr.—one 350 lb. and one 800 lb. steam drill for limestone rock.

Va., Altavista—Altavista Ice Co.—complete equipment for proposed ice plant.

Va., Bedford—Bedford Hardwood Co.—pin, bracket and shuttle block jaws.

Va., Wytheville—R. P. Johnson (machinery dealer)—No. 4 or 5 gyratory crusher, capacity 500 ton per day, complete with elevator and screens.

W. Va., New Martinsville—Republican—7 column quarto newspaper press, job printing press, paper cutter, belting, hangers, pulleys and shafting.

W. Va., Norton—West Virginia Coal & Coke Co.—coal handling equipment for tipple at Junior.

Wis., Appleton—S. W. Murphy, Mill and Lake Sts. (manufacturer of paper)—one electric traveling crane, about 10 ton.

Wis., Hartland — Hartland Creameries Co., c/o J. P. Haerle, Pres.—dairy machinery, vat, sterilizers, tubs, belting and shafting for proposed $50,000 creamery.

Wis., Madison — A. J. Sweet, 639 West Wilson St. (fruit dealer) — refrigeration equipment, brine type.

Wis., Milwaukee—Harsh & Chapline Shoe Co., 694 Hanover St.—siding, eyelet, vamping and stitching machines.

Wis., Monroe—Blumer Products Co. (manufacturer of dairy products, etc.) A. Blumer, Purch. Agt.—ice making machinery, several ton capacity.

Wis., Neillsville—Neillsville Canning Co.—machinery for proposed $40,000 addition to cannery.

Wis., New Glarus—New Glarus Post—folder for 6 column quarto.

Wis., Osseo—Gunam Bros. & Mosvick—gasoline storage tank, pump and air compressor for proposed $40,000 garage.

Wis., Spring Green—H. L. Gray—sorters, viners, sealers, etc., for cannery.

Wis., Valders—Valders Canning Co., c/o W. F. Christel—canning machinery, belting, shafting, etc., for proposed $50,000 factory at Hilbert.

Wis., Wausau—Marathon County, H. J. Vogt, Court House, Comr.—rock crushing machinery, including crushers, conveyors, screenings, etc.

Wis., Wausau—H. J. Vogt—gravel crushing plant and screening plant, motor power.

Alta., Calgary—Alberta Flour Mills, Ltd., W. B. Sifton, Purch. Agt.—complete equipment for flour mills.

Man., Winnipeg—Winnipeg Brick & Fuel Co., Ltd., Osborn St. and Mulvey Ave.—equipment for proposed expansion.

N. B., Fredericton—Escuminac Lumber Co., Ltd., J. B. McNair, Purch. Agt.—sawmill equipment.

Ont., Fort William—Canadian Iron Fdrys. Co. (manufacturer of brake shoes and special railway equipment)—equipment for foundry and furnace room, to replace fire loss.

Ont., Kincardine—J. McLeod—complete equipment for creamery at Port Elgin.

Ont., Kincardine—J. B. Watson—special machinery and equipment for the manufacture of reed furniture.

Ont., Kingston—Dye & Chemical Co. of Canada, Ltd., J. Hyland, Purch. Agt. — equipment for the manufacture of chemical products, preparations and apparatus.

Ont., Maxville—A. J. McEwen (saw and planing mill)—sawing machinery.

Ont., Morrisburg—Tindal Bros.—miscellaneous small tools, shears, etc., for garage.

Ont., Orillia—Canada Wood Specialty Co., Front and Coldwater Sts.—special woodworking equipment.

Ont., Walkerton—Canada Spool & Bobbin Co.—equipment for the manufacture of spool and bobbin parts.

P. E. I., Charlottetown—Montague Sash & Door Co., Ltd., I. Ives & Son, Purch. Agts. —complete equipment for sash and door factory.

Que., Montmagny—E. Laflamme—woodworking machinery for the manufacture of chairs.

Que., Montreal—Acme Supply Co., Ltd., 7 St. Nicholas St.—automatic jig saw.

Que., Montreal—Blair & Pelletier, 1580 St. Lawrence Blvd.—emery wheel and other equipment for automobile repairs.

Que., Montreal—A. Desjardins, 3872 Notre Dame St.—complete equipment for blacksmith shop.

Que., Montreal—Farand & Delorme, Ltd., 59 St. Martin St.—welding outfit.

Que., St. Therese de Blainville—Dion & Dion, B. Dion, Purch. Agt.—equipment for the manufacture of band cutters and feeders.

Alaska, Ketchikan—Supt. of Lighthouses —receiving bids until Jan. 21, 1924, for two internal combustion engine driven air compressors.

Metal Working Shops

Ala., Auburn—The Alabama Polytechnic Institute is having plans prepared for the construction of engineering building to contain a machine shop. Estimated cost $300,000. Warren, Knight & Davis, Auburn, Archts.

Calif., Fresno—The Benham Ice Cream Co., H St., awarded the contract for the construction of a 1 story garage and repair shop. Estimated cost $40,000.

Calif., Long Beach—Young & Gresham, c/o A. G. Bailey, Jr., Archt., Orpheum Bldg., are having plans prepared for the construction of a 1 story, 90 x 150 ft. garage on Anaheim Ave.

Calif., Los Angeles—W. Beck, 4519 Finley St., is having plans prepared for the construction of a 1 story, 50 x 150 ft. garage on Santa Barbara St. and Vermont Ave. J. J. Frauenfelder, Story Bldg., Los Angeles, Archt.

Calif., Los Angeles—Coony & Winterbottom, 1400 South Santa Fe Ave., manufacutrers of plumbing goods, awarded the contract for the construction of a 1 and 2 story, 95 x 140 ft. factory on Hunter St. Cost will exceed $40,000.

Calif., Los Angeles—J. A. Hill, c/o G. LaBarr, Contr., California Bldg., awarded the contract for the construction of a 1 story, 100 x 150 ft. garage on Crown Hill Ave.

Calif., Los Angeles—The Home Service Co., 779 Towne St., awarded the contract for the construction of a 1 story, 45 x 140 ft. garage on 8th St.

Calif., Los Angeles—The Pacific Wire Screen Co., 1840 East 15th St., awarded the contract for the construction of a 1 story (ultimately 2 story), 75 x 250 ft. factory.

Calif., Los Angeles—The Southern Pacific Co., Pacific Electric Bldg., awarded the contract for the construction of a 90 x 500 ft. locomotive erecting shop, etc., on Alhambra Ave. Estimated cost $200,000. Noted Nov. 15.

Calif., Los Angeles—The Ward Heater Co., 1243 South Hope St., is having plans prepared for the construction of a group of factory buildings, including foundry, assembling plant, warehouses, etc. Cost will exceed $175,000. B. J. Bloser, Consolidated Realty Bldg., Los Angeles, Archt.

Calif., Oakland—The Bastian Mfg. Co., 2117 Violet St., Los Angeles, plans to build a factory for the manufacture of water heaters, here. Cost will exceed $40,000.

Calif., Oakland—The Crowley Launch & Tug Boat Co., foot of Howard St., will build a 1 story machine shop, foot of 14th Ave. Estimated cost $11,000.

Calif., San Francisco—The Central Finance Co., c/o W. F. Gunnison and H. P. Merritt, Archts., 57 Post St., is having plans prepared for the construction of from thirty to forty garage buildings in various sections of San Francisco Bay district. Estimated cost $25,000 each.

Calif., San Francisco—The Drendell Electric & Mfg. Co., 1345 Howard St., is having plans prepared for the construction of a 1 story factory on Howard and Erie Sts. Estimated cost $40,000. Private plans.

Calif., San Francisco—The Riddle Sheet Metal Wks., 1067 Folsom St., is having plans prepared for the construction of a 2 story shop on Folsom and Sherman Sts. Estimated cost $15,000. D. A. Riedy, Pacific Bldg., San Francisco, Archt.

Conn., Bristol—The New Departure Mfg. Co., 269 North Main St., manufacturer of hardware specialties, awarded the contract for the construction of a 1 story, 130 x 600 ft. factory. Estimated cost $55,000. Noted Nov. 22.

Conn., Hartford—The Standard Oil Co., Wawarme Ave., is having plans prepared for the construction of a 1 story garage and service station on Windsor Ave. Estimated cost $50,000. Private plans.

Conn., Putnam—The Lowell Needle Co. has had plans prepared for the construction of a 2 story, 50 x 100 ft. factory. Estimated cost $45,000. Private plans.

Conn., Waterbury—The Waterbury Farrell Fdry. Co., 425 Bank St., awarded the contract for the construction of a 2 story, 48 x 52 ft. factory. Estimated cost $40,000. Noted Nov. 22.

Ill., Ottawa—E. L. Damon, Centralia, representing owner, awarded the contract for the construction of a 2 story, 100 x 155 ft. garage, here. Estimated cost $40,000.

Ind., Fort Wayne—The Schiefer Auto Co., 715 Barr St., is having plans prepared for the construction of a 1 story, 60 x 150 ft. automobile service building. Estimated cost $75,000. Pohlmeyer & Pohlmeyer, Central Bldg., Fort Wayne, Archts.

Ind., Fort Wayne—The Wayne Oil Tank & Pump Co., Anthony Hotel, plans to build an addition to its plant for the manufacture of gasoline pumps, etc. Estimated cost $50,000.

Ind., Indianapolis—L. B. Millikan, Barton Hotel, is having plans prepared for the construction of a 1 story, 97 x 107 ft. garage on Talbott and East 21st St. Estimated cost $50,000. Private plans.

Ind., Indianapolis — The Ostrom Realty Co., Peoples Bank Bldg., will build a 1 story, 195 x 202 ft. garage on East Ohio St. Estimated cost $125,000.

Ind., Kokomo—The Realty Co. is having plans prepared for the construction of a 2 story, 33 x 132 ft. garage. Estimated cost $60,000. E. Eberhardt, Pres. Vonnegut, Bohn & Mueller, 610 Indiana Trust Bldg., Indianapolis, Archts.

Ky., Louisville—The Highway Iron Products Co., Columbia Bldg., plans to build a 1 story, 80 x 250 ft. factory for the manufacture of bridge iron and drainage material for highways on 17th and Magnolia Sts. Estimated cost $106,000.

Md., Baltimore—H. Gamse & Bros., 421 Exchange Pl., awarded the contract for the construction of a 2 story, 25 x 104 ft. garage and office building at 423 Exchange Pl. Estimated cost $40,000. Noted Nov. 22.

Md., Baltimore—The General Elevator Co., 400 South Charles St., is having plans prepared for the construction of a 1 story, 65 x 160 ft. factory on Bush, Russell and Ridgely Sts. Estimated cost $50,000. W. S. Austin, 1002 Maryland Trust Bldg., Engr.

Md., Baltimore—The Leonhardt Wagon Wks., 417 East Saratoga St., will build a 1 story, 156 x 250 ft. factory on 8th St. near Philadelphia Rd. Estimated cost $60,000.

Md., Baltimore—F. Schulte, 3600 Dillon St., will build two 1 story, 140 x 150 ft. and 150 x 190 ft. garages on Fleet and 5th Sts. Estimated cost $43,000.

Mass., Cambridge—The Columbia Cornice & Skylight Co., 268 Elm St., plans to build a 1 story metal working plant. Estimated cost $20,000.

Mich., Battle Creek—The Rich Steel Products Co. is having plans prepared for the construction of a 2 story, 80 x 131 ft. factory for the manufacture of castings, machinery, parts, etc. Estimated cost $42,000. Private plans.

N. J., Trenton—Holmes, Inc., 29 Chancery Lane, is having plans prepared for the construction of a 2 story, 56 x 106 ft. battery service station and work shop. Estimated cost $65,000. F. D. Priory, 11 West State St., Trenton, Engr.

N. Y., Brooklyn—The Aaron Constr. Co., c/o A. Goldberg, Engr. and Archt, 164 Montague St., will build a 1 story, 150 x 200 ft. garage on Dean St. Estimated cost $60,000.

N. Y., Brooklyn—J. Stattman, c/o T. Goldstone, Engr. and Archt., 50 Graham Ave., is having plans prepared for the construction of a garage on 39th St. Estimated cost $100,000.

N. Y., New York—A. J. Schwartzle, c/o S. J. Kessler, Engr. and Archt., 529 Courtlandt Ave., will build two garages on Morris Ave. Estimated cost $85,000 each.

N. Y., New York—The Western Realty Corp., c/o V. Mayper, Engr. and Archt., 15 East 40th St., will build a 2 story, 100 x 150 ft. garage on West 207th St. Estimated cost $60,000.

O., Cleveland — The E. H. Bryant Co., 1251 Superior Ave., awarded the contract for the construction of a 2 story, 36 x 150 ft. addition to its garage. Estimated cost $50,000.

O., Cleveland—Christian, Schwarzenberg & Gaeda, Archts., 1900 Euclid Ave., are receiving bids for the construction of a 2 story, 93 x 180 ft. garage at 1841 Prospect Ave. for the Private Investment Co., c/o S. Miller, 1822 Central Ave. Estimated cost $150,000.

O., Cleveland—The Echo Dairy Co., 7103 Aetna Rd., has had plans prepared for the construction of a 2 story, 50 x 115 ft. factory and garage on Crane Ave. Estimated cost $60,000. B. Stern, Pres. A. F. Janowitz, 311 Prospect Ave., Cleveland, Archt.

O., Cleveland — The Ferro Machine & Fdry. Co., East 66th St. and Hubbard Ave., awarded the contract for the construction of a 1 story, 100 x 200 ft. factory. Estimated cost $75,000. E. W. Beach, Pres.

O., Conneaut—The New York, Chicago & St. Louis R.R., Columbia Bldg., Cleveland, is having plans prepared for the construction of a 1 story machine shop and office, here. Estimated cost $50,000. E. E. Hart, Ch. Engr.

O., Minerva—The G. H. Bowman Co., 224 Euclid Ave., Cleveland, plans to build a 3 story, 46 x 90 ft. factory for the manufacture of toys of wheel type, here. Estimated cost $75,000.

O., Plainville—The Bd. of Comrs. of Hamilton County, C. Brown, Pres., Courthouse, Cincinnati, will receive bids until Dec. 14 for the construction of a repair station, here.

O., Youngstown—The McKay Machine Co., Rayen Ave. and Foster St., manufacturer of sheet leveling machinery, awarded the contract for the construction of an addition to its plant. Estimated cost $50,000. T. L. Thomas, Genl. Mgr.

O., Youngstown—The Truscon Steel Co., Albert St., will build a 1 story addition to its plant, to contain 100,000 sq.ft. of floor space. Estimated cost $400,000. J. Kahn,

Ore., Portland—F. E. Taylor, 1201 Yeon Bldg., is having plans prepared for the construction of a 2 story, 100 x 100 ft. garage on Washington and Ella Sts. Estimated cost $75,000. Shacht & Bergen, 607 Worcester Bldg., Portland, Archt. Packard Service & Sales Co., 10th and Burnside Sts., lessee.

Pa., Phila.—Henry & Gunkel, Broad and Belfield Sts., awarded the contract for the construction of a sales and service station. Estimated cost $40,000.

Pa., Phila.—M. J. Powers, Broad and Cumberland Sts., awarded the contract for the construction of garage, sales and service station. Estiimated cost $177,500.

Tenn., Manchester — The Universal Fly Exit Screen Co. plans to build a screen factory along tracks of the Nashville, Chattanooga & St. Louis R.R.

Tex., Fort Worth—E. T. Glasgow, Archt., 1st Natl. Bank Bldg., will receive bids until Dec. 21 for the construction of a 3 story, 100 x 100 ft. garage on 1st and Commerce Sts., for the F. H. Jones Co., 200 Commerce St. Estimated cost $65,000.

Va., Richmond—The W. T. Rawleigh Co., 101 South Liberty Ave., Freeport, Ill., awarded the contract for the construction of a 2 story, 75 x 190 ft. warehouse and garage, here. Estimated cost $75,000. Noted Nov. 1.

Wis., Janesville — The Chevrolet Motor Co., c/o C. E. Wilson, Engr., will build a 2 story, 75 x 90 ft. addition to its factory. Estimated cost $75,000.

Wis., Madison—A. J. McCann, 204 Mearey St., is having plans prepared for the construction of a 1 story, 60 x 100 ft. garage and repair shop on Washington St. Estimated cost $40,000. Private plans.

Wis., Madison—L. F. Schollkoff, 210 East Washington Ave. (Ford garage), awarded the contract for the construction of a 4 story, 43 x 85 ft. garage and repair shop. Estimated cost $45,000.

Wis., Milwaukee—The Natl. Biscuit Co., 12 Erie St., awarded the contract for the construction of a 1 story, 54 x 100 ft. garage on Milwaukee St. Estimated cost $40,000.

Wis., Milwaukee—The Prime Mfg. Co., 653 Clinton St., is having plans prepared for the construction of a 1 story, 60 x 120 ft. brass foundry. Estimated cost $50,000. F. D. Chase, Inc., 645 North Michigan St., Milwaukee, Engr.

Wis., Osseo—Gunam Bros. & Mosvick will build a 1 story, 48 x 100 ft. garage. Estimated cost $40,000.

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Grinding in the Railroad Shops

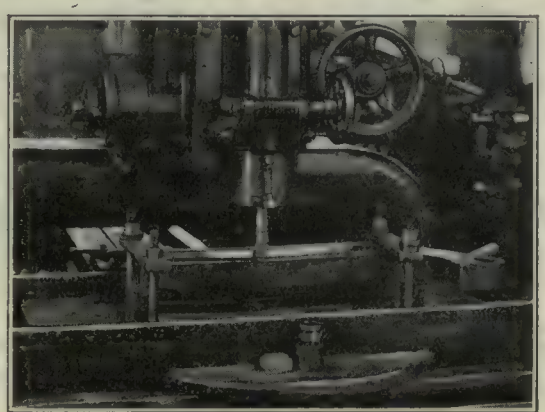
By HOWARD CAMPBELL
Western Editor, *American Machinist*

Illustrations and data collected from various railroad shops where grinding machines are used on a variety of work—The wide range covered is of unusual interest

IN COLLECTING these illustrations and the data which accompany them it has been my aim to show something of the growth of grinding in railroad shops and to point out the variety of work that is being ground in some of them. The detailed information is given as concisely as possible so that anyone may easily compare the results with those obtained in his own shop.

It is hardly to be supposed that the best wheels, feeds and speeds are being used in all cases. There is perhaps more difference of opinion regarding these three factors than on anything else in the shops. Even in shops where grinding is an old story, there is a vast difference in the methods found.

The examples given will, however, serve to show that advances are being made in railway shop practice in many shops. In too many instances the shops are handicapped by inadequate equipment and in cases where the methods differ from those of large production shops it is because the only equipment available must be used. Instances of this are shown in Figs. 1 and 2. The first shows a standard machine for link grinding while in the second is a home-made device for doing the same work. Needless to say the work is done without the planetary movement of the head of the cylinder grinder. The slot in the link, shown in Fig. 1, is cut from the solid with a gas torch using a templet. It is finished approximately to size on a slotter. Time required to grind a new link is from 3 to 4 hr. To repair a link with a bad twist, such as when badly worn, 3 to 4 hr. The link shown is of case-hardened wrought iron with $\frac{3}{32}$ in. left by the slotter, for grinding. The wheel is wide enough to cover the work and moves up and down vertically for $\frac{5}{8}$ in., 27 times a min. The time for work to travel past wheel and return is 22 seconds.



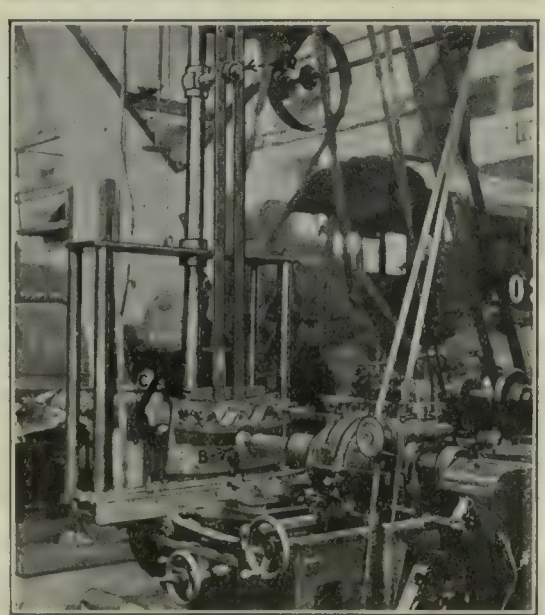


FIG. 1—NEWTON LINK GRINDER. FIG. 2—SECTION OF LINK ON MADISON INTERNAL GRINDER

The work shown in Fig. 2 is clamped to piece *A* which is held by pin *B* to angle plate *C*, the latter being bolted to table of machine. Piece *A* is held by a swivel at point *D* so that as machine reciprocates, the plate *A* swings on pin *B* and the desired radius is ground on the piece. A sectional link is composed of four pieces, each of which is ground in approximately 15 min., making 1 hr. for the link.

The material is case-hardened steel with enough material to just clean up and is ground dry. Wheel is carborundum 36-H, running 7,500 r.p.m. The feed is 10 ft. per minute.

Railroad shopmen are fully alive to the possibilities of grinding in many cases. They are very apt to point out work which they would like to grind if they had the proper equipment. And it must not be forgotten that by equipment we must include a sufficient supply of proper grinding wheels as well as the machines themselves.

It will, unfortunately, require considerable education to bring railway purchasing agents and those who control the order of supplies to the point of ordering the exact wheels specified and, unless the proper wheel of the correct grade is supplied, the best results cannot be obtained. Those who are not familiar with grinding can hardly be expected to appreciate the fact that,

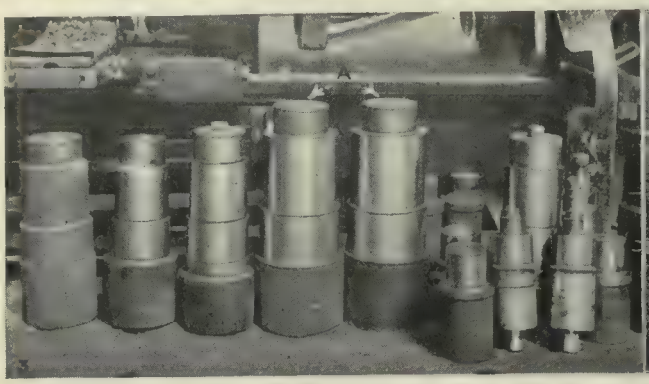


Fig. 3 — Large crankpins *A* are ground on the 9 and 10 in. diameters. Old method includes rough and finish turning and rolling. Time, 3 hr. 45 min. complete. Pins are now ground on Norton grinder. Time, 2 hr. 15 min. complete. The small crankpins took 2½ hr. each to turn and roll; to turn and grind 2 hr. each.

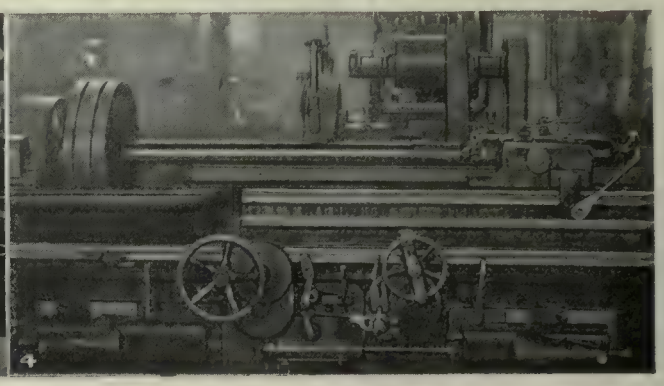
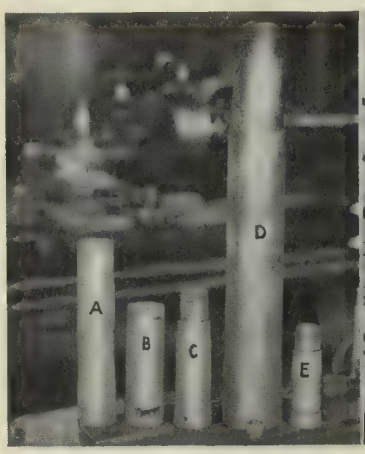


Fig. 4—Piston rod on 90-in. Norton gap grinder. Rod, 4½ in. diameter. Wheel, 24 x 3⅜ x 5 in. hole. Grain, 24-C. Grade, K alundum. Cut 0.002 in. Old method included roughing and finishing cuts and rolling. Time, 2 hr. Present method rough cut, then grind. Grinding time, approximately 25 min.



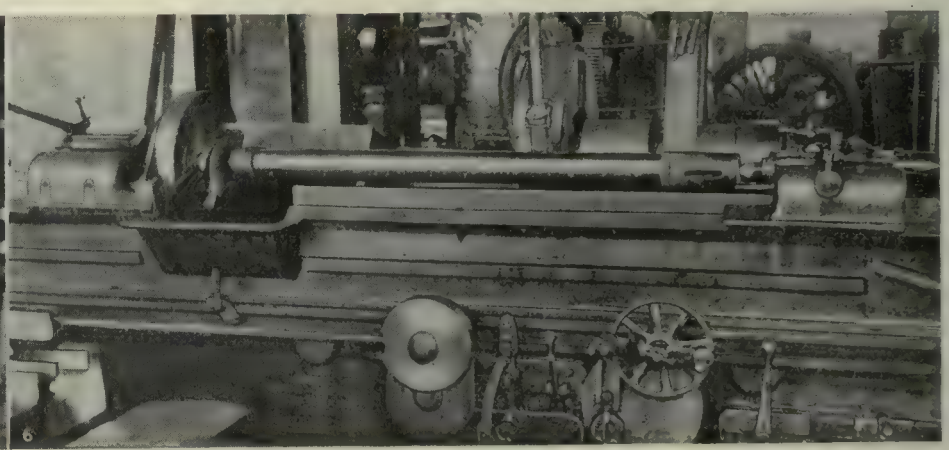
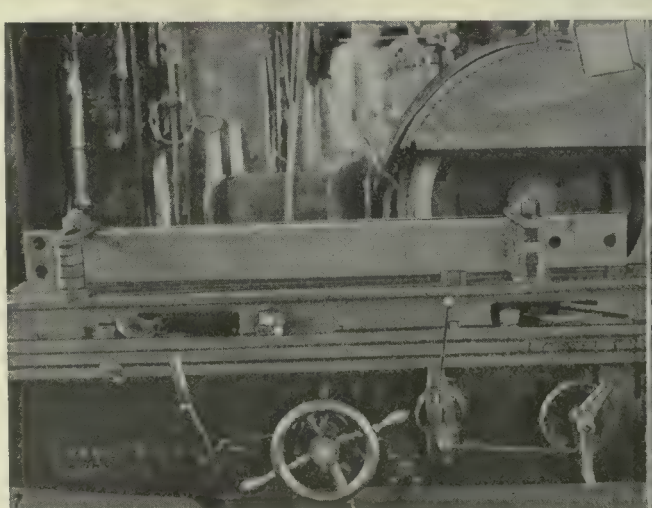


Fig. 5 — Work done on Landis grinder. Amount left for grinding, $\frac{1}{32}$ in. Time: *A*, 3 bearings, 15 min.; *B*, 3 bearings, 10 min.; *C*, 1 bearing, 5 min.; *D*, 1 bearing, 30 min.; *E*, 1 bearing, 5 min. Wheels used, 12 x 1 x 5 in., 46-M aloxite and 14 x 1¼ x 5 in., 46-M aloxite.

Fig. 6 — Piston rod in Norton grinder. Material, steel. Clean up on repairs; $\frac{1}{32}$ in. stock left for grinding on new rod. Wheel, 24 x 3⅜ x 5 in. hole. Grain 24-C. Grade K alundum. Traverse: roughing, 3 ft. per min.; finishing, 1 ft. per min. Work speed, 16 r.p.m. Cut, 0.002 in. Time, new rod, 45 to 60 min.; worn rod, approximately 30 min.



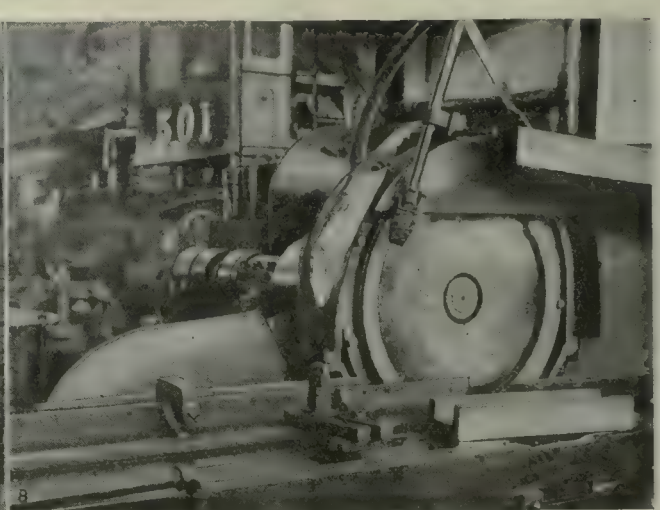


Fig. 7 — Grinding guides on Diamond grinder. Repairs only. Material, steel forging. Held by clamps. Wheel, carborundum ring with 2 in. surface. Speed 700 to 800 r.p.m. Feed, 0.001 in. per rev. Depth of cut 0.001 in. Stock, $\frac{1}{64}$ to $\frac{1}{16}$ in. on a side. Grinds face and sides of bottom guide; top guide on face only. Grinds from 4 to 6 guides in 8 hr.

Fig. 8—Grinding shoes on a Diamond grinder. Material, cast iron. Usually takes 0.006 to 0.008 in. at a cut. Wheel, 30 x 6 x 26 in. Speed, 400 r.p.m. Traverse 16 ft. per min. First planed on inside, then ground on outside. Stock allowed for grinding $\frac{1}{32}$ to $\frac{1}{16}$ in. Time 8½ min. per shoe.

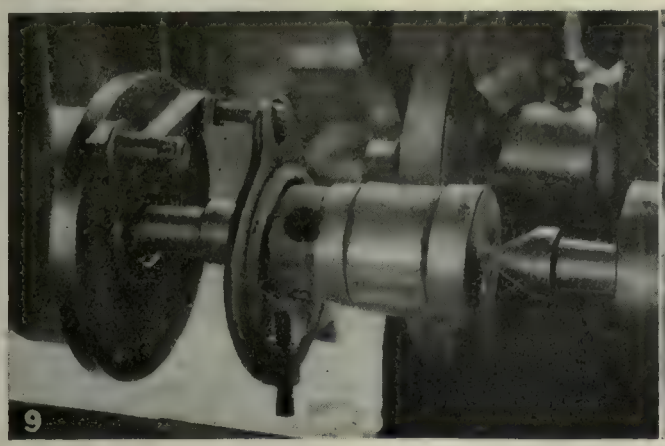


Fig. 9 — Grinding case-hardened link pin on Landis grinder. Material case-hardened forging. $\frac{1}{64}$ in. total stock left for grinding. Wheel, 46-M aloxite, 14 x 1¼ x 5 in. Wheel speed, 1,500 r.p.m. Work speed, 140 r.p.m. Depth of cut, 0.002 in. Limits, 0.002 to 0.005 in. Grind to running fit in bushing.

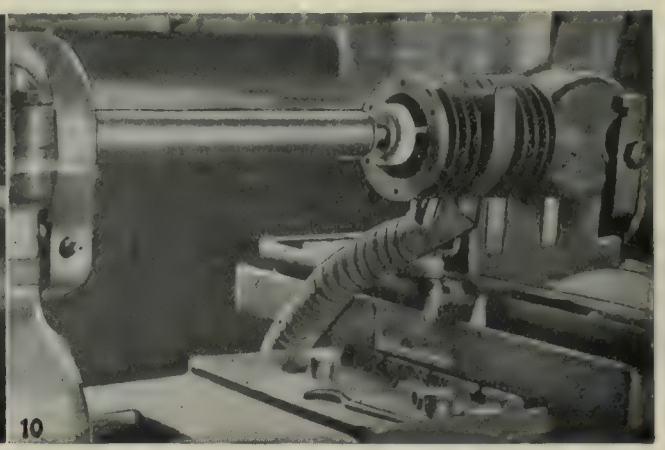


Fig. 10—Grinding barrel of Mudge gas-engine cylinder for inspection car. On Heald cylinder grinder. Piece held by angle plate, bolt and strap (fixture will be made). Wheel 36-I, crystolon, 3½ x 1 x 1¼ in. Speed, 6,900 r.p.m. Feed, approximately 0.15 in. Cuts, rough 0.001 in., finish 0.0005 in. Grind 0.010 in. in 40 min.

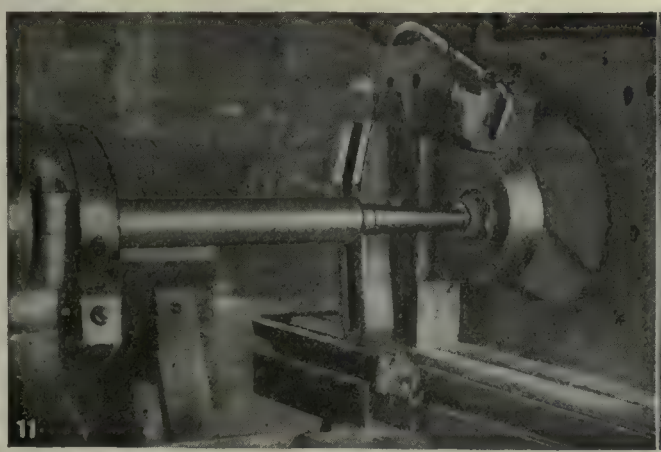


Fig. 11—Grinding hole in knuckle-pin bushing in middle side rod on Heald cylinder grinder. Material, case-hardened steel. Wheel, 50-M, aloxite. Speed, 3,600 r.p.m., spindle circling in hole at rate of 34 r.p.m. Amount of stock, 0.010 in. Hole 3½ in. diam. x 2 in. long. Grind to slip fit on pin. Set up and grind, 1 hole 30 min.

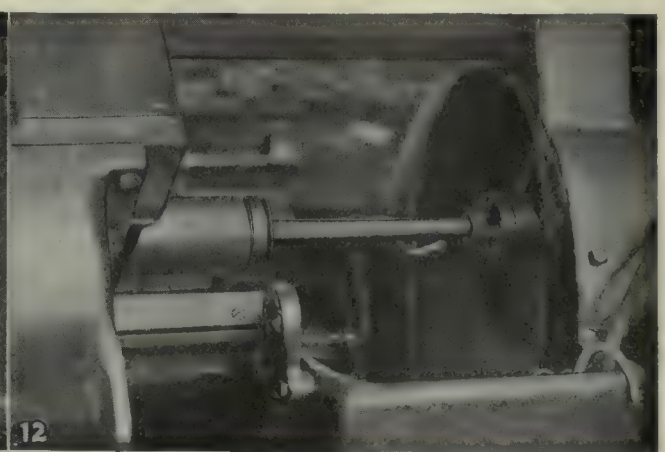


Fig. 12—Grinding steel link-bushing in Bryant chucking grinder. Dimensions, 2¼ in. inside x 4 in. long with ⅛ in. wall. Wheel, 2 x ⅝ in. Speed: Wheel, 2,200 r.p.m.; work, 180 r.p.m. Amount of stock for each bushing 0.005 in. Limit, 0.005 in. Time, 10 to 15 min.

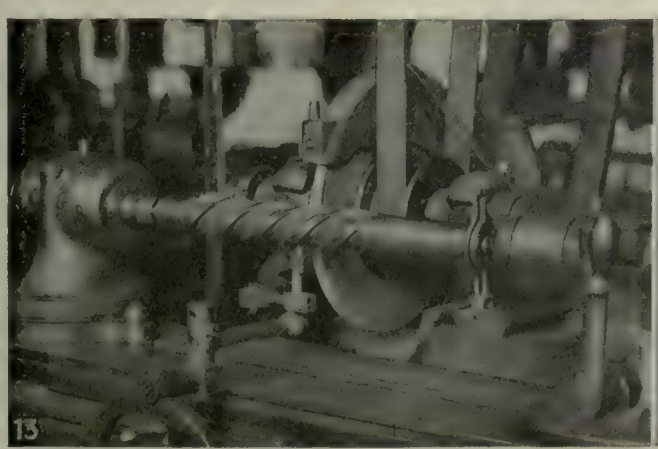


Fig. 13—Grinding helical cutter for milling ends of side rods on Brown & Sharpe No. 2 grinder. Tooth support bolted to machine by two bolts through ends of curved section at front and bolted to machine under wheel bearing, making rigid support. Wheel, 60-M, aloxite, 12 x ⅛ x 5 in. Speed, 1,200 r.p.m. Time, 15 min. each.

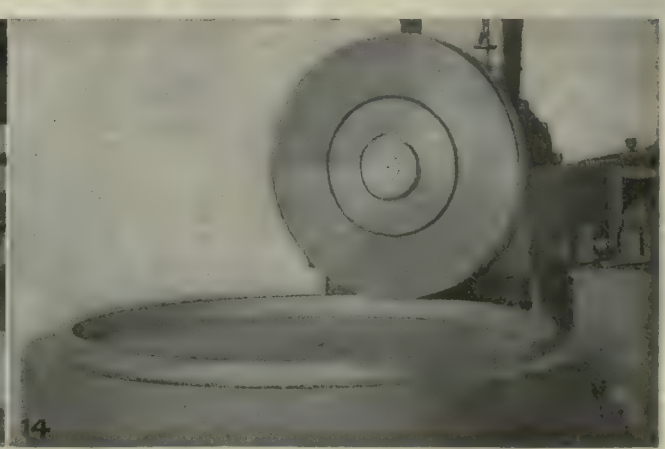


Fig. 14—Grinding 15$\frac{7}{16}$ x ⅝ x 17/32-in. ring for piston valve on machine built by Locomotive Finished Material Co. Magnetic chuck will take 24 in. ring; auxiliary chuck will grind 44 in. diameter. Wheel, 2 x 14 in. Hand feed. Work speed, 42 r.p.m. Stock 0.010 in.; 0.005 in. on a side. Production, 50 to 60 rings per hr.

though all grinding wheels may look alike, there is a vast difference if the best work is to be secured.

The various illustrations deserve careful study and it must be remembered that the examples shown represent a marked step in advance during the past five years. It takes considerable courage to advise the purchase of equipment which is entirely of a new kind for the shop. Nor is it always easy to get a fair trial for a new machine, both on account of the physical difficulties and of the inertia of the personal element. But grinding is growing in railway shops and these examples may help to encourage others.

In the case of the piston rod shown in Fig. 4, the men emphasize not only the time saved but the difference in finish, the straightness of the rod and the effect on the rod packing, the wear being materially lessened.

In Fig. 8 is shown a change from planing to grinding. Patterns were changed so that there is only about $\frac{3}{32}$ in. to $\frac{1}{16}$ in. stock on the outside of the casting. A string of six castings is held by clamps to the bar as shown, and the first side cleaned up. The shoes are then turned and finished to size. The cost of planing is 23 cents each and of grinding, 12 cents each.

When these shoes were planed there was a machining allowance of $\frac{1}{4}$ to $\frac{3}{8}$ in. of metal. This has been reduced from $\frac{3}{32}$ to $\frac{1}{16}$ in. for grinding. The shoes are first planed inside to fit frame pedestal, then ground to size on the outside. Some of the comparative times are as follows:

	Planing Time	Grinding Time	Planing Cost	Grinding Cost	Saving
Valves	16 min.	8½ min.	23c.	12c.	11c.
Shoes	50 min.	18 min.	70c.	25c.	45c.

Rough and finish ground in one operation, six ground at once.

In Fig. 10 a finish cut is taken through and return twice, to insure a perfect bore. This is a small repair job so just enough is taken out to clean up. If the cylinder is not scored, approximately 0.010 in. is removed; if scored, from 0.015 in. to 0.020 in. The machine is operated dry. Link blocks, cylinders for operating butterfly fire-box doors, valve guide blocks, etc., are also ground on this Heald cylinder grinder.

The Heald cylinder grinder, shown in Fig. 11, is also used to grind the case-hardened steel bushing for floating bushing, in the back end of the main rod. The hole is 9 in. in diam. by 7 in. long. Time complete, 2 hours.

Railroad Shop Repair Work—Discussion

BY CHESTER LYNNDELLE

The article on page 600, Vol. 59, of the *American Machinist*, by I. B. Rich, under the title given above, mentions a series of 1-in. holes being drilled across the face of an axle to free a tight wheel. This recalls a somewhat similar experience in the shop where I first worked at locomotive repairing. We had a press for removing wheels, and in this case a set of drivers came in for which it was imperative that the axles be preserved intact.

When the press, with as much of a pressure overload as possible, failed to start the wheel, we rigged up a sling and brace to hold two heavy air hammers, on opposite sides of the axle and parallel to it. The grips were backed with formed rubber pads to permit just enough "give" to the support to eliminate breakage. The hammer dies were set against the inner side of the wheel hub, pressure built up in the press cylinder, and held at the maximum allowable and the air hammers were started.

After a few minutes continuous jarring the wheel began to creep on the axle, and finally came off with ease. The steady pulsations of the air hammer amplified the effective pressure so well that later experiments demonstrated the advisability of hammering for as long as fifteen minutes before resorting to the drilling method.

Later, on a contract job for another railroad, we got in a locomotive on which the driving brasses had all run very hot, and the wheels were very tight on the axles. As in the other instance, lack of suitable stock made it imperative to save the axles or delay the work for we were under a time contract that meant money one way or the other, depending on the delivery date.

Our pet air-hammer scheme failed to free the wheels, and it was finally decided to telegraph for new axles, but in the meantime we decided to try a new plan. We had four $\frac{1}{4}$-in. holes drilled into the joint between wheel and axle, carrying their depth to within 2 in. of the axle shoulder. The outer ends of these holes were then reamed and tapped for $\frac{1}{8}$ in. pipe thread, the holes filled with a light oil (of the type used for auto spring lubrication), and standard automobile pressure lubrication system couplings screwed in. A pressure of 3,000 lb. per sq.in. was applied with grease and held there until oil showed at the shoulder under the wheel.

The success of the scheme was astonishing, even to the foreman originating it, and the wheel yielded readily to the press without the aid of the air hammers. The oil spread as soon as the wheel began to move; but we were able to determine from the darkened areas that the oil under pressure had found its way to a distance of nearly 2 in. on each side of the holes, relieving the grip of the hub enough for the press to function.

The small drill holes in both wheel and axle were electric welded and faced off to the proper arc, without reducing the strength of either part appreciably, and the engine was repaired and delivered before the new axles arrived.

New Glycerine-Water Quenching Medium

In connection with the investigation made by the Bureau of Standards of steels for the manufacture of precision gages, an effort has been made to find a quenching medium intermediate between oil and water. During the past month, quenching curves were taken of specimens cooled in water solutions of glycerin. Such solutions fill the gap effectively, so far as the cooling rates at high temperatures are concerned. On the other hand, glycerin and its water solution cool distinctly faster in the lower temperature ranges than quenching oil. This appears to be a desirable property.

As a commercial quenching medium glycerin or its water solutions should not be unduly expensive, for although the first cost is high, glycerin does not decompose to any great extent on heating, as is the case with oils. The composition of glycerin-water solutions may be easily maintained by hydrometer tests. The solutions do not give off irritating fumes and are harmless to the worker.

How Rivett Makes Spring Collets

SPECIAL CORRESPONDENCE

Formed upon Gridley automatics — Held upon centers in succeeding operations — Turning and threading on engine lathes — Sawing the slots — The final grinding

SPRING collets for bench and toolroom lathes have long since become so familiar an adjunct of the toolroom that the average user accepts them as a matter of course, with little or no thought of the problems or processes of the manufacturer. Any toolmaker will acknowledge that the making of a single true-running collet of accurate size is a job that calls for no small degree of skill and consumes a considerable amount of time, and, being confronted with such a job, he may be curious to know how collets are made in quantities when every step must be carefully calculated to secure the greatest amount of product in a given time without sacrifice of accuracy or finish.

The name of Rivett upon a spring collet has long been accepted as a guarantee of excellence. The Rivett Lathe & Grinder Corp., of Boston, Mass., has been making collets for bench and toolroom lathes, small grinders and similar machines for many years, and it is from this factory that the data and photographs from which this article was prepared were obtained.



FIG. 1—FORMING COLLETS ON THE GRIDLEY

The raw material from which collets are made is received at the factory in the shape of hot-rolled bars of Sanderson No. 4½ temper tool-steel about $\frac{1}{16}$ in. larger than the largest diameter of the finished product. Though collets are made by the Rivett Co. to hold from $\frac{3}{8}$ in. down to 0.010 in. in diameter, there are but seven sizes so far as concerns outside diameters and lengths.

The first steps toward the production of the finished collets are made in the Gridley automatics, one of which is shown in Fig. 1, which reduce the bar stock to the familiar appearance of the collets as shown in Fig. 2, at the rate of 10 pieces per hour for the smallest sizes down to 5 pieces per hour for the larger ones. One operator runs several machines. In this machine the pieces are successively spot-centered, shouldered for threading portion, the stock at the center of the bar removed by drilling and the body turned to size, plus grinding allowance, by tools held in the turret. In the final turret position, a steady rest supports the outer end of the piece while a form tool in the cross-slide is shaping the beveled head and the piece is being severed from the bar by a tool held in the cut-off arm.

No threads are cut on the Gridley machines, and no through hole is made at this stage. Ordinarily it is not known at this time what the nominal holding size of the collet is to be and therefore the large drill that takes out the stock at the center is stopped at a distance from what is to be the finished face of the collet of about twice the average nominal holding diameter for the range of holding sizes this particular body size is expected to cover.

The cut-off tool is purposely shaped to leave a substantial tit, or projection, at the point of severance, as may be seen in Fig. 2, when the piece is separated from the bar of stock, and advantage is taken of this projection to make a male center at this end upon which to support the individual collets while undergoing succeeding operations.

As all collets of any one lot are now of a uniform (though not standard) size, they can themselves be held in special spring collets of larger capacity. By this means they are held in the spindle nose of the hand screw-machine shown in Fig. 3 while a form tool in the cross-slide reduces the projection left by the cut-off tool of the Gridley to a standard 60-deg. male center.

The pieces then go to a bench lathe where they are held by means of the male center at one end and upon a steady rest at the other while the open end is chamfered to a 60-deg. angle, thus providing a female center at this end. In all subsequent operations the collets are supported in the machines by these centers.

The next two operations are performed upon standard engine lathes, and have to do with the thread by means of which the draw-bar engages the collet when in service and pulls it back against the beveled sleeve in the spindle of the machine—the feature from which the spring collet derives its popular designation of "draw-in chuck." It will be remembered that no thread was cut during the preliminary operation upon the Gridley machine, and this omission is because it is desired to make the male and female centers upon which the work can now be supported the basis, or point of departure, for all operations affecting concentricity.

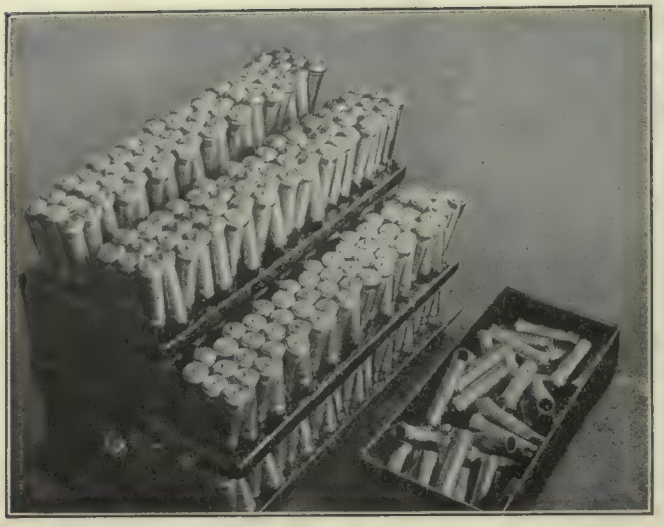


FIG. 2—METHOD OF HANDLING THE WORK

Therefore the shoulder at the rear end of the collet, upon which the thread is to be cut, and which was left a few thousandths oversize by the tools of the Gridley, is now turned with a single point tool to the finished outer diameter of the thread. Next, the pieces pass to another and similar lathe where they are again supported upon the centers while the thread is cut.

The threading tool, shown in position in the lathe in Fig. 4, is the well-known "Rivett" device, resembling a ten-tooth milling cutter in which the first tooth is but a rudimentary thread form while each succeeding tooth approaches more nearly to a full 60-deg. V until the tenth tooth is reached, which is a full formed threading tool. The carriage of the lathe is traversed back and forth in the manner usual to thread cutting in engine lathes and the cutter is rotated and locked in position at each successive tooth at each pass until it has passed ten times over the thread and the latter is completed.

In each collet there is a short keyway to engage with a corresponding key in the spindle of the machine in which the collet is to be used, to prevent the latter from turning with relation to the spindle. This keyway is next milled in a hand milling machine in which the work is held in a fixture that supports it from the centers.

The next operation is that of grinding the body of the collet to finish size, performed in a standard Norton grinding machine in which the work is supported by the centers. A "set" wheel is used and the work is fed straight toward the wheel without traverse. The second grinding operation, that of grinding the 30-deg. angular gripping surface under the head of the collet, is done in the same way with the wheel head set at the corresponding angle.

A few minor operations follow, such as stamping the trademark on the body of the tool, removing burrs, and rounding over the end with a handtool; the latter operation being performed in a bench lathe in which the collet is held in the spindle by the regular draw-bar. This operation removes the male center upon which the turning and grinding operations have been done, and leaves a slight depression that is truly central with the collet for the purpose of starting the drill in the next operation; which is drilling the hole that constitutes the holding part of the collet. This hole is not, however, drilled at this stage. Instead, the collets go to the stock room as "semi-finished" blanks.

It would be impossible for the manufacturer to forecast the demand for specific sizes of collets and to meet all orders with immediate shipments would necessitate a prohibitively large stock of the finished product.

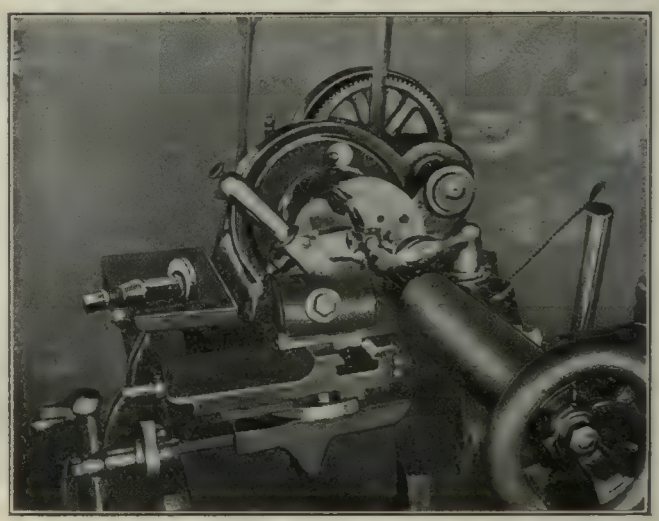


FIG. 4—CHASING THE THREAD FOR THE DRAW-BAR

Therefore the collets are thus held in the stock room as semi-finished material, to be drawn upon and put through the final operations that determine the actual holding sizes as the orders demand. A suitable number of completely finished collets of the sizes most used is also carried in stock.

The first operation in the second stage, when the collets have been issued from the stock room upon specific order, is drilling and reaming the hole. This is performed in a small hand screw-machine in the spindle of which the collets are held by a draw-bar in the usual manner, for at this time they are finished so far as the exterior surfaces are concerned. A hole is drilled and reamed in each collet to a diameter from 0.005 to 0.007 in. below the nominal holding size as specified by the order.

The holding size—$\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, etc., as the order may indicate—is then stamped on the face of the collet and it goes to the hand milling machine shown in Fig. 5 to be slit. In this illustration the actual operation shown in the slitting of some special "push" collets of a kind not regularly included in the line of manufacture, but the fixture is the same as is used on the regular work. A separate fixture is required for each size (body size)



FIG. 3—FORMING THE MALE CENTER ON THE OUTER END



FIG. 5—SLITTING, OR "OPENING" THE COLLETS

of collet and the regular collet is, of course, almost wholly within the fixture; the saw being guided by a slot in the steel bushing.

If the size is to be ¼ in. or larger, a single saw is used to cut clear through to the central hole and open the collet. If the collet is under ¼ in. but is ⅛ in. or more, the saw cuts down but part way and leaves a small amount of material surrounding the hole. A thinner saw, taking up the work at the bottom of the kerf left by the first saw, completes the cut.

On collets less than ⅛ in. and down to 0.010 in. in diameter the saw is not allowed to reach the center



FIG. 6—THE FILE USED TO OPEN THE SMALLER COLLETS

hole but stops at a distance from it depending somewhat upon the size of the hole and the collet is then opened by means of the file shown in Fig. 6, the thickness of which at the center is such that it fits smoothly in the kerf left by the saw and from thence bevels to a knife-edge either way. The filing is carried just far enough to separate the stock but not far enough to remove an appreciable amount of material from the circumference of the hole.

The collets are now ready for hardening and tempering. Contrary to popular belief they are not "sprung"

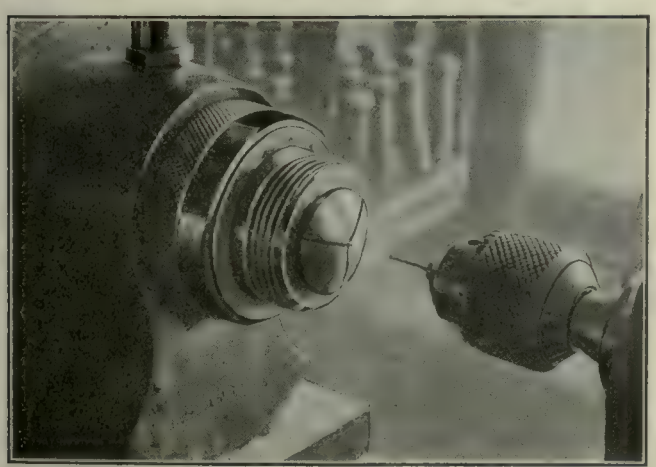


FIG. 7—GRINDING THE HOLE

open previous to the hardening, nor are there any separators placed in the slots. They are heated in muffle furnaces, quenched in oil and tempered in an oil bath.

The final machining operation is the grinding of the hole. Though care and skill are essential in all the preceding operations the value of the collet in the last analysis is dependent upon the roundness and truth of the hole, and all the painstaking effort thus far expended upon the product would be lost unless accuracy in this respect were attained.

The grinding is done upon Rivett No. 102 internal grinders with headstocks specially designed and built for the purpose in the Rivett shops. The operation is true grinding—not lapping—for even upon the smallest holes the grinding medium is smaller than the hole and grinds only upon one side of the latter.

Upon the larger sizes, down to $\frac{5}{16}$ in., ordinary abrasive wheels may be used, the manner of mounting them upon the spindle depending somewhat upon the size. Wheels over ½ in. in diameter are held by a round head screw and the smaller sizes with solder.

From $\frac{5}{16}$ in. downward the grinding is done with metal rods charged with abrasive. Copper and hard brass may be used on holes that are large enough so that rods of corresponding size are able to withstand the necessary side pressure; drill rod upon smaller sizes; and semi-hard needle wire upon the smallest sizes. Aluminous oxide and silicon carbide abrasives are used as a grinding medium for the comparatively larger sizes and diamond dust upon the very small ones. The collet shown in Fig. 7 is of ⅛ in. diameter and the grinding rod is hard brass, charged with carborundum.

There is no secret or mystery about the grinding; it is merely a case of keeping at it until the job is done. To grind a collet of 0.010 in. holding diameter, round, true and accurately to size, may take several hours of the time of a specially skilled operative.

This will serve to explain why the cost of a collet is apparently high and increases as its nominal holding size diminishes. If it departs from any of the above mentioned characteristics by even the small fraction of a thousandth it is no longer a valuable tool but a worthless piece of scrap; no matter how carefully the preceding operations have been carried out.

The Melting of Sponge Iron

Experimental work on the production of foundry iron from sponge iron in the electric furnace, performed by the Department of the Interior at the Seattle station of the Bureau of Mines, demonstrated that technically, at least, the process is a success, though large-scale tests are necessary to determine its commercial applicability. Such a process would find application in melting iron in regions remote from blast furnaces, or where establishment of blast furnaces would be impracticable. Sponge iron was melted in batch runs and continuous runs, in various types of furnaces.

The type of furnace found best fitted for the continuous melting of sponge iron is a deep pit furnace with a single electrode and a conducting hearth. The main problems solved were: High recovery of iron, clean separation of the slag, obtaining metal of a high-carbon content, introduction to the metal of silicon and manganese from the slag to eliminate the necessity of using ferro-alloys, and, finally, the removal of sulphur. In order to produce the best quality of gray iron, an auxiliary furnace would be necessary.

Increasing the Salesman's Useful Time

"THE management of a representative's time is often the cause of his success or failure," is one of the statements in a business leaflet on "Methods of Organizing Salesmen's Time" that has recently been gotten out by the Policyholders Service Bureau of the Metropolitan Life Insurance Co. The leaflet gives the following ten points on the subject that summarize the practices employed in successful business:

1. Relieving the salesman of all possible clerical work.
2. Giving the salesman adequate information of past requirements of customers.
3. Carefully routing the work of salesmen.
4. Reducing the size of territories so that they can be covered economically.
5. Training the salesman to give quick demonstrations and concise selling talks.
6. The use of the advance notice card wherever advantageous.
7. Endeavoring to have a customer set aside a definite time for the salesman.
8. Making the call effective when the customer is out or busy, by giving a demonstration, rendering some service or securing credit information.
9. The use of the automobile for small town work.
10. Always stressing the element of service.

Regarding the saving of the salesman's time on clerical work, these statements of a large manufacturer and distributor are given in the leaflet:—

"In two of our twenty-five selling districts, we have made up lists of prospective customers, and arranged them both by classes of trades and geographical locations, and we have increased the district manager's clerical force so that the clerical work of the salesman may be reduced to a minimum. Furthermore, the salesman's work is carefully planned out in advance of its execution.

Much Work Done for the Salesman

"We have found that lack of information about the prospective customers and what occurred in previous calls means a certain amount of time wasted in getting the lay of the land in every call, to say nothing of the more intelligent reports that can be made when the salesman has the complete story of the prospect before calling. Under this plan the salesman is furnished record cards plainly and neatly filled out, showing sales, lost orders, items bought, date that prospect will be in the market, and any other information of value taken from report slips of previous calls. A glance at the card brings the salesman up-to-date, while practically ten minutes or so of conversation would be required under ordinary circumstances."

As to the relation between the number of calls and service, this is said:—

"The number of calls should not interfere with the quality of service rendered, for the idea is gaining hold that manufacturers and merchants in the last analysis are not selling products but rendering service. This note is expressed in the two quotations following:—

" 'We feel that the element of service is more important than operating under a time clock. We encourage our men to arrange, wherever possible, to serve their customers at the latter's convenience, and sometimes this may be the early morning or at the later afternoon period. Many of our men have successfully utilized their time when it was necessary to wait, because the dealer was occupied, by aiding him in the sale of his merchandise and by giving other assistance to the dealer. In this way he has not only formed a good impression, but likewise has reduced the loss of time which might occur through waiting for an opportunity to have an interview.

" 'Our salesmen are service men, whom we endeavor to train and equip in such manner that they are able to make an appreciable contribution toward the solving of the questions and needs of the customer. They are constantly confronted by problems of distribution, merchandising, advertising and even financing, and local conditions are largely responsible for the existence of such problems, and govern too the time necessary for a practical solution.' "

Wanted—A Museum of Machine Tools—Discussion

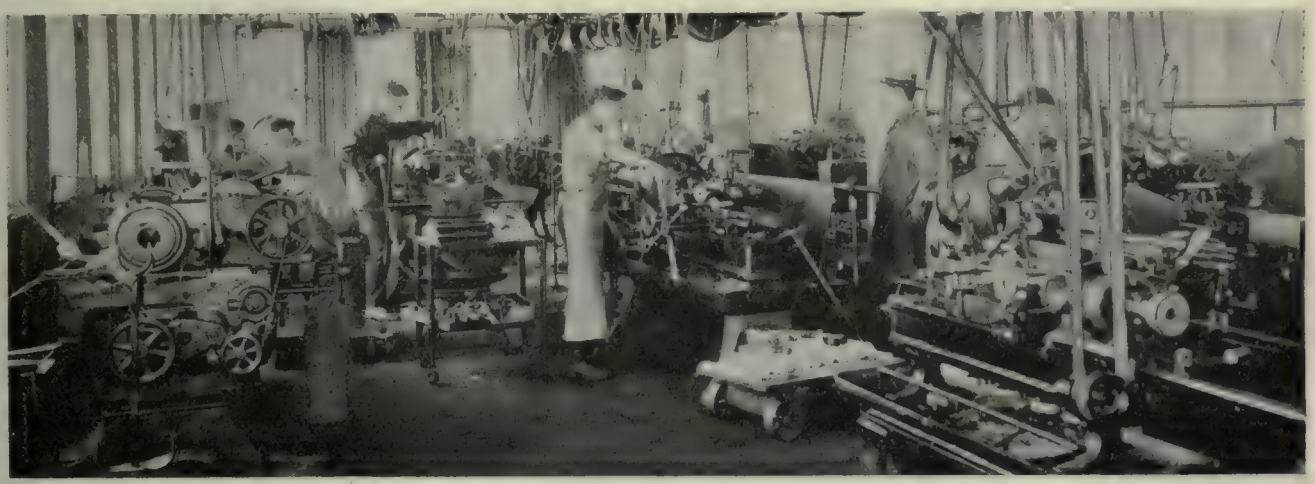
By L. L. Thwing

Referring to the article by Harry E. Harris under the title given above on page 689, Vol. 59 of the *American Machinist*, we cannot expect everyone to enthuse over our own particular hobby, be it collecting Beadle's dime novels or door knobs from famous buildings, so we should sympathize with Mr. Harris if he cannot "conceive what value such a collection (of old machine tools) would have, except to please a collector's whim, or satisfy the idle curiosity of a few."

To the writer, the interest which a large number of people take in tablets bearing the inscription "This is the spot where ————," seems profitless; and there are those who believe that golf is a game that unnecessarily prolongs the lives of some of our most useless citizens. But it seems presumptive to attempt to curtail the pleasure of those whose tastes differ from our own.

The question of the value of any sort of an entertainment, be it educational or otherwise, is too large a question to discuss here, but it is a fact that a large number of people do find pleasure in various collections of all kinds, such as are found in the museums in our large cities. In the new National Museum is a collection arranged to show the development of the drill from the flint implement of the savage to the high-speed twist drill of today. Just what the value of such an exhibit is, would be hard to put in words, but it interests a certain percentage of the masculine population and educates them in the history of the progress in the art of drill making. What the value of an education in ancient methods or ancient history is, I will leave for someone else to answer. Considerable time is given to the latter, and it may be wasted.

There is one thing that is certain, viz.: that museums and collections do not get themselves assembled without considerable effort on the part of a large number of interested people, so that if the writer's interest in old machine tools is not shared by many other people, there will never be much money spent for a museum of machine tools. In fact, even if there is a considerable amount of general interest in such a movement, it will never get anywhere unless it is pushed. That is why a committee was appointed by the Associated Engineering Societies, and it is on this assumption that it is thought that such a museum would be enjoyed by enough people to justify its existence.



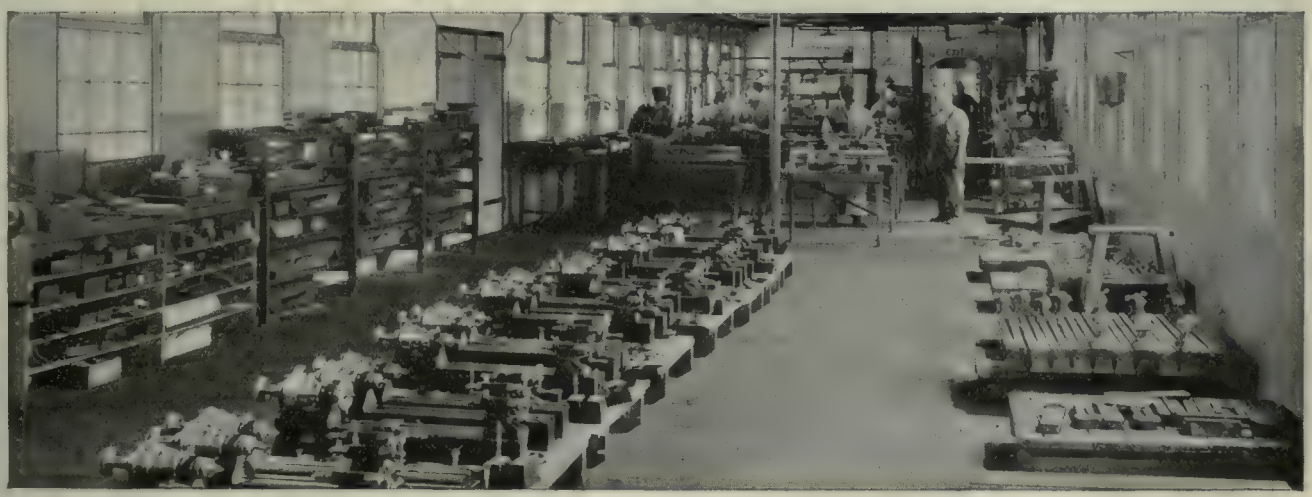
Making Parts on Turret Lathes and Automatic Screw Machines

Where Machine Tools Are Made

Rivett Lathe & Grinder Corporation

Founded 1884

In the Assembly Department



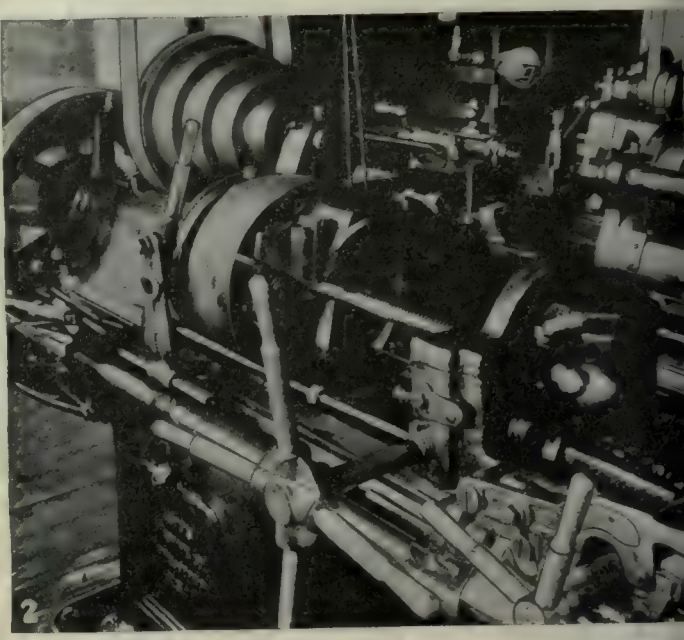
Scraping to Surface Plates and Gages



The Final Testing



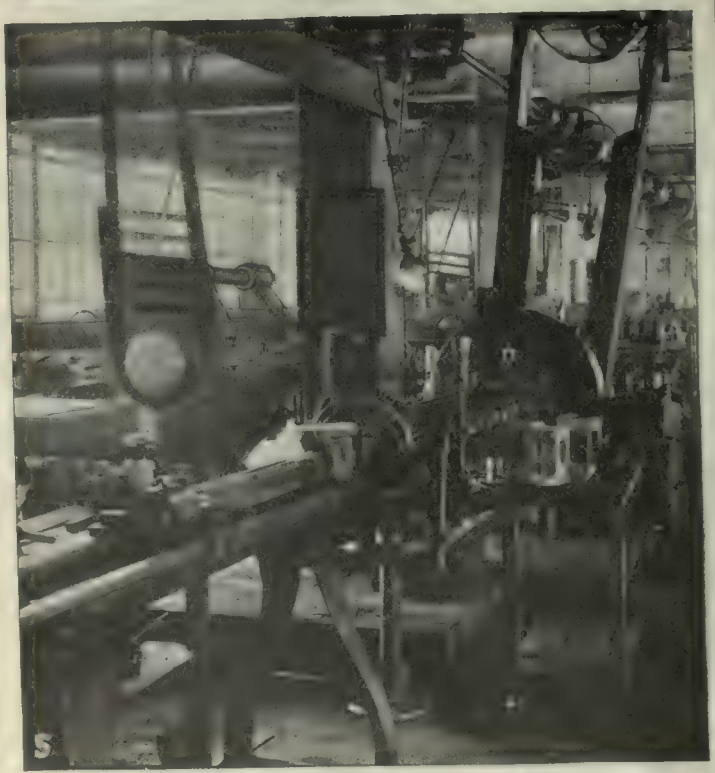


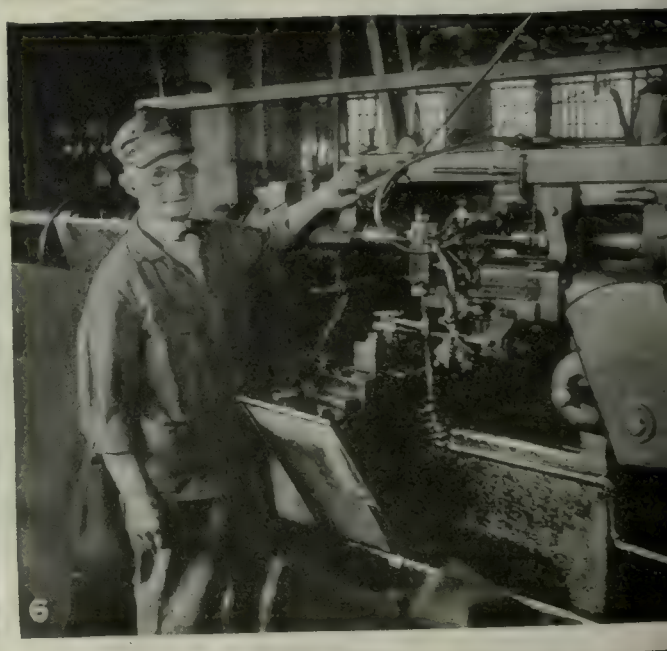


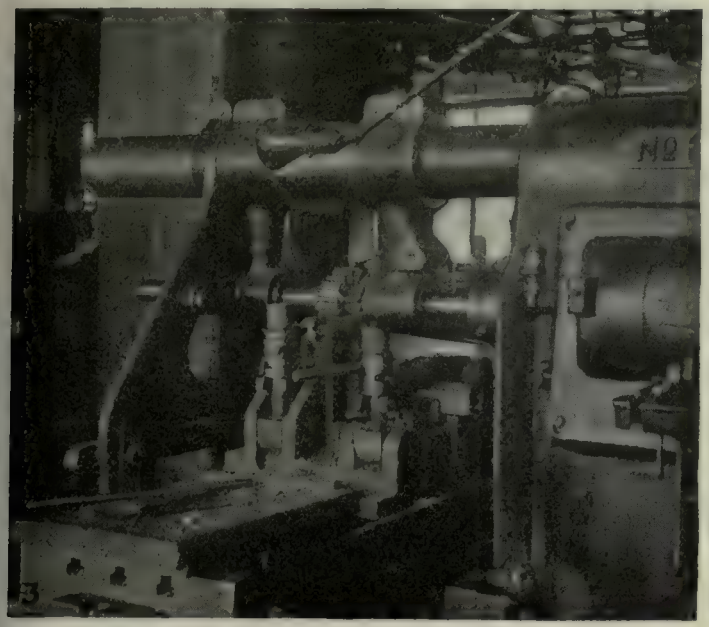
Steps in the Manufacture of Bench Vises

Athol Machine & Foundry Co.

Athol, Mass.







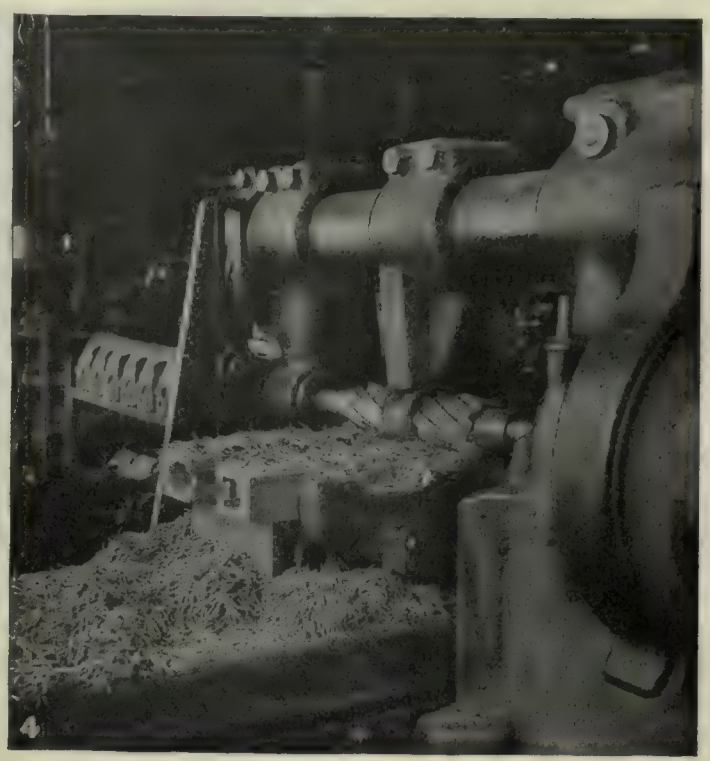
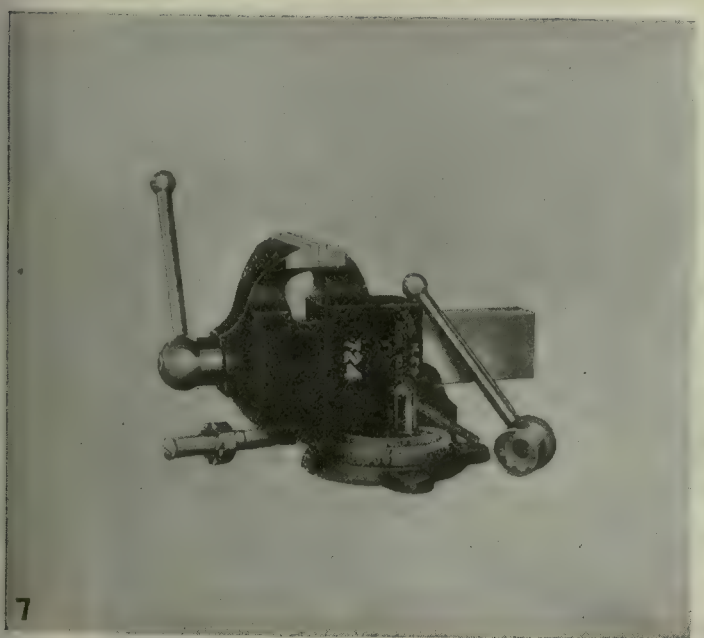
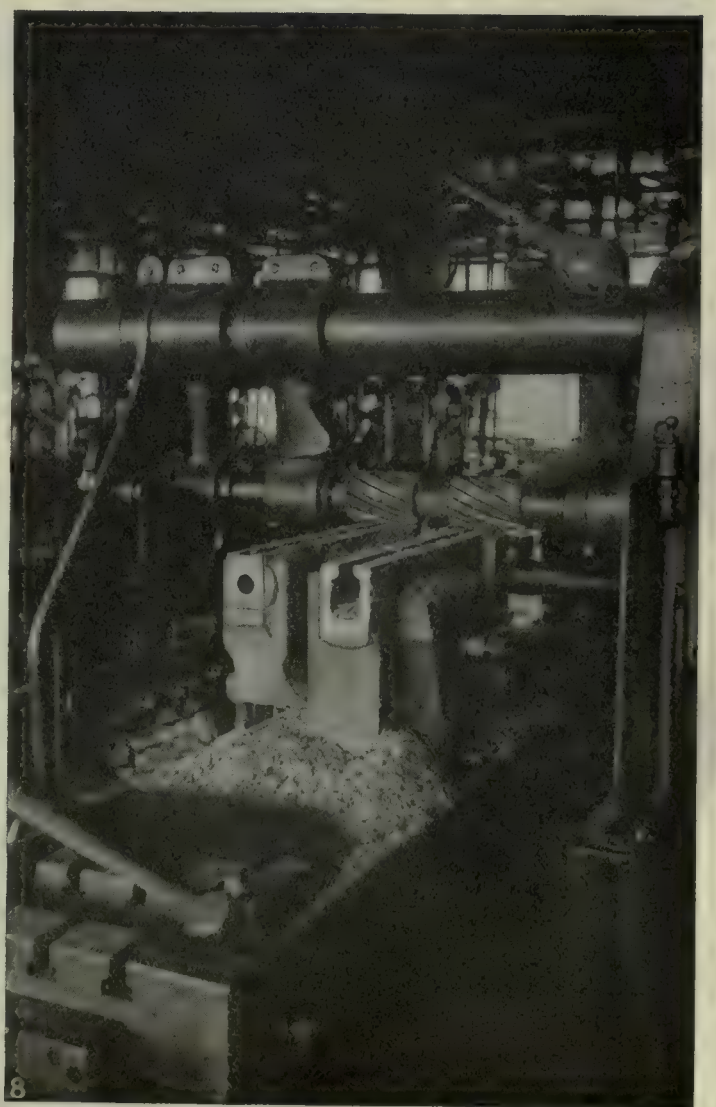
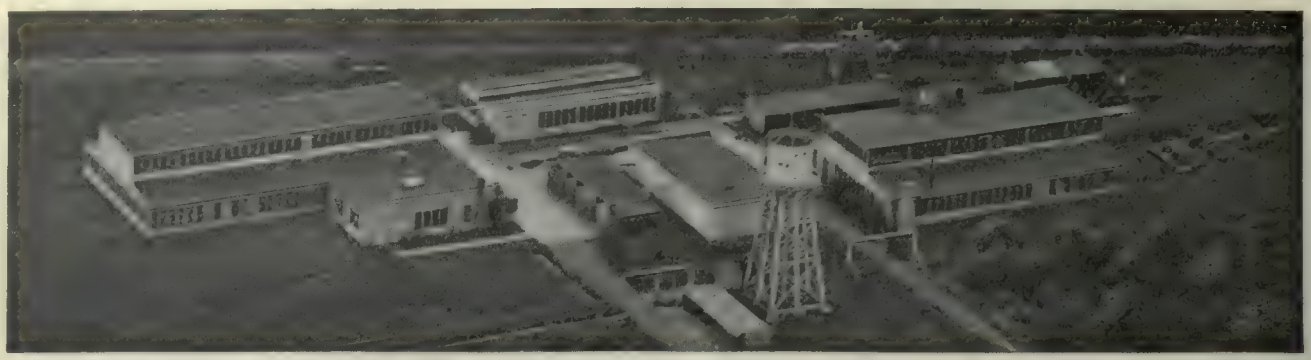


Fig. 1.—Milling Small Vise Beams in Cincinnati Semi-Automatic Machine
Fig. 2—Threading Vise Screws on Landis Bolt Cutter
Fig. 3—Milling Vise Jaws on Cincinnati Machine
Fig. 4—Milling Sides of Vise Beams on Cincinnati Machine
Fig. 5—Broaching Square Hole for Beam in Lapointe Machine
Fig. 6—Making Screws for Small Vises on the Gridley Automatic
Fig. 7—One of the Vises
Fig. 8—Milling Under Sides of Beams in No. 3 Cincinnati Machine







Airplane view of plant

Where Big Pulley Blocks Are Made

Lamb Machine Co., Hoquiam, Washington

Using Greene electric furnace in pouring vanadium alloy steel for block side-castings



Pouring with small shank ladles. This method has been superseded by the bottom-pour ladle



Part of forty-eight styles and sizes of pulley blocks for logging equipment



Book Reviews

Commerce Yearbook. 1922. (Including early part of 1923.) Compiled under the direction of the Bureau of Foreign and Domestic Commerce. Julius Klein, Director. 692 pages, 6x9 in., clothboard covers. Sold by the Superintendent of Documents, Government Printing Office, Washington, D. C. Price, 60 cents.

This unique volume is the first issue of a yearbook which is to be published annually, hereafter, by the Department of Commerce. The present issue covers the year 1922 and its publication was delayed by the difficulties attendant upon the compilation of the material for a book, so wide in scope and detailed in character. Before the volume was ready for publication it was found possible to cover the early part of 1923 also, and this has been done.

As stated in Director Klein's letter of submittal to Secretary Hoover, the book is published not only to meet the need for a reference source, but for a book which can be read for general commercial information and for a survey of the most important economic developments of the year.

In a review of the period covered, the trend of business in general is noted, the effect of the depression of 1921 is shown, and a summary of the conditions and developments in various great industrial groups is made, together with discussions of such subjects as prices, employment and wages, transportation and communication, banking and finance, foreign trade, and balance of trade. These review pages form an excellent introduction to the book, as they give the reader a broad picture of the industrial and economic developments practically throughout the world for 1922 and the spring of 1923, and make it easier to study intelligently detailed information which follows.

Production of manufactured goods increased during 1922 by about 20 per cent over the figure for 1921, and this revival of production is made the basis for a study of causes and effects in the next section of the book. This matter is, of course, largely statistical but is presented in such a way and so clearly explained that it is instructive and interesting.

Individual industries are next studied and it is impossible in a few words to give an idea of the wealth of information and valuable statistical comparisons contained in this section of the book. The treatment of the machinery industry may be used as an example, although each industry is discussed in the way best calculated to bring out the salient points.

A summary of developments in this industry for the period is followed by remarks on the general scope and position or rank of the industry and the rank of the United States among other countries. Production conditions before 1922 and the recovery from the depression are then discussed, the points made being emphasized by the accompanying statistical tables and graphs. This is followed by an exposition of foreign trade movements in the machinery and machine tool industry.

Detailed discussions of finance and banking and foreign trade are followed by a comprehensive economic review of all foreign countries with which trade was carried on. This section is particularly illuminating and valuable.

The book should fulfil the requirements which made its publication a matter of need and gathers in one volume an amount and variety of commercial information never available in this form.

The Design of Diagrams for Engineering Formulas and the Theory of Nomography. By Laurence I. Hewes, deputy chief engineer, U. S. Bureau of Public Roads, and Herbert L. Seward, associate professor of Mechanical Engineering, Sheffield Scientific School, Yale University. First edition, 111 pages, 83 illustrations, 9x12 in., clothboard covers. Published by the McGraw-Hill Book Co., 370 Seventh Ave., New York, N. Y. Price, $5.

Because this book is a bit unusual and aims at performing a valuable function in engineering work, it merits special attention. This is particularly true because of the increasing importance and prevalence of diagrammatic solutions for engineering formulas. All too often such diagrams are made by the method of trial, which naturally is not conducive to the best results nor saving of time.

The book presents the theory underlying nomography, or the diagrammatic representation of formulas, which enables the positions of the various elements of the diagram, the limits of accuracy, and the range of values of the variables to be accurately planned in advance. Trials can thus be dispensed with in the actual construction and a permanent, useful diagram results, giving a saving of time in the construction. The chief saving, however, is in the use of the diagram when solving a formula, as it ordinarily requires but a fraction of the time taken for direct computation by means of the formula. If the formula is difficult of solution and need be solved often, the advantage is evident.

The subject matter of the book has been well tested out by teaching of the subject at the Sheffield Scientific School. It is the aim of the writer not merely to outline the methods of drawing diagrams but to develop the grasp of the reader on the subject so that he will be able to analyze complex formulas. Since the author believes that the treatment would be handicapped by attempting to avoid the use of the third-order determinants, that notation is employed in the latter part of the book. For those not familiar with this branch of college algebra Appendix A presents sufficient treatment for the work in hand. The use of "projective transformation" is mentioned, but the reader must not necessarily understand it. Appendix B, however, gives a simple treatment of the subject.

The determinant notation helps greatly to identify the given formula with a known type. This identification has, furthermore, been made more complete by the introduction of an entirely new class of nomograms designated as "diagrams of adjustment." All other alignment diagrams are special cases of these more general types, as they may be considered as diagrams of adjustment where the adjustment has reduced to zero.

So that a variety of types of formulas can be explained, fifty-four illustrative examples have been worked out. Most of the diagrams appear in large size, which the format of the book readily permits. The problems at the end of each chapter can be of use to both student and instructor. The treatment of the subject is quite concise, considering the range of material covered. As the steps are logically taken in the development, there should be no great trouble for the

student in following the ideas and in mastering the subject. The book should prove useful to engineers, designers and those who must frequently solve formulas.

Rehabilitated Ex-Service Men Candidates for Employment. 238 pages. Issued by the United States Veterans' Bureau, Washington, D. C.

This report is essentially a collection of tables showing the number of ex-service men undergoing rehabilitation instruction in the various districts. They are grouped by states with the idea that a manufacturer having openings for certain kinds of workers or minor executives would be most interested in men from his own district.

Further classification is by occupation. Under each state the table shows, for example, the number of mechanical engineers, machinists, gardeners, stenographers, etc., that will finish training each month from July, 1923, to January, 1924.

A similar report, prepared for the use of the United Steel Corporation, resulted in the satisfactory placement of a large number of rehabilitated veterans. Action indorsing the project has been taken by chambers of commerce, labor unions, and other bodies.

Several paragraphs from the general statement preceding the tables are worth quoting.

"Men with one arm are trained for work in which only one arm is brought into use. Men who have lost their sight or hearing are trained for work in which these senses are not absolutely necessary.

"The great majority of them are normal in appearance, normal in ability, and normal in their manly desire to be self-sustaining and to make a success of their lives, for the sake of themselves, their dependents, and their fellow men in general.

"More than 33,000 of these men have been rehabilitated and have gone into employment within the last two years. Statistical studies made on some 20,000 of them show that they are earning more in their new vocations than they earned before the war, and before they received their disabilities or handicaps from service in the army.

"It is the desire of the Government that employers take these men and pay them according to their individual earning power and accomplishment.

"The Government does not ask charity for these men. They do not ask charity for themselves. They deserve wise and sympathetic consideration and an opportunity in keeping with the best thought and the best feeling of our country."

Self-Taught Mechanical Drawing and Elementary Machine Design. Third Edition. By F. L. Sylvester, with additions by Erick Oberg and C. W. Reinhardt. Clothboard covers, 5x7½ in., 345 pages, 237 illustrations. Published by The Norman W. Henley Publishing Co., 2 West 45th St., New York, N. Y. Price $2.50.

The volume is well written for, and should fulfill, the purpose implied in its title of helping the student or mechanic to acquire a knowledge of drafting and machine design. The treatment goes back to first principles, as the author wishes it to care for the needs of the student whose previous theoretical knowledge is limited. Self-study is aided by clear, sufficient, but concise treatment of important points, and sufficient explanation of fundamentals.

Mechanical drawing is the first subject treated, followed by the methematics necessary for the solution of problems in machine design. Elementary mechanics and strength of materials then come in for consideration. Lastly, chapters are devoted to the design of the various elements and details that enter into machine design, such as cams, gears, shafts, screws, clutches and flywheels. The book closes with some practical instructions for mechanical drawing and lettering.

The volume is thoroughly practical and should prove of real value to those for whom it is intended. It should be commended for aiding the practical mechanic and young draftsman to advance in knowledge of the art.

Magnesium. 177 pages, 4½x7 in. Published by the American Magnesium Corp., Niagara Falls, N. Y. Price $2.50.

This is a very complete little handbook of information and data relating to the use of magnesium and magnesium alloy. It is intended to meet the growing demand for information concerning this relatively new metal, which is being used more and more in the automotive and other industries. The book seems to contain about all the information that a prospective user might need and should prove a valuable addition to our literature on the subject of light alloys.

Teach Your Boy a Trade—Discussion

By Lawrence F. Swenson

There recently appeared on page 392, Vol. 59, of the *American Machinist*, an article under the title given above by W. J. Fisher, Jr., in which he points out the desirability of every boy learning a trade and wonders why the machinist trade is being neglected at the present time.

There are several important features about the machinist trade as it is being worked today that cause this condition. To my mind the prevailing wages have more to do with the situation than is generally believed. Another thing I have noticed is that many shops make little or no difference in the wages paid to men who are all-around machinists with an apprenticeship training and the ones who have been taught to operate only one or two machines.

When such conditions exist, it is not to be wondered at that young men of the desirable type go into the building trades to get the high wages offered, or into office work to be away from the dirt and longer hours, but paid fully as well as the average skilled machinist. Much of the old spirit of being able to do a good job is now lacking. Perhaps these conditions are unavoidable, but why should a young man choose a life work that will make him a human "cam" if he can possibly avoid it?

Mr. Fisher also thinks it regrettable that so few college men go into the machine shop. I think that a man with college education working as a machinist is misplaced, because of the few positions open to him for advancement. When a college man goes into one of the professions, he mingles with men who know more than he does which has a tendency to elevate him both morally and intellectually, whereas the average machine shop would have the reverse effect. Propaganda of the right sort is beneficial, but I fear it would not do the machinist trade much good as long as the present condition continues.

Modern Problems in Gear Testing and a Proposed Testing Machine

By WILFRED LEWIS

The purpose of the proposed tests will be the determination of the effect of varying degrees of tooth accuracy and varying velocities on the strength of gear teeth. The information gained by this research will be essential to the solution of wear and noise problems, and further investigation along these lines will be undertaken.

The Special Research Committee on gears of the A. S. M. E. has made arrangements to have the tests made by the Massachusetts Institute of Technology, and is awaiting the receipt of sufficient funds to complete the building of the machine and beginning the tests.

ABOUT thirty years ago, the writer made an investigation of the strength of gear teeth based upon tooth forms in common use, and formulated the working strength in terms of pitch, face, number of teeth and working stress. This investigation was theoretical rather than experimental in character and, in the application of the formulas developed, the engineer was expected to use his own judgment as to the safe working stress allowable in any given case. As a guide, however, to keep him within reasonable bounds, 8,000 lb. per sq.in. was suggested as a safe working limit for cast iron and 20,000 lb. per sq.in. for steel.

These stresses referred to static conditions or to gears running at slow speed without shock, and it was recognized that the safe working load was related in some way to the perfection attained in forming and spacing the teeth, and to the speed. However, no attempt was made to establish these relations, and the matter was left for future determination, after citing Walker's rules, published in 1868, as the best to be found on the subject.

How Walker's speed factors were obtained does not appear, but it is fair to assume that they were determined with considerable care from observations or experiments, and it is interesting to note their agreement in form with the results obtained by Professor Marx in his elaborate and carefully made experiments, reported to the A.S.M.E. in 1912 and 1915, as shown in Fig. 1. Both curves of strength are convex to the base line and approach it as asymptotes with the increasing speed.

It is difficult, however, to reconcile these results with the analytical work of Oscar Lasché of Berlin, published in 1899, which appears to have escaped the attention it deserved until translated and emphasized by Daniel Adamson in 1916. While recognizing the importance of the part played by resilience in iron and steel and the somewhat plastic deformations in such materials as rawhide and hard wood to absorb shock and reduce the increment load arising from irregularities in forming and spacing the teeth, he pointed to the tremendous influence of velocity on the detrimental effects of errors in pitch or form, and showed that rigid forms in rolling contact would cause increment loads proportional to the square of the speed.

From this point of view the curve of strength as affected by speed becomes a parabola focused in the axis of ordinates, and such a curve, also shown in Fig. 1, can be made to run very close to the extreme values as plotted for Walker and Marx. Instead, however, of dropping rapidly at first and showing smaller losses thereafter for equal gains in speed, the Lasché curve of strength has an entirely different character, being a curve wholly concave to the base line and plunging across it in a way which would seem to put a definite limit to the speed.

On the other hand, it is pretty clear that if gear teeth were perfectly formed and spaced, there would be no appreciable loss in strength from speed, and yet thirty years ago the writer was rash enough to presume that

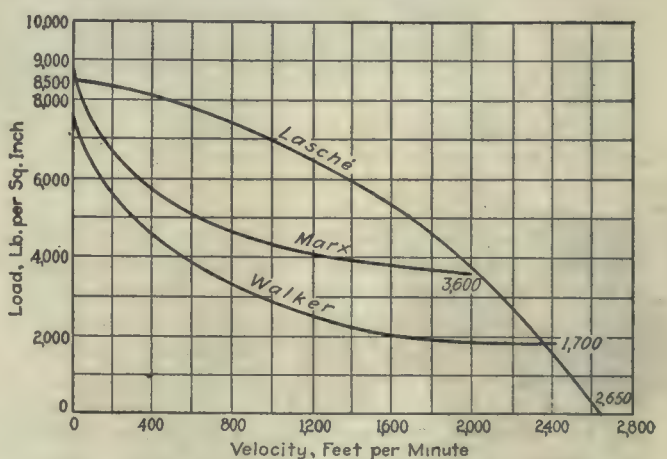


FIG. 1—CURVES SHOWING RELATION OF ALLOWABLE LOAD ON SPUR GEAR TEETH TO VELOCITY

there might be a difference of two to one, representing the usual difference between a live load and a dead load. That was before the advent of automobiles with their highly elastic pneumatic tires, which show on a smooth road a uniform elastic compression quite independent of speed, and make clear the difference between a suddenly applied load and one that is simply transferred, as it might be in perfect gearing from one tooth to another, without shock.

A comparison of the curves of strength as plotted for Walker and Marx shows a gain of 12½ per cent in the static strength and 100 per cent in the running strength at 2,000 ft. per min. The initial gain may be due to better material and the gain at speed to the better forming and spacing that has come about in fifty years of evolution in the art of gear cutting. Walker's gears may have had cast teeth laid out by old-fashioned approximate methods, and if cut teeth were used, the

A paper read before the American Gear Manufacturers Association, Cleveland, Ohio, April 20, 1923.

same cutter was probably made to answer for more than one pinion and for wider ranges in larger gears. Generated gear teeth were then unknown and it is not surprising that the results obtained by Marx are so much higher than those given by Walker so many years ago, but in view of the wide divergence between these results and those indicated for momentum, the question may well be asked how they can be reconciled with each other, and the answer seems to call for further investigation in the hope that a new gear testing machine may shed some light upon it.

In the writer's opinion, breaking tests are misleading and should be discouraged for the simple reason that when a gear is broken under any given conditions as to load and speed, it is done for, and it becomes impossible to say what that gear would have shown under some other conditions. So also in regard to forming and spacing, it is a matter of vital importance that the minute errors, so detrimental to smooth running, be noted in terms of the velocity ratios which they produce, and as near as may be under actual working conditions.

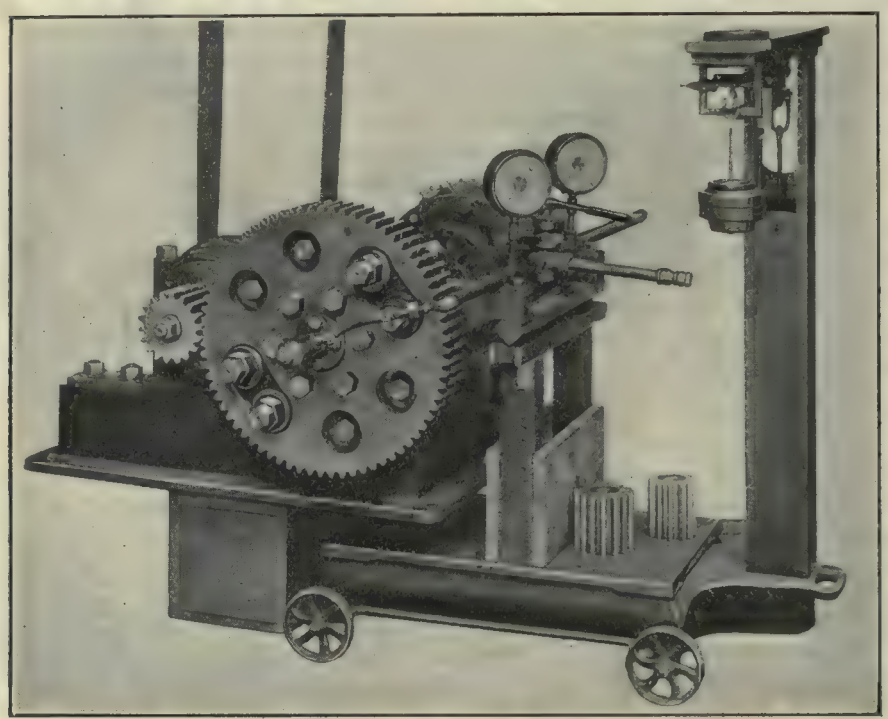


FIG. 2—A GEAR TESTING MACHINE BUILT IN 1916

But if it be true, and no doubt it is, that errors in forming and spacing are responsible for the loss of working strength in gear teeth at speed and that, as pointed out by Lasché, the variations in velocity ratios caused thereby give increment loads proportional to the square of the speed for rigid forms in continuous rolling contact, a complete understanding of the effect of speed upon the strength of gear teeth requires a correlation of errors to the increment load or to the permissible speed, as indicated by Adamson in the paper referred to above.

Originally, the writer believed that the only way to ascertain the effect of speed upon strength was to run gears to destruction on the lines followed by Professor Marx, and in view of the difficulties attending the use of power sufficient to break heavy gears at high speeds, he was tempted to design the gear testing machine described in the *Transactions* of the A.S.M.E. for 1914, afterward built for the University of Illinois in 1916, and shown in Fig. 2. This was also intended to determine the efficiency and breaking strength of gear teeth under various loads and speeds, but the war intervened and nothing has as yet been reported from its use.

Here again the principle announced by Lasché was overlooked, and it was not until the summer of 1920 that the writer's interest was revived by a communication from Charles H. Logue, the first step forward in the application of Lasché's principle since its importance was emphasized by Adamson in 1916.

Mr. Logue proposed the making of mechanical diagrams to show in a magnified way the irregularities in velocity ratio for a pair of engaging gears, and from these diagrams to calculate the force of acceleration causing an increment load which, when deducted from the allowable static load, would give the allowable safe load at any speed.

For this purpose, a pair of gears were mounted in bearings, and a pair of disks on the gear shafts were connected by a wire, the tension in which caused pressure between the gear teeth. The disks, of course, bore the same relation to each other as the pitch circles of the gears and, as they turned with the teeth in action, irregularities in velocity ratio would cause more or less slack in the connecting wire, which was multiplied by an index finger. Readings were taken at successive points in the arc of action and the variations in velocity were noted as the data needed in connection with mass to determine the increment load at any speed. This apparatus was modified and improved to give indicator diagrams on paper ribbons, or on disks in a closed curve, from which the increment load was calculated and, at the suggestion of Mr. Adamson, Mr. Logue very freely laid the whole matter before the writer to discover if possible whether the gear testing machine above referred to could be utilized in connection with his problem.

So far as the diagrams were concerned, the testing machine was seen at once to be admirably adapted to their accurate production under conditions that could not be realized so well with any other form of apparatus, but it took some time to observe that the same machine was equally available for the direct determination of decrement loads rather than increment loads, and that it might be materially simplified without detriment, as a means for determining the effect of speed upon the strength of gear teeth.

The development and construction of such a machine was suggested by the writer to the General Research Committee of the A.S.M.E. about two years ago, as a promising source of information on the effect of speed upon the strength of gear teeth, and this suggestion led to the appointment of a Special Committee of Research on Gears, consisting of Earle Buckingham, Ralph E. Flanders, Arthur M. Greene, Jr., Chas. H. Logue, F. E. McMullen, E. W. Miller, and the writer as chairman, to which committee Ernest Wildhaber has since been added. To the helpful, constructive criticism of these experts, and others who have kindly volunteered suggestions, the gear testing machine in its present form

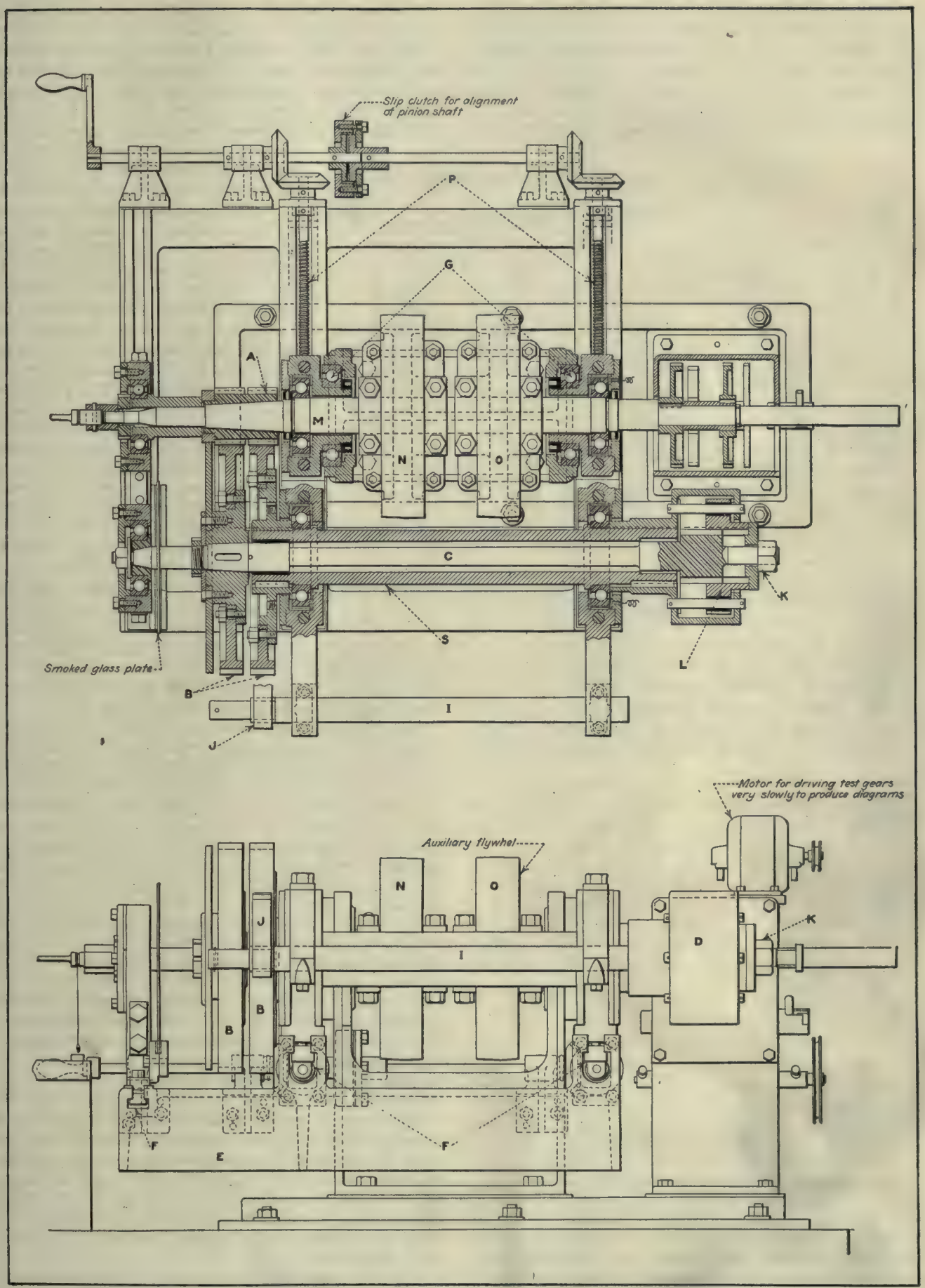


FIG. 8—SECTIONAL AND FRONT VIEWS OF THE NEW DESIGN OF GEAR TESTING MACHINE

is due and, as the result of an appropriation by the A.S.M.E., the writer has been enabled to make general and detail drawings, on which estimates are being asked for the construction of the machine.

Referring to Fig. 3, the new gear testing machine is shown to consist, as before, of a wide faced pinion *A* mounted in bearings on a swing frame which carries a pair of test gears *B* on telescoped shafts, *C* and *S*, the outer ends of which can be twisted to produce an initial load and held in place by a powerful screw adjustment *D*. This differs from the machine described at the Annual Meeting of the A.S.M.E. in December, 1922, by the addition of outer bearings suggested to Mr. Flanders by Professor Magruder of the Ohio State University, and they constitute a very important improvement in the machine. The swing frame is extended as an anchorage for these bearings and it now consists of a cross ribbed casting *E* with three parallel slots *F*, two of which carry the main bearings and one the outer bearings, all of which are securely clamped in position before the initial load is applied.

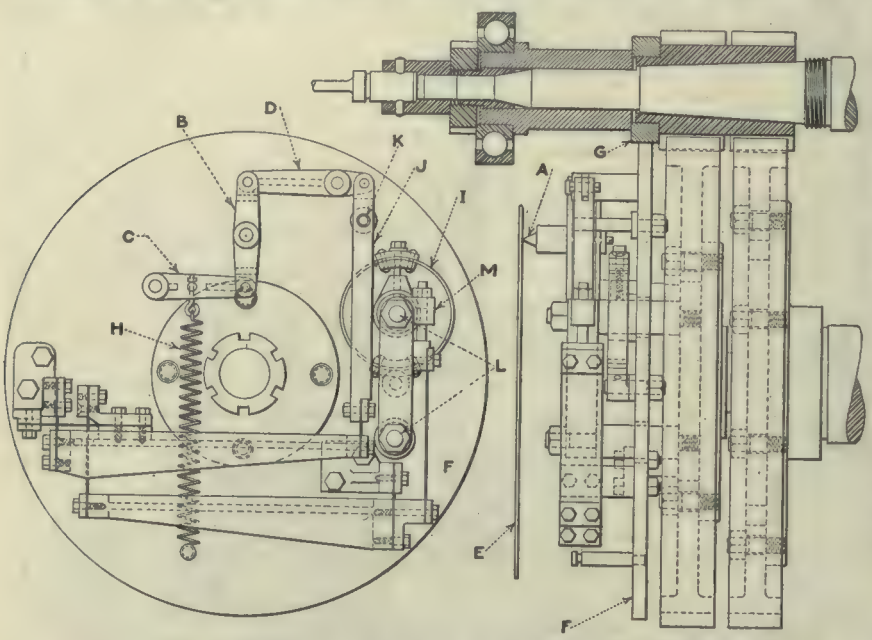


FIG. 4—MECHANISM FOR SHOWING GRAPHICALLY THE BEHAVIOR OF GEARS UNDER TEST

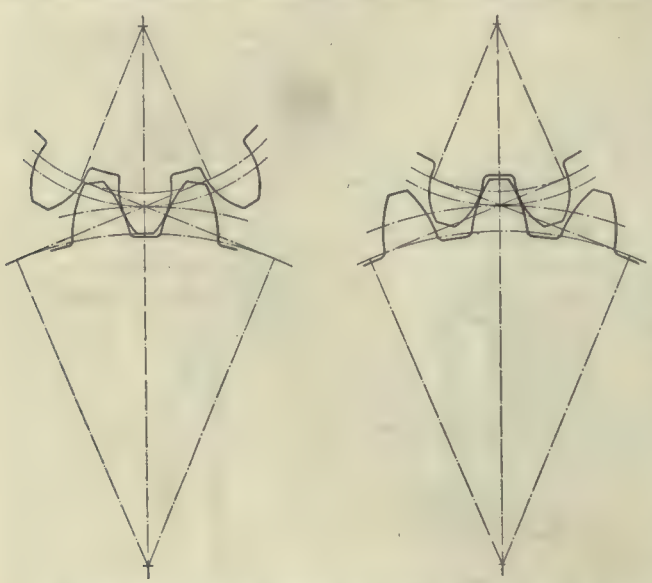


FIG. 5—POSITIONS OF MESHING GEARS IN WHICH THE LINES OF ACTION INTERSECT AT THE PITCH POINT

The swing frame is carried on two Hess-Bright bearings *G*, with 1-in. balls, in a fixed stand *H* centered on the pinion shaft. Parallel with this shaft and at a convenient distance, determined by the sizes of the engaging gears, is a heavy round bar *I* resting upon portable platform scales. A pawl *J* on the projecting end of this bar can be engaged with either or both of the test gears, and when so engaged the initial load can be adjusted by a nut *K* on the outer end of the central shaft through an intervening nut *L* of very long pitch, mounted on the same shaft and engaging the telescopic sleeve by insulated pin connections. When an initial load has been applied in this way, it can be accurately measured by the supporting scales, as will appear later on. In this way the load on the teeth is made to act equally in opposite directions upon the wide-faced pinion, but when running, there will be a slight difference in pressure on the test gears which measures the friction loss as shown by the scale readings.

The pinion shaft *M*, 3 in. in diam., is carried on three Hess-Bright ball bearings with $\frac{15}{16}$-in. balls, and the driving pinion runs between two of these, pinched on a conical surface to avoid the use of keys and to make changes easy. The pinion shaft may be driven by one of two heavy belt pulleys, *N* and *O*, which serve also as flywheels, or by a motor coupled directly to the end of the shaft.

These flywheels are made in halves to be clamped securely to the pinion shaft, which may be run with either, both, or neither of them. The pinion shaft alone, with an 18-tooth pinion, is estimated roughly to have a mass effect at its pitch line equal to that of either test gear of 72 teeth running with it. This mass is augmented about 25 times in each of the flywheels provided so that the effective mass of the pinion shaft with both flywheels attached is about 51 times that of either test gear.

Test Gear Mounting

The sleeve *S*, on which one of the test gears is mounted, is carried on 1-in. balls in bearings dowelled to the swing frame, and the other test gear is carried on the end of the central shaft *C*, between an outer bearing on $\frac{15}{16}$-in. balls and insulated bearings in the sleeve. All bearings are insulated to provide for electrical connections, as will presently be explained.

When the pinion shaft bearings are loosened on the swing frame, the frame, with the fixed bearings, can be traversed to any desired center distance by the lead screws *P*, and distance pieces set between the bearings will insure perfect alignment. To guard against irregularities in pitch or adjustment of the lead screws, a slip joint is introduced in the bevel gear shaft, and by this means the screws can be turned together or independently, as desired.

It is evident that if the engaging teeth are perfectly formed and spaced, the gear wheels will run side by side in unison. If imperfections exist, they will cause the test gears to shift relative to each other, thus gain-

ing and losing in speed and causing increments and decrements in the load carried on the teeth.

It occurred to the writer, therefore, after seeing the results obtained by Mr. Logue, that this shifting of the test gears could be made visible by suitable multiplying levers attached to them, as shown in Fig. 4, and actuating a scriber. To accomplish this result the scriber *A* is mounted in a link *B* between the radius arms *C* and *D*, so centered as to form a Watt parallel motion, and it is made to act, under light spring pressure against a plate of smoked glass or photographic film *E*, by levers which multiply the differential movement about 250 times. Although Watt's parallel motion is not quite perfect, it will be seen that between the limits to which it is here applied, it is very simple, effective and accurate. Originally these levers were all mounted on pin bearings, half of which were subsequently changed to plate fulcrums at the suggestion of Major Buckingham, to whom we are also indebted for a very ingenious optical device for making diagrams at speed.

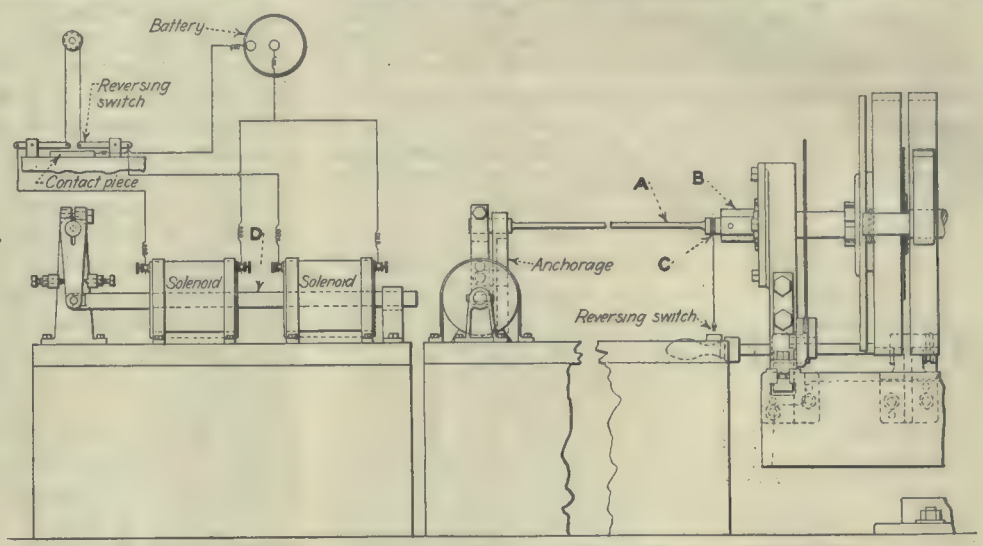


FIG. 6—ELECTRICAL TORSION ATTACHMENT USED TO DETERMINE RELATIVE ANGULAR MOMENTUM

The diagrams made by the mechanism of Fig. 4 require a very slow and steady rotation of the pinion shaft to avoid undesirable momentum in the multiplying levers, and this is produced, when desired, by a small motor carried on the gear cover at the end of the pinion shaft, Fig. 3. This motor is belted to a light shaft beneath, which is connected through a chain of reduction gears to the heavy pinion shaft. This train of gearing and all parts used in tracing a diagram are, of course, disconnected when the test gears are run at speed.

If there were no irregularities in the gears, the scriber would trace a perfect circle but, since absolute perfection is unattainable, the scriber will move in and out as it turns with the test gears, and trace a line indicative of acceleration or retardation which, when interpreted with reference to the conditions imposed, will give the increment or decrement in the load carried on the teeth.

The radial movement of the scriber will show the plus and minus displacements of either test gear as measured by the constant velocity ratio of the rolling disks, *F* and *G*, whose diameters are equal to the pitch diameters of the gears and pinion. The smaller disk *G* is driven tight on the pinion and the larger disk or fulcrum plate *F*, which carries the multiplying levers, is mounted loosely on the hub of the outer test gear and is covered by a washer which holds it in place.

It will be seen that either test gear can be connected with the multiplying levers. A light helical spring *H* is attached to a stud in the fulcrum plate and carried to an arm of the Watt linkage to eliminate lost motion and produce an initial load upon all of the links and levers employed. The force exerted by this spring is amplified about 125 times by the levers through which it passes, until it comes to the anchorage *M*, and this considerable force, if unbalanced, would tend to slip the friction disks upon each other. A heavy counterbalance spring has, therefore, been introduced in the form of a ring *I* between the anchor post and a pin in the large friction disk, the reaction of which balances the tension upon the tape connecting the multiplying levers with their anchorage.

One of the links in the system, *J*, is made large and heavy to allow for drilling to a perfect balance, and the same link is drilled to form a clearance hole for a stop pin *K* in the friction disk. In this way the movement of the stylus is limited to an amount that will safeguard the flexible fulcrum plates between the multiplying levers, while providing ample movement for the stylus under any anticipated conditions. An adjustment is provided at the anchorage to keep the limit stop clear of the link which circumscribes it, while making diagrams.

The anchor posts *L*, attached to either test gear, are made double like columns in an office building, and with a tie bar at their outer ends, thus giving the great rigidity required to show the minute displacements between the friction disk and the test gear to which it is attached. As proposed by Major Buckingham, one pair of test gears may be perfected by grinding, with which a pair of commercial gears can be compared and, for such comparison, provision has been made to positively secure the outer test gear to the fulcrum disk while making diagrams. The construction shown provides,

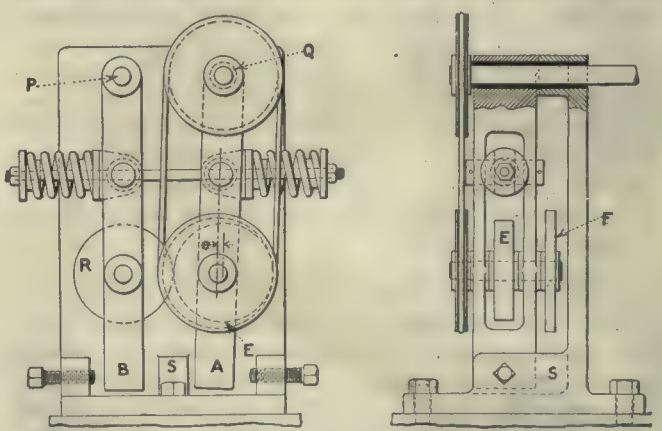


FIG. 7—A MECHANISM FOR FINDING ABSOLUTE INCREMENT LOADS

therefore, for diagrams of the velocity ratios between the teeth of each pair of gears and rolling disks, and also these variations combined.

When similar commercial gears are combined in one diagram, there are, presumably, two positions of the engaging gears and pinion, as shown in Fig. 5, in which their lines of action intersect the line of centers at the pitch point. There are also at least two other positions where their lines of action intersect each other on the line of centers above or below the pitch point, and in these four positions, or more perhaps, for every pitch traversed the test gears are in unison and the stylus is describing a circular arc, or a curve of inflection tangential thereto. The friction disks may or may not be used

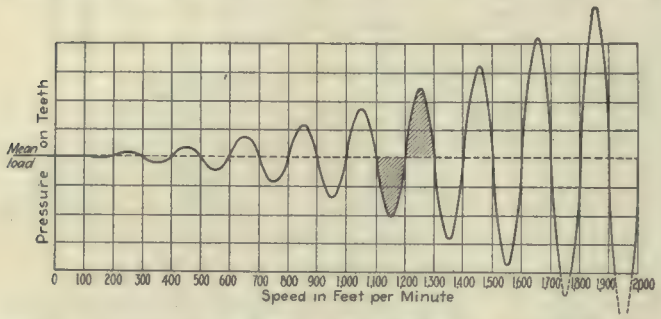


FIG. 8—DIAGRAM SHOWING PRESSURE ON GEAR TEETH AS AFFECTED BY MOMENTUM AT SPEED

in making diagrams, but in any case, there is nothing in the mechanism employed to slip or stretch; it takes no part of the load carried; and it is therefore possible to produce diagrams under light or heavy loads. A comparison of these diagrams may reveal the effects of compression and elastic deformations and tend to modify the law of the speed squared, which applies only to rigid solids.

However this may be, the results hitherto obtained come from the consideration and manipulation of very minute quantities, the multiplication of which may also multiply unsuspected errors in construction, and after seeking in vain for some way to measure the increment load direct, the writer began to consider the decrements entailed by increments, as pointed out by Mr. Logue. Then came the conclusion that when the initial load disappeared and caused the engaging teeth to break contact, there would be a distinct change in the noise, after which he hit upon the better plan of insulating the gears and using an electric circuit to announce through telephone receivers a break in contact with the pinion by either or both test gears.

Electrical Connection for Telephones

One or more dry cells are connected by a wire, therefore, to the pinion shaft, through which the current passes to the gear wheels in contact and divides in two branches, returning through telephone receivers in each branch to the opposite pole of the battery. This scheme was submitted to an electrical expert whose advise was that the breaking of contact between the teeth would be announced in no uncertain way and that variations in pressure might also be expected to make a noticeable change in the sound of the running gears, and more recently, Professor Greene of the A.S.M.E. Committee has confirmed this assurance.

Having set up an initial load on the test gears by means of the torsion device at the end of the telescoped shafts, the exact amount of pressure on the teeth can be weighed on the scales under the swing frame by engaging the pawl on the crossbar with one of the gear wheels pulling on the belt or fly wheel until a sharp click in the telephone receiver announces a break in contact. The gain or loss of weight on the scales should then be noted and converted into the pressure on the teeth by a simple proportion, expressing the ratio betweent the radius of the swing frame at the crossbar to the radius of the pinion.

The locking pawl may now be disengaged and power applied to drive the pinion shaft at a gradually increasing speed, which will be indicated by a tachometer, located for convenience above the little motor on the gear box. At the same time, the telephone receivers are ready to announce a break in the circuit and when this occurs the speed is noted. Having passed the speed required to break contact, the power may be reduced and another observation taken when continuous contact is resumed. These observations when repeated for various initial loads, will establish the relation between speed and decrement loads, as affected by all the conditions which enter into the problem. When the law of speed squared is not sustained by experiments, it becomes evident that elasticity or a shock absorbing medium is making itself felt in the action of the running gears. It is hoped that a way may also be found to establish an electric circuit through contact with wood fibre or raw-hide pinions, as well as through cast iron or steel, and so subject non-metallic substances to the same speed tests But, while increments and decrements are necessary counterparts in the maintenance of the initial or average load, they are not necessarily of equal intensity because their durations may be different, and consequently the diagrams will help to establish the relation between increments and decrements in any given case.

Increment Load with Infinite Flywheel

Having determined in this way the increment load for any given speed, the result applies to the test gear when running with a pinion of much greater mass or flywheel effect, and it remains to be seen what this increment might become if the pinion were attached to a flywheel of infinite mass. The angular momentum of the pinion shaft with flywheels attached as shown in Fig. 3, compared with that of the test gears, is relatively much greater than that of the same shaft and flywheels with a larger pinion although the larger pinion naturally increases the angular momentum of the shaft and attachments to which it belongs. But, in view of the fact that the test gears are substantially equal in mass and flywheel effect and, running as they do, with a pinion whose pulley is a massive flywheel and under conditions that impose substantally equal, opposite and approximately simultaneous reactions upon the pinion, there is no reason to ascribe much if any variation to the movement of the pinion, which runs in consequence as though attached to a flywheel of infinite mass.

This may not be strictly true, but it is not far wrong for a small pinion, and to determine whether or not the pinion shaft suffers any appreciable fluctuations in speed, the auxiliary flywheel *O*, Fig. 3, made in halves, has been provided to make comparative tests. If the reactions of the test gears are equal, opposite and simultaneous, the addition of another flywheel will have no effect; but, if the extra flywheel has an appreciable effect upon the decrement load, it is possible to determine the maximum result attainable with a flywheel of infinite mass from the relative moments of momentum

as found for the pinion shaft with and without the extra flywheel.

In this connection, it is necessary to ascertain the angular momentum or mass effect at the pitch line of each test gear and its connections, in terms of the angular momentum of the pinion shaft complete, with and without its auxiliary flywheel. Referring to Fig. 6, attention is directed to the apparatus indicated somewhat diagrammatically as a torsion pndulum with solenoid escapement. A slender rod *A* of tempered steel about ⅜ in. in diameter and 5 or 6 ft. long is attached to the end of the pinion shaft *B* at one end and to an anchorage at the other, the anchorage having a slight rotary movement between adjustable stops. Pole pieces are carried by a light cord from a groove *C* in the torsion rod near the pinion shaft, and serve to reverse the effect of the solenoids upon a core *D* attached to the swinging arm at the anchorage. The movement of this arm at the beginning of each reversal augments the torsion in the rod and it can be adjusted to maintain any desired amplitude in the oscillations. By disengaging the pinion from the test gears its periods of oscillation with and without the auxiliary fly-wheel can be taken, and then, after taking periods with either or both test gears engaged, the data for the desired moments of momentum become known.

Method for Finding Relative Angular Momentums by Oscillation Periods

All that we need to obtain in this way is relative values, the absolute effects of momentum being determined from experimental data to which these relative values are applied. For instance, the test gears may be disconnected to find the time *t* in which the pinion shaft alone may oscillate. One or both flywheels may then be clamped on the pinion shaft and the time *T* taken, showing, perhaps, $\frac{T}{t} = 5$ for one flywheel, from which the angular momentum of the loaded shaft is seen to be $\left(\frac{T}{t}\right)^2 = 25$ times that of the unloaded shaft. Then, with either or both test gears engaged with the pinion, other periods of oscillation can be taken and other relations established, so that in this way index numbers for mass effects at the pitch line may be assigned to the pinion shaft, with one or two flywheels or without any flywheel, in terms of the mass effect of a test gear as the unit of comparison.

In the gear testing machine the pinion shaft with one or two flywheels and the test gears are co-operating to produce effects, by reason of their inertia, which partially or wholly neutralize each other in their reactions, whereas reactions would ordinarily be confined in practice to a pair of gears or a gear and pinion. To illustrate the reactions of rigid forms in rolling contact, attention is called to Fig. 7, showing a stand *S* on which two pendulums, *A* and *B*, are mounted with rollers, *E* and *R*, held together by a load spring. *B* hangs on the quill *Q*, through which a shaft is carried to the upper pulley, which is belted to the pulley of the eccentric roller *E*. A balance wheel *F* at the other end of the lower shaft completes the pendulum *A*, which is heavier than *B* by reason of its additional parts. Either *A* or *B* can be attached to the stand *S*, thereby becoming substantially earth-fast and immovable, and by locking *A* to *S*, the eccentric *E* can be run at a certain speed and the spring tension adjusted to break contact under an initial load *b*. Similarly, when *B* is locked to *S*, and the eccentric *E* is driven at the same speed, the rollers will break contact under an initial load *a*.

These loads, *a* and *b*, are called absolute increment loads because determined for *A* and *B* with reference to an infinite opposing mass. Moreover, *a* and *b* are respectively proportional to the angular momentums of *A* and *B* which may be represented by *A′* and *B′*. But when *A* and *B* are both free from *S*, the initial load *I* required to maintain contact becomes $I = \frac{ab}{a+b}$.

A diagram of these reactions can be applied to a pair of gears under constant load as shown in Fig. 8. At slow speed the pressure on the teeth is constant, but as the speed increases, it rises and falls as shown by the wave line, maintaining a constant mean. At any constant speed, the shaded areas above and below the mean line must be equal, whether caused by a rigid solid like the roller *E* or by elastic gear teeth under impact. With the eccentric roller the ordinates above and below the line, as well as the shaded areas, must be equal, and with gear teeth this may also be true although not necessarily so. The increment may exceed the decrement, and evidence as to whether it does or not must be looked for in the gear diagram.

Without venturing upon a mathematical analysis which may be deferred until some experimental data have been obtained, let me say that the auxiliary flywheel seems to solve the problem as to absolute decrement loads, and that the diagrams point the way for their conversion into increment loads. The diagrams will show the errors and the speed tests will show the corresponding effect upon strength, so that ultimately the errors will be correlated to the strength at speed without breaking anything, and with a clear understanding of cause and effect. The same apparatus can be used also in tests of efficiency and endurance and a fund of information can be obtained, based upon analysis and experiment. These considerations make the machine of general interest and justify its further development.

Effect of Tooth Irregularities on Noise Can Be Studied

It will be seen that the gear tester as planned offers an unusual opportunity to study the effect of irregularities in the teeth upon the noise produced in running, and since quietness in running has come to demand more and more attention by manufacturers to satisfy the cultivated taste of an exacting public, it is believed that this end can be attained by the study of irregularities, not only in their effect upon strength but also in their closely related effect upon noise. It will be seen also that the gear tester is well adapted to tests of endurance, requiring only about 2 per cent of the power transmitted and returned through the test gears, and making it possible to note the effect of wear as the tests proceed. By running very slowly under a test load, as provided for making diagrams, the friction of approach and recess may also be distinguished on the scales, and coefficients of friction may be established for different speeds.

In conclusion the writer wishes to acknowledge his indebtedness individually and collectively to his committee of experts, and to the American Society of Mechanical Engineers for its cordial and generous support in this pioneer work.

The Danger of Ultimatums—Discussion

BY JOHN T. SLOCOMB

I most heartily agree with the writer of the short editorial discussing the above subject on page 424, Vol. 59, of the *American Machinist*, and would like to give an illustration of how an ultimatum worked in one case in a machine shop.

John Smith was very busy and was having considerable trouble in getting satisfactory help. One morning he discovered that Bill Jones was not on the job. Now, while Bill may not have been the best man in the shop, still he was useful and certainly valuable at that particular time. The superintendent informed Smith that he had issued an ultimatum to Bill Jones and, as Bill had violated the conditions, Bill was no longer there.

It was like this: Bill had asked for a raise in wages and the ultimatum was, "If you ask again, you get through"—and Bill had asked.

Even the owners agreed that the superintendent was justified in firing Bill, and Smith wasted considerable time trying to explain to the owners that the real fault was not in firing the man but in issuing the ultimatum. Any man has a right to ask for a raise in wages as many times as he pleases, as far as I know, but if he becomes a nuisance at it, of course, it becomes the owner's privilege to get through with him. Such decisions can best be made when the time comes, and there is no necessity of giving notice in advance.

ULTIMATUM NEITHER TEACHES NOR DISCIPLINES

We, in machine shops, are not running kindergartens, teaching children ethics in regard to how to act toward their superior officers, as the most important subject. We might be trying to build good machinery, and the two schools might not hitch up well together. Anyway, there is no use in trying to teach a man anything by killing him, for in that case, he cannot make use of his education.

In this case, Bill went about a half mile away and found a better job at higher pay. All he learned by the incident was that Mr. Superintendent had something the matter in his upper story. Many incidents of this nature have made machine shops unattractive to men of a certain fiber and have gone a long way in making the personnel of shops unsatisfactory.

An ultimatum, telling what you will do in a certain case a day or a year in advance may be the height of foolishness. You do not know that you will be on earth to do anything, and you may be only suggesting to someone that he do something awful, that he had never thought of doing until you suggested it.

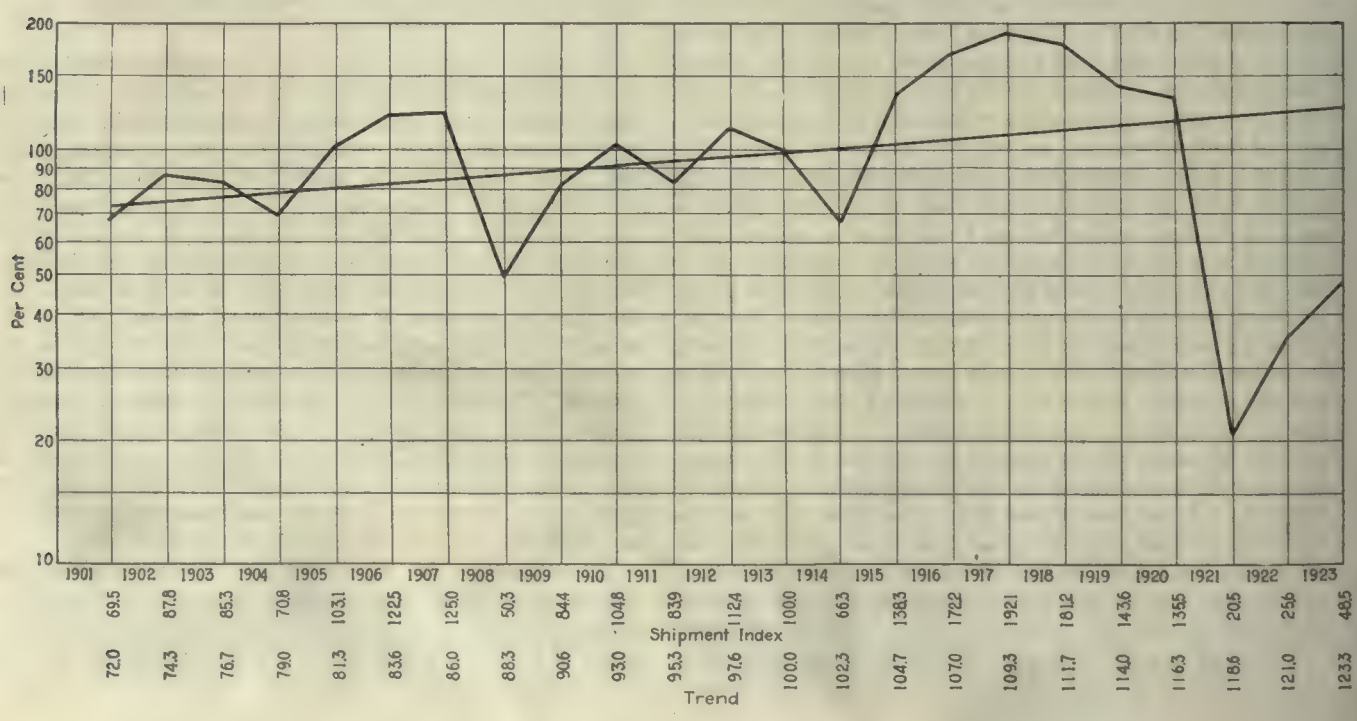
Permanent-Mold Casting of Aluminum Alloys

A study of the state of the art in the production of aluminum castings by the permanent-mold process has been made by the Department of the Interior at the Pittsburgh experiment station of the Bureau of Mines. Experimental work undertaken some time ago on the gating of aluminum alloy pistons on casting in permanent molds has been completed. It has been shown that the occurrence of blow-holes and related defects can be controlled by proper gating and pouring practice.

Shipment of Machine Tools

If anyone still has any lingering doubts as to what effect the war had on the machine-tool industry he has but to glance at the chart shown here to set them at rest. The chart was made up from the reports of twenty-nine representative firms by E. F. Du Brul, general manager of the National Machine Tool Builders' Association. Note that the figures are reduced to a basis of 100 as of 1913.

The first line of figures below the base line gives the yearly shipments in per cents of 1913. The line below that gives the trend figures assuming 1913 to be 100. It will be observed that although shipments for 1923 are nearly twice as large as those of 1922 they are less than half what they should be under normal conditions of industrial growth.



Development of Modern Stamping Practice

By W. W. GALBREATH and JOHN R. WINTER
President and General Superintendent, Youngstown Pressed Steel Co.

Early uses of pressed metal — Pressed steel in the automobile field—Replacement of cast-iron parts by pressed steel—Various applications of pressed steel

THE whole progress of man has been dependent upon the discoveries and inventions which he has made, and the greatest single step in this progress has been his discoveries in treating metals to accomplish certain desired ends.

The first metal used by man was copper—logically, too, because of its softness. This very softness, however, that was a point in favor of the early use of copper, was also the first to count against it. But when primitive man learned that the reddish earth we call iron ore could be smelted and made into tough, hard metal which would take and retain a point or edge, he stepped up from the primitive stage into the real mastery of the earth.

Every hour of the twenty-four that we live and

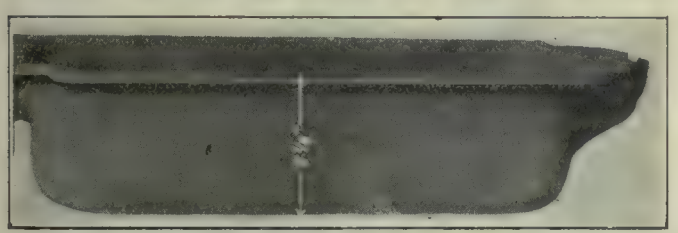


FIG. 1—PRESSED-STEEL CRANKCASE THAT REPLACED CAST ALUMINUM CRANKCASE

breathe—and even some of the hours that we slumber away into eternity—are affected by the use of metal—chiefly iron and steel. We sleep in a metal bed, made comfortable by metal springs covered with fabrics woven on metal machines. In the morning we jump into a metal tub, only practical because of metal pipes. Even our faces are kept youthful through the use of metal razors. To go into the details of the tremendous, but often unthought-of, part that metal plays in our lives would take more time than is now available. But because metal has become so common, so ordinary, so much a necessity of every movement in life, seldom does the real realization of the progress which the metal industry has made come to mind.

Primitive man had fire at his command at a very early period, and with its aid he was able to smelt ore and then hammer or cast the product thus obtained into various forms. For centuries, forging and casting were the only methods known for producing iron parts. Large quantities of parts were not required and for a long time slow, expensive methods of manufacture prevailed. Many can remember the cast-iron keys and the forged hardware that decorated the doors of homes only a few generations ago. Since quantities were small, there was little incentive to develop methods that would produce parts at high speed and relatively low cost.

Then came the development of the electrical industry which grew with amazing rapidity. The old-time gas-chandelier and oil-lamp manufacturers had been content with slow hand methods of spinning the light-weight metal parts that were required. The electrical industry, however, needed speed in the production of thousands of various parts that had to be uniform but usually with only thin walls and of no great size. Electrical manufacturers discovered that these parts could be pressed from steel and brass with amazing rapidity and accuracy.

The first electric door-bell bases, as well as the covers for the magnets, were cast affairs—expensive to make. Here was a simple stamping job, of thin material, easily handled and easily pressed. Split-hair accuracy was not required. Stamped metal boxes and bases have since become universal. Then the electrical industry found it could also press bells for gongs, railway signals, and such with equal facility.

In the telephone exchanges thousands of relays were required and each had to be fitted with a cover as protection against dust. The problem was relatively simple—just a tube about two inches in diameter and four inches deep. But quantity production was required and light presses could turn out the parts speedily and accu-

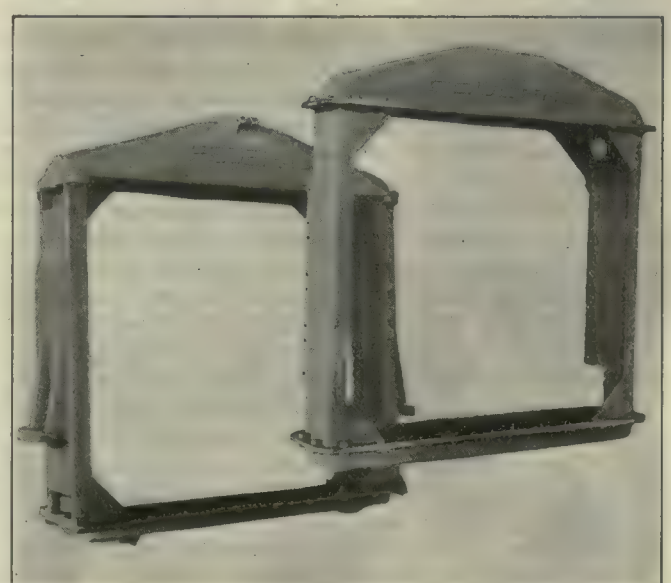


FIG. 2—LEFT: CAST RADIATOR SHELL WEIGHING 44 LB. RIGHT: PRESSED-STEEL RADIATOR SHELL WEIGHING 28¼ LB.

Abstract of paper presented before the Machine-Shop Division of the American Society of Mechanical Engineers, at the annual meeting, Dec. 3 to 6, 1923.

rately. A glance at any desk telephone today will show that the instrument as well as the bell box is made almost entirely of pressed metal parts.

Shortly after began the phenomenal development of the automobile, and soon the primitive "horseless carriage" was raising the dust of the highways. But the automobile manufacturer followed a very ancient law, the "law of habit." Because he had grown up in the carriage and wagon business where castings, forgings, and wooden parts had been his daily contact, these were the parts he used. His vehicle was exactly as

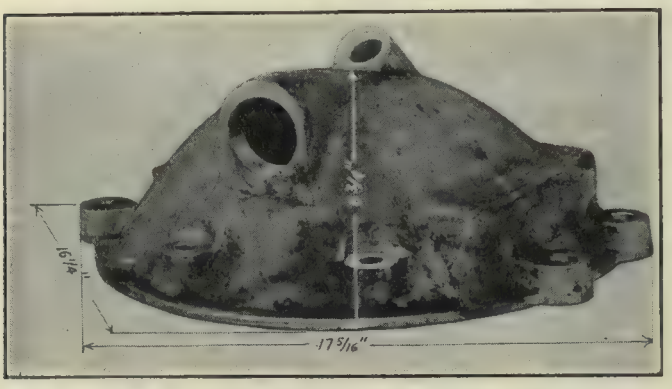


FIG. 3—CAST ALUMINUM HOUSING COVER WHICH WAS REPLACED BY ONE OF PRESSED STEEL

described, a "horseless carriage." Even the frames in the early machines were of wood. And no one today would want the enormous wheels that dignified the first gasoline chariots. The law of habit was strong, but the law of necessity was greater. Many castings were too heavy and too slowly produced. With greater production the automobile manufacturer could see the day coming when he would have to put in enormous quantities of additional equipment for performing the necessary machining and drilling operations required on cast parts. Most important, however, was the demand for lighter weight.

Pressed Steel in the Automobile Field

About this time the man with pressed-steel experience began to seek employment in the automobile field. His early activities in pressed steel for the automotive industry were confined to the lighter parts, such as clips, braces, and brackets. Here savings were accomplished that made it easier to get the automobile manufacturer to consider stamping the heavier parts of his car.

A typical instance of how pressed steel made a saving for one automobile manufacturer in the early days when chain drives were standard practice, is told by a man of many years' experience in the stamping field. This particular manufacturer had a combined sprocket and brake drum for the rear wheels of his car. The part was made from a casting which was expensive, heavy, and difficult to make. But by the proper combination of a pressed drum with a separate sprocket—not so easily worked out as words seem to convey—this pressed-steel engineer designed both a better drum and a better sprocket at lower cost. One can just imagine this manufacturer soon looking over his car for other savings pressed steel might bring.

In the automotive field the first major parts of a car that were pressed in large quantities were brake drums, and then frames and then hubs, and so on until today almost the entire car, body and all, is made of pressed steel.

What to the eye seems a rather simple job of stamping is very frequently a task which requires days and days of study and experimenting. The first brake drums produced were made by two drawing operations and had, as the pressed-steel man terms them, "picket fences." In other words, the edge of the flange was not true, but wavy, nor were the drums always perfectly round. Now pressed brake drums are manufactured by one operation.

Today a brake drum must be round within twenty thousandths of an inch, which in a 14-in. drum is surely a very slight variation from a perfect circle. This tolerance would not be difficult if every piece of sheet steel supplied had exactly the same thickness and exactly the same temper, but this is not commercially possible. This very difference, which cannot be overcome, causes stamping manufacturers the most of their difficulties.

Much thought and effort have been expended on the relatively simple process of pressing drums. One large manufacturer, whose plant turns out mountains of brake drums each year, tells of the obstacles that had to be overcome in producing a particular drum with an unusual profile of various sizes. A contract for making these drums (9 in. in diameter) out of ⅛-in. stock was secured. The dies were made and the job

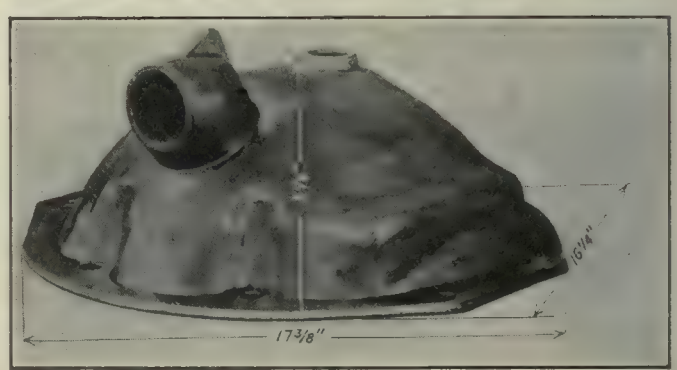


FIG. 4—DUAL REDUCTION HOUSING COVER OF PRESSED STEEL THAT REPLACED THE COVER SHOWN IN FIG. 3

went through the plant without a hitch. Then along came a contract for making the same drums 12 in. in diameter out of slightly heavier stock. Every one expected the work to go through with the same facility as before, but unexpected difficulties were encountered.

Cold sheet steel when subjected to several hundred tons' pressure in a heavy press really flows, or in other words, part of the sheet is stretched to make a thinner wall, and part forced into certain sections to make a thicker wall. In the 12-in. drum the steel did not act at all as it had in the smaller drums and too much metal concentrated at one point. However, after many hours of study and experimenting, perfect drums were finally produced.

But the story does not end here. Shortly after along came an order for 14-in. drums with the same profile and of proportionately heavier stock. With the previous experience on the 12-in. drums it would seem that no new problem could arise. But it did, for the 14-in. drums did not act at all as had either the 9-in. or the 12-in.; and the production of the larger drums had to be studied through just as thoroughly as that of the two smaller ones.

This particular experience is cited at length to point out that even though two pressed-metal pieces appear the same and are used for the same purpose, there is no known rule that can be applied to the action of the metal, when under pressure, that works satisfactorily in all cases.

The production of pressed parts of large size requires infinite patience, coupled with a wide knowledge and experience of the action of steel under various conditions and an understanding of why and how each job differs from another. Success in the use of pressed parts can be assured only when this experience is employed. Fortunately, there are today a number of stamping organizations in the country that have this ability.

Considerable emphasis has been placed on brake drums in the preceding paragraphs, but the conclusion should by no means be drawn that brake drums are the only pressed parts of an automobile. There are hundreds of pressed parts on every automobile today.

Another one of the interesting phases of the development of pressed-steel parts for this industry is the replacement of cast-aluminum parts. As previously mentioned, lightness was one of the influencing factors in the automobile industry that pressed steel helped to solve.

Before pressed steel occupied the important place it does today in the automotive field, manufacturers turned their attention to lighter metals, chiefly aluminum, in attempting to reduce the weight of their cars. In many instances, however, pressed-steel parts have even excelled aluminum in lightness, not to mention the additional advantage—saving in costs.

Pressed Steel for Weight Reduction

In one case a cast aluminum crankcase weighed 13.5 lb. while the pressed-steel crankcase which replaced it, shown in Fig. 1, weighs only 12 lb., or 1½ lb. less than the aluminum part it replaced. Both crankcases are identical in size and accomplish the same purpose, but the pressed-steel part made a substantial saving in both cost and weight for the manufacturer.

In the replacement of cast-iron parts, pressed steel has effected very many savings, both tangible and intangible, for the automotive industries. Fig. 2 shows two radiator shells used on a well-known truck in which the use of pressed steel saved the manufacturer 35 per cent in material tonnage alone. In addition, many machining operations were eliminated and the parts were delivered to the plant ready for assembling. Moreover much less weight had to be hauled both in and out of the plant, as well as by the truck during its whole period of usefulness.



FIG. 5—CAST-STEEL (LEFT) AND PRESSED-STEEL PINTLE HOUSINGS

A particularly interesting example of the application of pressed steel to the automotive field is illustrated by the redevelopment of a dual-reduction housing cover from cast aluminum to pressed steel (Figs. 3 and 4). By the very nature of the method of manufacture, a cast part is usually one solid unit. All projections, bosses, etc., can be cast as integral parts of the main member. In considering such a part from a pressed-steel production standpoint, it frequently happens that the cast part has to be viewed from its component parts. Here is where the ingenuity of the pressed-steel engineer comes to play. In this dual-reduction housing cover the problem was to provide material for the necessary tapping of the two small openings. This demand was successfully and cleverly met by the insertion of a steel flange and cast-iron elbow, which provided the necessary tapping facilities. While the weight of the whole part was increased very slightly, this was not a vital factor, and the cost of the pressed part represented a very substantial saving over the cast part. Particular attention is directed to this redevelopment, because many parts that at first are apparent impossibilities for pressed-steel redevelopment can be produced by those who are experienced in this work and who recognize that a completed pressed part is often secured by the combination of several different pressed units. The only way of making sure that any part cannot be successfully produced by stamping methods is to submit the part in question to a competent pressed-steel engineer.

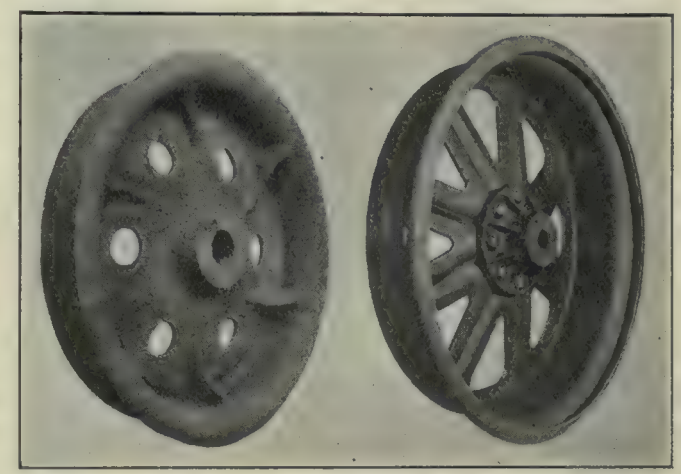


FIG. 6—CAST-IRON AND PRESSED-STEEL INDUSTRIAL CAR WHEELS

But while the automotive manufacturer had been building his business through the use of pressed-metal parts and thus obtained not only the required quantity production but was also able to turn out better cars at lower prices because of the savings accomplished, a few other manufacturers made desultory attempts to apply the pressed-steel idea. During the war, both small and heavy pressed parts were used in enormous quantities. The casting capacity of the country was limited and could not begin to fill the requirements, so that pressed steel met an urgent need.

Pressed-steel shells are familiar to all, but a typical war development of pressed steel is illustrated by a cast-steel pintle housing (Fig. 5) developed into pressed steel. In this instance not only was the saving in weight a strong incentive, when the demand was for

conservation, but the difference in method was of first importance, since all casting capacity thus released could be more effectively used on other parts where casting was an absolute requirement.

During the peace-time prosperity which followed the war, many of these manufacturers who had watched the development of pressed steel in the automotive industry and who had seen the war-time use of pressed metal, cast about for less costly methods of securing parts. But the real possibilities had to be brought home by those interested in the manufacture of pressed parts, and unfortunately many manufacturers have been too lethargic in appreciating the value of pressed steel. As a case in point may be cited the experience of one pressed-steel salesman with a gas-meter manufacturer.

Noticing one day that the covers of the meters made

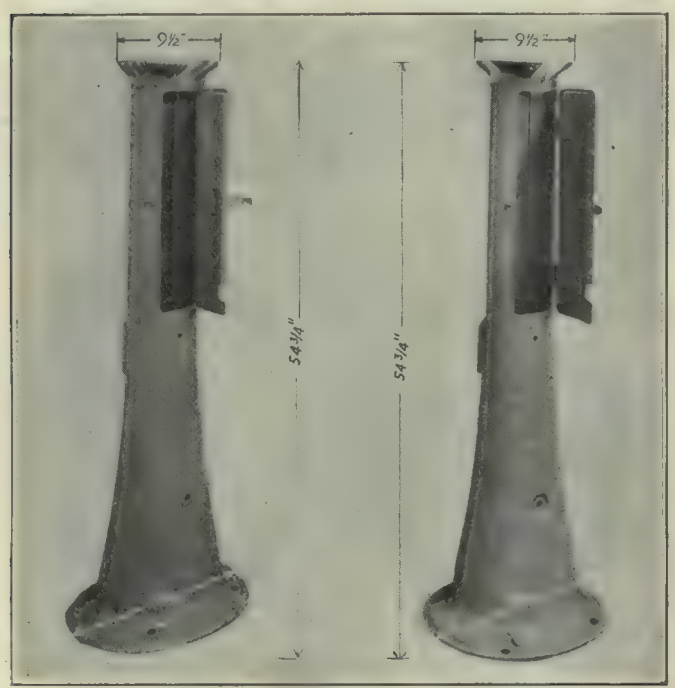


FIG. 7—CAST- (LEFT) AND PRESSED STEEL GASOLINE-PUMP BASES

by this manufacturer were castings and required a number of drilling and machining operations to secure a proper fit, the salesman paid him a visit and discussed the advisability of making them out of pressed steel. This material did not at first seem to meet the requirements, but the problem was studied and a pressed-steel meter cover designed that not only saved the meter manufacturer many dollars in first cost, but also eliminated a number of expensive machining and drilling operations. In addition, a troublesome problem in breakage of the cast covers was solved by the employment of pressed steel.

One pressed-steel redevelopment, made for a manufacturer of gasoline section cars—the type so often used by railroad track gangs—is a striking example of the weight saving that pressed steel often accomplishes. This manufacturer had been using a cast-iron wheel 20 in. in diameter on the tread and weighing 125 lb. The redevelopment of the cast wheel into a pressed wheel, to which a cast-iron hub was fastened, reduced the weight 78 lb. Of even greater importance was a cost saving of over 50 per cent. In Fig. 6 photographs of both wheels are reproduced.

Many of the gasoline pumps seen at filling stations are definite object lessons in pressed steel that can be applied to the business of a customer provided he uses any cast parts. Take for example the pump base shown on the left in Fig. 7. This base consisted of two cast parts 54¾ in. high, with a cast door giving access to the mechanism installed in the interior. From the layman's standpoint the base looked like an impossibility for pressed metal because of its great length and the number of minor attachments, such as hinges and door latch, that were an integral part of the large casting. But a pressed-steel engineer who knew how to attack such problems studied the casting not as a whole but in all its various parts, and worked out ways by which these smaller parts could be reduced to pressed-steel possibilities. The results of this study are to be seen in the pressed-steel pump base shown at the right.

Correct design, big, heavy-duty presses, the acetylene torch, and electric welder produced a pressed base made up of twenty-five separate pressed pieces which, when assembled, weigh less than half as much as the cast base—60 lb. of pressed metal against 155 lb. of castings. In addition to the material savings must be considered the collateral savings in freight and ease of handling, as well as the elimination of machining costs and breakage.

Savings Through Use of Pressed Steel

Many manufacturers who have learned by actual experience the exceptional advantages pressed steel has accomplished in one part, have carried the saving thus secured to other parts of the same equipment. A stove manufacturer who was induced to adopt pressed-steel legs for his stoves found the savings so substantial that he developed several other cast parts such as door frames and doors into pressed parts. Another feature—of selling importance—was found in the fact that pressed parts take enamel finish better than cast parts.

One wringer manufacturer is now using pressed parts in place of cast parts for all of the metal work on his product with the exception of the clamping screws. A washing-machine manufacturer redesigned his entire machine and kept in close touch with the engineering department of the stamping organization that made his stampings—with the result that he now has a machine that uses pressed steel most effectively and presents a much better appearance.

The opportunity of getting a better product with stronger selling points can be secured by many a manufacturer in the household-appliance field if he will but get in touch with a competent stamping organization. A gasoline-pump manufacturer who had had previous gratifying experiences with pressed steel, was considering the manufacture of an oil-tank truck. Ordinarily his own designers would have planned the entire job, but his confidence in the pressed-steel organization and the results it had secured for him led him to find out first how pressed steel could be used in its construction. The truck was designed entirely in the stamping manufacturer's plant and every part, except the castors, is pressed metal.

There is scarcely a plant in this country using metal parts that cannot apply pressed metal to advantage, no matter if the product is one of long standing or whether a new product is under consideration.

It is not the aim of the pressed-metal manufacturer to eliminate castings, for there are thousands of parts which are cast that cannot be produced in any other

way. But pressed metal is making a wonderful contribution to industry in speeding up the production of parts, reducing excessive unnecessary weight, eliminating many expensive machining operations, and saving material and handling costs, in addition to savings in plant investment that would have to be made to take care of many finishing operations required when cast parts are used. The same advantages which many industries today are getting from the use of pressed parts can be obtained by almost any manufacturer who will get the facts on his own products. The pressed-metal industry is ready and waiting to serve him.

Heat Treatment of Carbon Steel Castings

THE recommended practice given herewith is intended solely for guidance and is not to be construed as entering in any manner into specifications of the American Society for Testing Materials. When adopted as standard, it will supersede the present recommended practice for annealing of carbon-steel castings as given in the 1921 Book of A.S.T.M. Standards.

The castings should be sufficiently cleaned of adhering sand before annealing to insure thorough and uniform heating. It is, of course, inadvisable to sand blast the castings before annealing.

The castings should be heated slowly and uniformly to temperatures varying with the carbon content of the steel, approximately as follows:

Carbon, per Cent	Temperature
Up to 0.40	900° C. (1652° F.)
0.40 to 0.60	850° C. (1560° F.)
Above 0.60	830° C. (1525° F.)

The castings should be kept at the maximum temperature a sufficient length of time to insure the refining of the grain. Generally, from one to two hours is required to accomplish this refining after the steel has reached the maximum temperature. As it requires a considerable length of time for the interior of a heavy piece to reach the indicated temperature of the furnace, it is recommended that the castings be held at the maximum temperature at least forty-five minutes for each inch of thickness of the castings and that to the time estimated from one to two hours be added to insure thorough grain refining throughout the piece.

The castings should be cooled slowly and uniformly in the furnace, when it is desired that the steel shall possess the maximum softness. In the case of very heavy castings of comparatively uniform section they may be cooled in the air. It is, of course, quite unnecessary and superfluous to use this method as preliminary to any of the methods outlined below.

The castings may be cooled at an accelerated rate when it is desired that the steel possess rather higher tensile strength. Elastic limit can be procured by slow cooling. The cooling must be so conducted as to leave the steel reasonably free from cooling stresses. The castings may be withdrawn from the furnace and buried in a bed of material that is a poor conductor of heat; or the annealing furnace may be so thrown open so that the castings will cool more rapidly than they would if the furnace were left closed. Should, however, the castings be of such uneven section that they cool at unequal rates at various points when the furnace is opened, especially if the carbon of the steel is high, the furnace should be closed immediately after the castings have become black.

If the sections of the castings are such that the castings will cool in air, from the annealing temperature, to a black heat in less than 30 min., the castings may be withdrawn from the furnace and cooled in the air. When a car-type furnace is used, this may be accomplished by withdrawing the car from the furnace and allowing the casting to remain on the car. In this case, however, care should be taken in loading the car so that the castings will cool as uniformly as possible.

When the greatest possible strength and elastic limit for any given extension and contraction are desired, the castings may be quenched in oil or water followed by reheating, provided they are of suitable design and section.

Certain castings which would crack if held in the water or oil until completely cold, may be safely treated by removing them from the bath when they have reached a black heat, placing them in a furnace at approximately the same temperature as the castings and immediately reheating them as described.

Castings which have been cooled in air, or quenched in water or oil as described, should be reheated to a temperature not exceeding 675 deg. C. (1,247 deg. F.). If there is danger of cracking the castings in this reheating, on account of the stresses set up by previous rapid cooling, this second heating should be at a slower rate than the first heating. In no case should the rate for the second heating exceed that for the first heating. The castings should be held at the given temperature at least one hour for each inch of section to insure thorough and uniform heating throughout the piece. To this time of exposure to the maximum temperature should be added at least two hours to complete the drawing of the interior of the castings. After the drawing is completed, the castings may be cooled as desired either in the furnace or in the air.

In general, the shock toughness of the steel is considerably improved, and the elastic limit considerably raised, by air cooling and drawing as compared with these properties in a similar steel when annealed. Both these properties are still further improved by quenching and drawing.

Pressed Metal Engineering

Under the title "Pressed Metal Engineering—Some Principles and Examples," Douglas P. Cook, President of the Boston Pressed Metal Co., Worcester, Mass., presented a paper before the Machine Shop Practice Division of the American Society of Mechanical Engineers at the annual meeting held during December.

The subjects taken up in Mr. Cook's paper are the scope of the industry; the "jobbing" pressed metal industry; importance of engineering functions; the process, its diversity and complexity; rapid growth of the industry; the automotive demand and its relation to the pressed metal industry; general lack of understanding about the industry; lack of engineering standards and information; erroneous designs; unwise specifications; possibilities and imitations of press production; first cost versus ultimate economy; the question of tools; search for broader markets for pressed metal; the pressed metal sales engineer; discussion of sales models and drawings; examples of pressed metal design.

An exhibition of lantern slides accompanied the paper. The slides showed numerous examples of redesign in pressed metal of parts originally designed as iron, brass, aluminum and malleable castings, screw machine products, die castings and forgings.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Large Work on a Small Machine

By C. H. Hays

Through a change in design of one of our products it became necessary to find a method to machine some castings to a 23-in. radius. Being equipped to handle small work only, we designed and had built the fixture shown in the illustrations herewith.

In Fig. 1, the fixture *A* is shown mounted on the

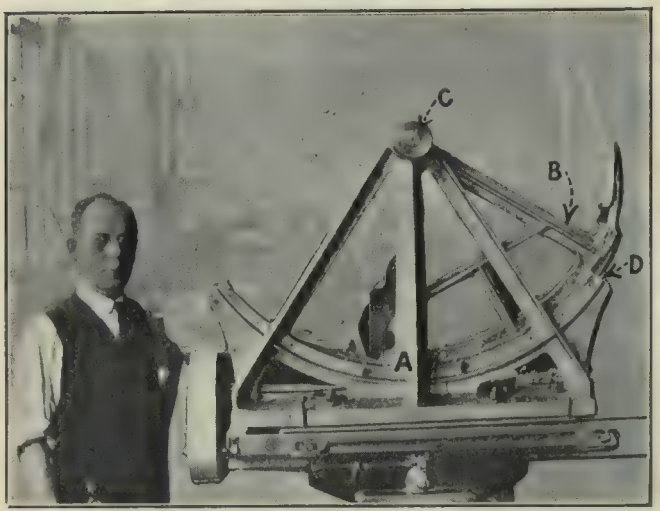


FIG. 1—FIXTURE FOR RADIUS MILLING

table of a No. 2 Brown & Sharpe milling machine. The swinging segment *B*, to which the work is attached, is pivoted at *C* and guided by the gibbed slide *D*. The segment has teeth cut in the circular part and is driven by a worm on the shaft *E*, Fig. 2, the shaft being driven from the regular feed mechanism of the machine. This view is from the working side of the machine and shows the gibbed slide *D* more in detail.

The work *G*, is shown in Fig. 3, the cut having been completed. This view also shows the clamping arrange-

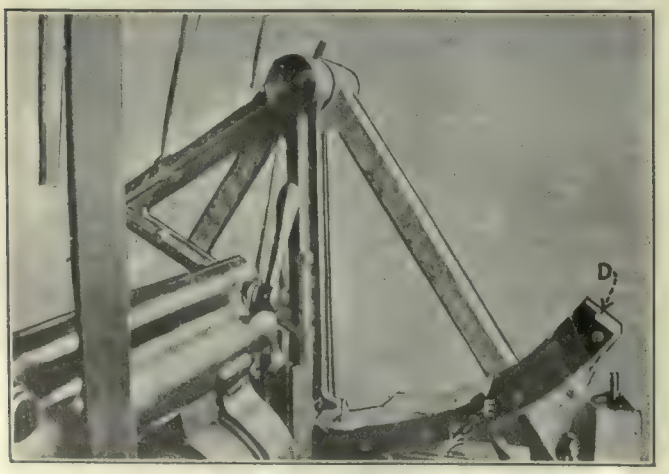


FIG. 2—DETAILS OF THE FIXTURE

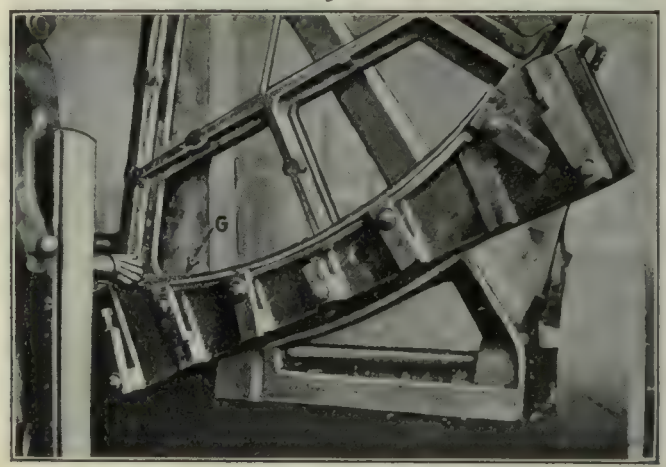


FIG. 3—HOW THE WORK IS HELD

ment by which the work firmly is held to the segment.

The fixture will handle work requiring the milling of radii from 6 to 30 in. and having an included angle of 80 deg. The radius to be milled is governed by the vertical position of the knee on the column of the machine.

An Ingenious Arrangement for Multiple Drilling

By J. A. Long

For the purpose of lightening the connecting-rod, it is customary in one automobile shop to drill 11 holes through the web of the rod. This operation is performed by means of the multiple drilling mechanism shown in Fig. 1, which was built on the bed of a discarded bench lathe.

A top view of the device is shown in Fig. 2, and it

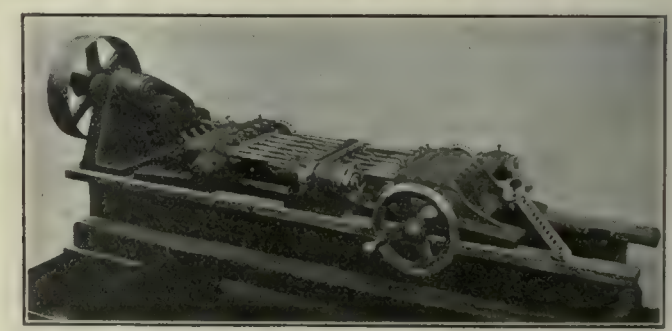


FIG. 1—MULTIPLE DRILLING MECHANISM

will be noted that the drills are disposed on either side of the jig at the center, six drills operating from the left-hand side and five from the right. The driving pulley is located at the left-hand end of the bed and drives the longitudinal shaft *D* through a train of gears.

The drilling heads *E* and *F* are split along the center

lines of the transverse shafts *O*, Fig. 3, as shown at *K*. These transverse shafts are driven through the bevel gears *J* from the longitudinal drive shaft, and carry long helicoidal gears which mesh with helical gears *N* on the drill spindles *G*. The drill spindles are mounted in bronze bushings *H*, the thrust being taken by the ball-bearings *I*. The drilling heads are arranged to slide on the ways of the lathe.

The jig for holding the work is composed of the base

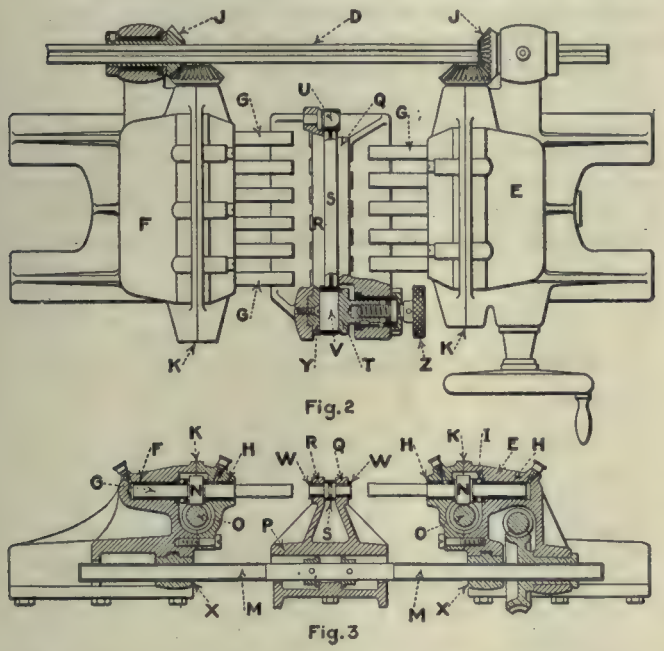


FIG. 2—TOP VIEW OF HEADS AND JIG. FIG. 3—SECTION SHOWING SPINDLE MOUNTING AND FEED

P, fixed to the lathe bed, and carrying two parallel bosses, *Q* and *R*, in which are located the drill bushings *W*. The bosses are properly spaced to permit the positioning of the connecting rod *S* between them, the wrist-pin end of the rod being located on the pin *U*. The other end is positioned by a sliding button *V* controlled by the screw *Z*. When in position on the button, the action of the screw clamps this end of the rod tightly between the shoulder-block *T* and the locating-block *Y*.

The heads are fed in and out from the jig by means of the right- and left-hand screw *M* which is prevented from moving longitudinally by two collars, one on either side of a boss in the jig. The screw rotates in the nuts *X* carried in the drilling heads, thus producing the feeding motion, the rotation being accomplished by means of the worm gearing located in the right-hand head. The worm shaft is rotated by means of the handwheel shown in Figs. 1 and 2. The wormwheel is, of course, feather-keyed to the screw.

A drilled connecting rod is shown at the right of the device in Fig. 1, and the maximum production of drilled rods on this operation is 100 pieces per hour.

Roll Grinding in California

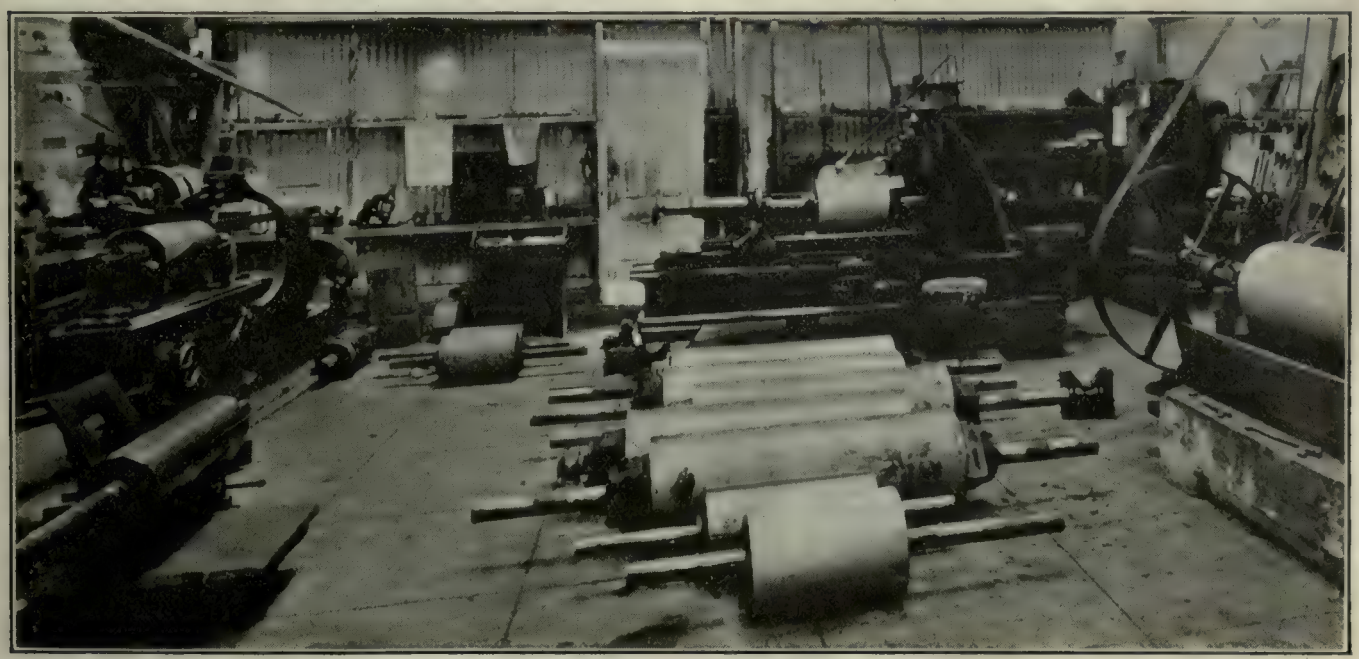
BY HERBERT CRAWFORD

Roll grinding is not an everyday operation in any part of the country, although there are a few centers where it is more common than in others. The illustration is from the roll grinding department of the Llewellyn Iron Works, Los Angeles, Calif.

The small rolls in front are for crushing or grinding barley and have spiral corrugations. They are made of chilled cast iron. The larger rolls on the floor and in the grinding machine are used in making cotton-seed oil. These rolls have no fluting but are ground smooth. Similar rolls are used by the rubber industry, there being a very large tire plant just outside of Los Angeles.

The machine at the rear is an automatic planer for cutting the spiral corrugations. The work in place is an 18-in. roll for barley.

The grinding machine at the right is a Morton-Poole grinding machine, one of the notable machines for grinding rolls, and developed many years ago. This particular machine has been modified to handle the large variety of grinding which comes to this department and will accommodate rolls up to and including those of 18 in. in diameter and 48 in. in length.



GRINDING ROLLS FOR BARLEY AND COTTON SEED OIL

Two Ways of Making a Core—Discussion

By F. C. Edwards
Birmingham, England

In his article under the above heading, published on page 152, Vol. 59, of the *American Machinist*, M. E. Duggan makes some remarks that somewhat alter the status of our bone of contention and brings us, on most points, to a condition of substantial agreement.

That there is a proper method attainable for every pattern made—that is, a method of pattern construction and molding best calculated to serve its specific purpose and to produce the highest efficiency in the foundry in which it is to be used—I still maintain. The actual achievement of the proper method is another question. The ideal is sometimes far removed from the real.

I find myself partly in agreement with Mr. Duggan on one point in his article and completely so in another. I certainly cannot give unqualified indorsement to the statement that the average patternmaker is unable to predetermine the operations of the molder. Speaking from personal experience (and it may not be out of place to mention that I have had charge of seven different pattern shops in various parts of England since first I trod the thorny path of foremanship in the year 1895) I have found the average patternmaker generally reliable on the ordinary run of work.

With anything uncommonly intricate, of course, assistance from the foreman should always be forthcoming. The foreman is more immediately in touch with the drawing office, the foundry and the other departments concerned, and therefore his command of relevant data is the more comprehensive, irrespective of his personal experience.

It is my invariable custom in such cases to discuss the job freely with the patternmaker before a start is made. Indeed, when I find it necessary to put several men on one job I usually hold a sort of general conference, inviting the utmost freedom of speech and criticism from every one present, and build up a general line of action to be followed in the construction of the pattern. Each successive step is viewed from many angles and is decided upon according to the weight of argument for and against. Everyone on the job is, therefore, thoroughly conversant with the route to be taken in subsequent steps.

This preliminary analysis eliminates wasted effort, achieves the best final result, and is found to speed up production considerably. The most unwieldy job can thus be sectioned up and each man given a particular section, with clear ideas on its relationship to the job as a whole. In handing out these sections it is understood—since not all men are of equal ability—that in order to secure the highest collective efficiency one must differentiate to some extent between individuals according to their respective capacities.

I agree with Mr. Duggan *in toto* as to the necessity of foundry knowledge to the patternmaker. Certainly one cannot predetermine molding methods as the poet is held by some to discover truth—by intuition. Experience (which connotes experiment) and observation in the foundry itself, with an ever-ready willingness to listen to the views of the foundryman is, beyond question, the key to the situation. Armed with the key, the patternmaker is not only able to solve most of his immediate problems but he may at times simplify the molding by suggesting appropriate alterations in design.

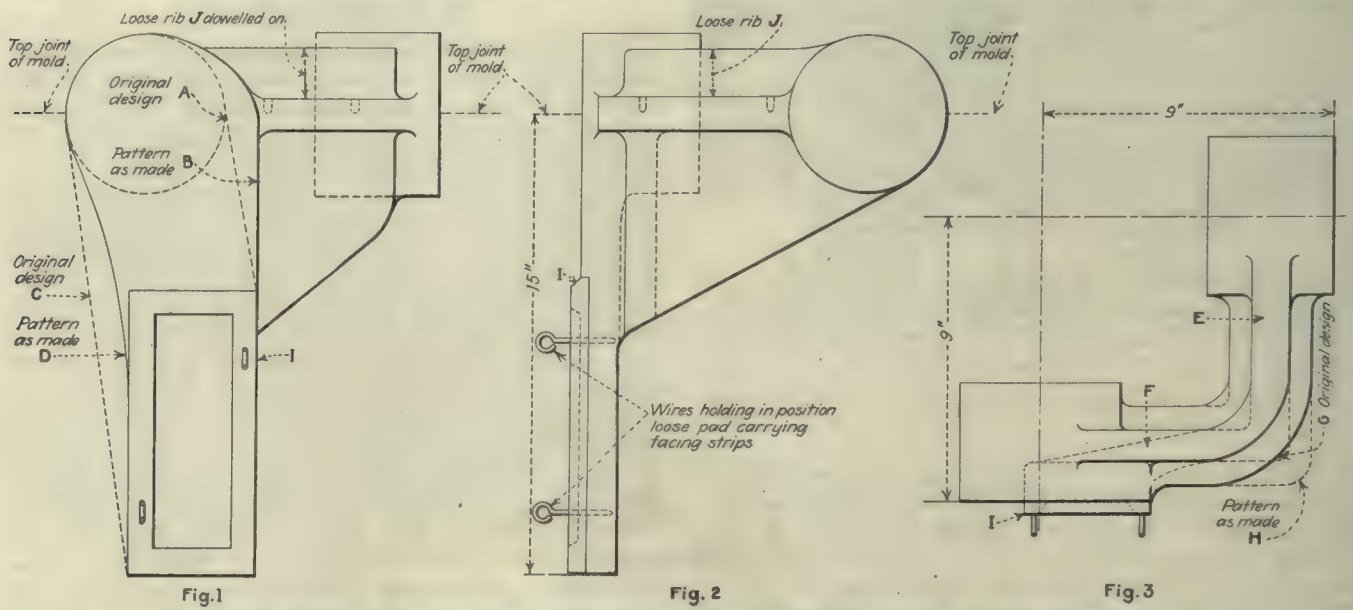


FIG. 1—FRONT ELEVATION. FIG. 2—SIDE ELEVATION. FIG. 3—PLAN OF PATTERN

An example of this latter class is illustrated by Figs. 1, 2 and 3, which are front and side elevations and plan, respectively, of a double bracket. On looking over the blueprint it was at once realized that this job, as designed, presented special molding difficulties. To produce a casting with the upper portion bevelled back, as shown at *A*, Fig. 1, would entail coring or—the molder's pet aversion—deep jointing. It was therefore suggested to the drafting room that the design be altered to bring the side up square, as at *B*. It was further suggested (though this did not affect the molding) that the straight side *C* be altered, as at *D*, in order to improve its appearance.

On the plan, Fig. 3, a large radius was shown at the junction of the sides *E* and *F*, as indicated at *G*. By reducing this radius, as at *H*, the pattern itself would be easier to make and would, moreover, be much more durable. Here, again, the drafting room was quite agreeable to the suggested alteration.

The groundwork of the pattern thus resolved itself into two side pieces *E* and *F*, screwed together at right angles, with bosses and ribs afterwards added. The pad *I*, containing the lower facing strips, was wired on loosely, to be withdrawn after the removal of the pattern. To facilitate molding operations further, the top piece *J*, Fig. 2, was dowelled on so as to lift up with the cope. It will be seen that a very simple job —both in pattern shop and foundry—was thus evolved from what originally promised to be a very difficult one.

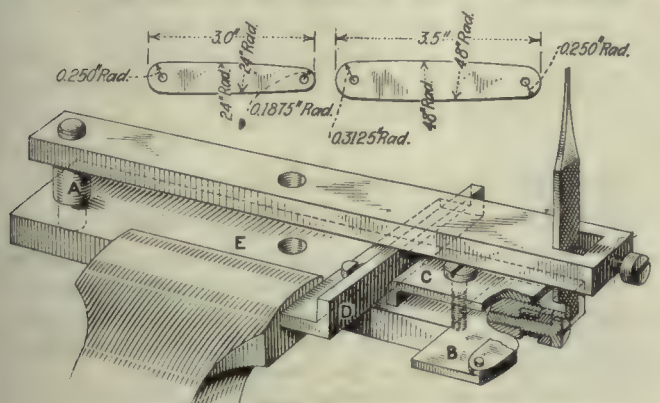
The above case exemplifies the indispensability of a sound knowledge of foundry practice to the pattern-maker. Lacking this essential (since slight variations either in size or shape may entail kaleidoscopic changes in their respective methods of molding) he is little more than a blind tool. Possessing this knowledge he is not only in position to predetermine foundry operations on a given job but, with the aid of a sympathetic drafting room, he may so influence design as actually to anticipate foundry difficulties.

Device for Finishing Accurate Radii

By James M. Call

Some time ago a small and not too well equipped tool and gage shop of which the writer was part owner, was favored with an order for a large number of the pieces shown in the sketch. The pieces were to be used as gages and were therefore to be hardened and must be accurate as to contour and dimensions as well as smooth and neatly finished as to surface.

The long sides of the pieces were to be finished to



DEVICE FOR MAKING ACCURATE RADII

true radii, 24 and 48 in. respectively, and to make these radii to the necessary degree of accuracy and finish, the tool here described was devised. In operation it was held in the jaws of a bench vise, which seemed to be the most convenient way of holding and operating it.

For the base bar of the device, a piece of flat cold-rolled steel of suitable strength and thickness was procured and holes drilled in it to take the shouldered stud *A*, which was to be the center of the respective radii. A rectangular shaped hole was made through the bar at the end opposite to one of the stud holes and to this hole was fitted the projecting lug of what may be called the feeding slide, *B*, to which the work was attached.

The upper surface of the feeding plate was provided with small locating pins over which the work was placed. A tapped hole through the downwardly projecting lug took the threaded end of a fillister head screw which passed through a body sized hole in the end of the bar, and a coil spring between the lug and the outer end of the rectangular hole in the bar kept the feeding screw always under tension and eliminated backlash.

A light clamp *C* was provided to hold the work in position on the pins, yet not to bind it so firmly that it could not be moved outward by turning the feeding screw. A piece of angle iron *D* was attached by screws to the upper surface of the base bar to act as a rest for the swinging arm. No special accuracy was needed in making this base bar except, as a matter of course, that the lug of the feeding plate should be a smooth sliding fit in the rectangular hole, and without appreciable shake.

The remaining part of the device was the swinging arm *E*, having two holes spaced 24 in. apart to fit over the fulcrum stud (this being the difference between the respective radii) and a square hole to take the tool; the inner, or clamping, side of which hole must be 24 and 48 in. from the centers of the respective stud holes.

To lay out the contour of the pieces preparatory to roughing them out, a special scriber was clamped in the swinging arm and lines scribed on the pieces. The pieces were then planed or milled as closely to line as possible and returned to the device for finishing. A pillar file held in the swinging arm was the finishing tool while the pieces were in the soft state, and after heardening them a lapping stone was substituted for the file.

Mandrel for Pressing Bushings on Ford Driveshafts

By R. W. Thomas

It is sometimes difficult to get the bushing on a Ford driveshaft, especially in a shop where there is no press or where the press is too small for the job. Driving the bushing on almost always causes trouble. Not having the proper press, I made the device illustrated herewith, and utilized the lathe as a power press. The operation is as follows:

Place the drive shaft, Fig. 1, in the lathe leaving

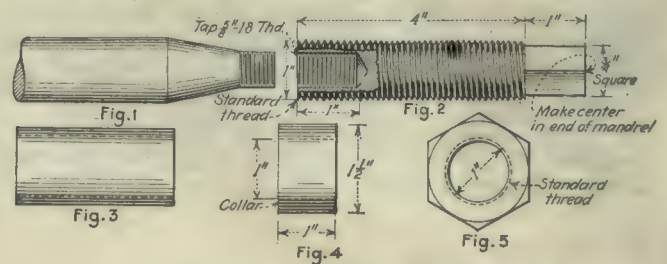


FIG. 1—END OF FORD AXLE. FIG. 2—THREADED PIECE FOR END OF AXLE. FIG. 3—THE BUSHING. FIG. 4—COLLAR TO GO BEHIND BUSHING. FIG. 5—NUT FOR FORCING COLLAR

about 6 in. of the threaded end projecting from the chuck. Then screw the piece, Fig. 2, on the threaded end of the shaft until it comes up to the shoulder. Next slip the new driveshaft bushing, Fig. 3, over the threaded piece and as far on the shaft as it will go. Place the collar, Fig. 4, over the threaded piece and run the nut, Fig. 5, up on the threads until it goes up against the collar. Bring the tailstock of the lathe up, put the center against the end. With a wrench on the nut put the lathe in low gear and start it. This will press the bushing in place easily and quickly.

American Machinist

Established 1877

KENNETH H. CONDIT AND FRED H. COLVIN

Editors

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What Will You Give Toward Research Work on Gears?

GEARING problems have furnished fascinating work for researchers ever since the ancient days when the ordinary wheel with wooden plugs in its periphery was used to transmit power.

At no time have the makers and users of gears been entirely satisfied with their knowledge of gears. Their inability to confidently predict the strength of teeth is still baffling, and absolute quietness cannot be guaranteed.

Progress has been made nevertheless. Several investigators have contributed to our present store of knowledge. Among them Wilfred Lewis, some thirty years ago, made an investigation of the strength of gear teeth based upon tooth forms in common use. About two years ago he proposed to the General Research Committee of the American Society of Mechanical Engineers the development and construction of a machine for testing the strength of teeth, with the result that a special committee on research of gears was appointed. An appropriation by the A.S.M.E. has enabled the making of general and detailed drawings. An article by Mr. Lewis outlining the steps taken in the work and explaining the design of the proposed machine is given in this issue.

Only lack of funds can now hold back the building of the machine and the carrying out of its tests. As a nest egg donations have been secured from some of the gear manufacturers, some of the machine-tool builders and from technical magazines. More money is needed and donations will be accepted by Mr. Lewis, whose address is the Tabor Manufacturing Co., 6225 Tacony St., Philadelphia, E. W. Miller of the Fellows Gear Shaper Co., Springfield, Vt., or Ralph E. Flanders of the Jones & Lamson Machine Co., Springfield, Vt., all members of the committee. The support of this very worthy project is urged.

Mobilizing Industry

THE RECENT article in *American Machinist*, by Assistant Secretary of War Dwight F. Davis, is well worth careful consideration. We should particularly note his statement that man power can be mobilized, trained and placed in action a year before munitions can be made and transported to the firing line. Mr. Davis is of course basing his data on the late war, and on that basis he is right.

It must be remembered, however, that the real delay was not so much in the actual making of the munitions as in the time taken to decide what was wanted and in the unnecessarily difficult designs and specifications which were given out for manufacture. The first requirement of any munition is that it shall function properly, regardless of the difficulties involved in manufacture. But much of the troubles and delays were due to designs which could have been simplified and specifications which were needlessly severe in many cases.

If the machine industry is given designs and specifications which are the result of joint conferences between ordnance officers and engineers who are skilled in modern production methods, munitions can be turned out much more rapidly than was the case in 1917 and 1918.

It is obvious then that this is the point where the greatest good can be accomplished in any plans to secure the co-operation of industry. Now is the time to begin to get the designs for everything needed by the army and navy in such shape that the desired munitions, or whatever it may be, can be put into production with the least delay and manufactured in the most efficient manner. For efficiency means increased production and lower costs.

It cannot be urged too strongly that the question of designs and specifications receive careful attention in every department. There is no wish to prevent ordnance officers getting what they want but rather the desire to help them get it more quickly. The production engineer can do far more to win a war by helping to simplify designs and specifications in advance than by all his efforts to produce work which is unnecessarily difficult after a war begins.

Why not call in the men who understand modern production methods now and utilize their knowledge on all kinds of munitions?

Three Requisite Characteristics of the Successful Shop Manager

ONE of the best known and liked, and most respected men of the machine tool industry gives three characteristics which the successful shop manager must possess. They are: an open mind, a well developed spirit of charity and a good sense of humor.

He did not lay particular stress on any one of the three as being most important but we are inclined to believe that he rather leans to the last mentioned virtue. Certainly its possessor has a far better chance to escape an early death from worry and nervous exhaustion in these difficult days. And he has a better time while he is exercising it.

Charitable treatment of the mistakes of others may well serve to soften the blow when one's own mistakes place him in a precarious position.

As to the open mind, lack of it is about as sure a bar to success as can be imagined. What is the use of arguing with a man whose mind has already been made up, often from insufficient knowledge of the facts? Progress is the spirit of our time and the man who shuts his mind to new ideas cannot but fall hopelessly behind the procession.

Seldom has a more succinct bit of philosophy come to our notice. We commend it to your thoughts.

Shop Equipment News

Cincinnati Climax Shapers

In the line of shapers, known as the Cincinnati Climax shapers, now being put on the market by the Cincinnati Shaper Co., Cincinnati, Ohio, all speed and driving gears are placed entirely within the column, there being no overhanging change-gear box on the outside of the machine. It will be seen from the general view of the machine, shown in Fig. 1, that the levers for starting, for speed control, for feed engagement and variation, for ram adjustment, and for stroke adjustment, are all easily reached by the operator without leaving his working position. Direct reading indicators for speed, feed and length of stroke are provided. The main helical-type crank-gear is of semi-steel, made in one piece, and all other gears are made from heat-treated chrome-nickel steel. The machine is completely guarded, both for the operator's protection against danger from moving parts and belts, and for the protection of sliding surfaces against chips.

The drive is of the single pulley type, with friction clutch and brake, the pulley shaft being mounted on Timken roller bearings. The machine may be driven by a motor mounted directly on pads on the back of the column and base, the arrangement making it possible to attach the motor at any time without difficulty. The speed of the drive pulley is such that the proper range of cutting speeds can be obtained by using a motor running at 1,800 r.p.m. The speed gears, placed within the column, run in oil and slide on integral multiple splined shafts which are supported at both ends, making a compact and rigid mechanism. The gear chamber, Fig. 2, forms a reservoir for the oil used for lubricating the drive gears as well as the rest of the machine. Eight selective changes of speed are provided, ranging from 11 to 138 cutting strokes per minute on the 16-in. size, and from 9 to 102 cutting strokes per minute on the 32-in. size.

The length of stroke is maintained without the usual clamping nut on the stroke adjusting shaft, as this is taken care of automatically. The indicator shows the setting for the length of stroke whether the machine is running or not.

The unique feature of the feeding movement is that it is actuated by cams and not by an eccentric and ratchet. This provides for a gradual rather than an abrupt feed and confines the entire feeding movement, under all conditions, wholly within the limits of the return stroke. Another feature is that the general feed arrangement is placed on the side of the column instead of at the end of the crossrail. This takes the bulk of the feeding mechanism out of the operator's way.

Eleven feeds, ranging from 0.010 to 0.170 in. per stroke, are provided. The feed variation is conveniently accomplished by means of a lever mounted on a direct reading dial, which indicates the feed in thousandths. The feed engagement lever has the three positions, "Stop", "Right-hand" and "Left-hand", indicating the direction of the table movement. A safety friction clutch device protects the mechanism from injury when the table is allowed to feed to the end of the rail.

The ram is of the V type, and a guard, forming part of the ram, prevents dirt from working its way into the bearings. The V-type of ram makes it possible to have both sides of the ram ways cast solid with the column and at the same time provide complete adjustment by means of a full length taper gib and a single screw, thereby taking care of any play, either sidewise or in a vertical direction.

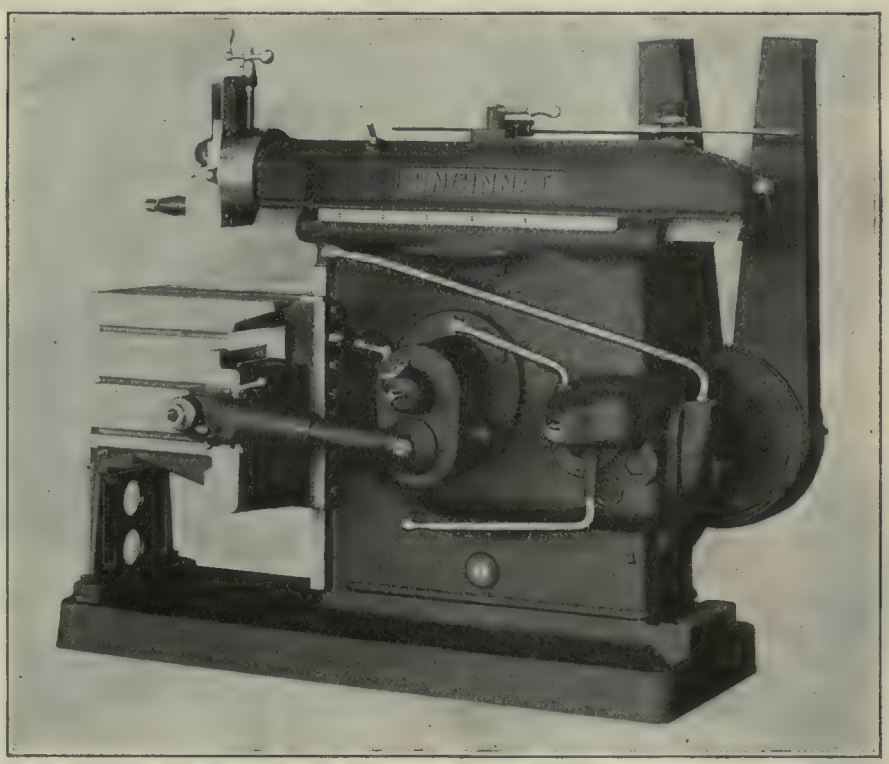


FIG. 1—CINCINNATI CLIMAX SHAPER

The movement of the ram clamp-lever is limited in its open position, so that no damage results to the adjusting screw if the operator accidentally fails to clamp it before starting a cut.

The ways of the tool slide are made with the male member of the dovetail on the head, which adds greatly to the strength and prevents the slide breaking at the sides. The toolpost is unusually large and the screw head is the same size as the

head of the vise screw, permitting the use of the long wrench when clamping heavy tools.

The column has heavily ribbed, dish-form sides, which resist the deflection resulting from the thrust of the crank bearing. The separate crank-gear bearing permits a solid crank-gear being used and makes possible a replacable bushing as in other bearings. The crank-gear journal is especially long and of two diameters, the enlarged portion be-

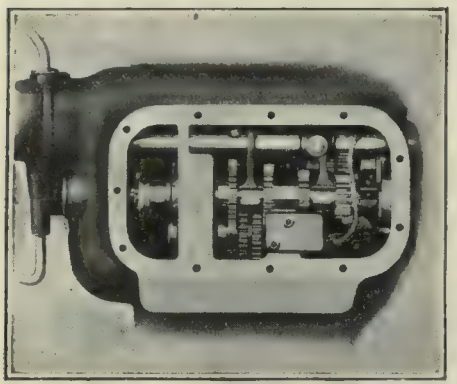


FIG. 2—SPEED GEAR CHAMBER

ing designed to provide additional strength and bearing surface at the point of greatest strain, while the length of the smaller portion maintains the alignment. The crank-gear bearing is close to the rocker arm, and in addition the gear portion is made to overhang, thus bringing the driving load well within the bearing.

The cross-rail is square locked to the column in order to better resist the direct thrust of the cut. Side alignment is maintained by means of a taper gib, and felt wipers remove any dirt from the face of the column while adjustment is being made. A heavy steel guard protects the rail bearing from chips, and is so made that it does not in any way decrease the working surface of the table, nor interfere with the operator.

The T-slots of the apron do not run entirely across but leave reinforcing ribs at the center and sides, adding greatly to the stiffness and strength. The apron is secured to the long narrow guide of the cross rail by taper gibs at the top and bottom. The table is almost a complete box section, only having small openings in the front and bottom. The spacing of the slots is such that the vise will fit either the top or sides. The table support is so made that the sliding action takes place at the base of the table, and with this type of support the parallel action is not dependent upon the exact alignment of the base of the machine.

Particular attention has been given to the matter of lubrication and the thorough protection of all bearings. The lubricating system consists of a plunger type pump in the gear case which delivers oil to a sight-feed distributing station located on top of the column near the belt guards. The level of the oil is visible through a glass gage. A surplus of oil is furnished to the distributing station and in the return of this surplus to the pump, it floods the main gear bearing and feed mechanism. Wicks in the distributing station feed the pipes leading to all parts of the machine.

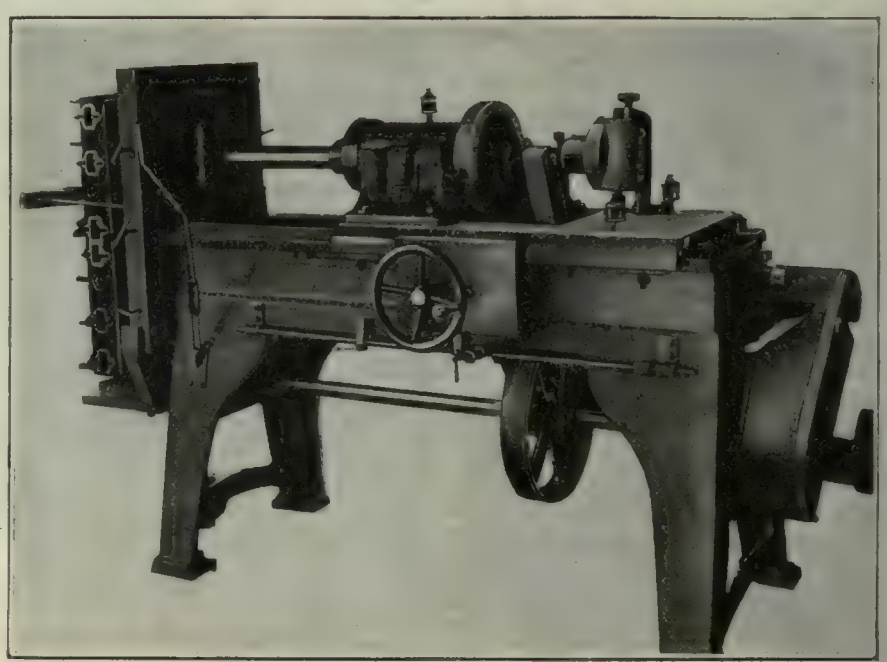
The belt and pulley guard is adaptable to any driving condition, as it can easily be arranged for either open or crossed belts, or for large or small pulley whether directly overhead or otherwise.

This line of shapers is furnished in seven models. Five sizes, the 16-, 20-, 24-, 28- and 32-in. are of the heavy duty type, while two sizes, the 20- and 24-in. are of the standard type.

W & B Grinding and Reboring Machine

An automobile cylinder reboring and regrinding machine is a recent product of the Automotive Service Works, 1111 W. Main St., Oklahoma City, Okla. The machine is also adapted for a variety of other boring and internal grinding work, and the essential features will be noted in the accompanying illustration.

The work is clamped on the large faceplate at the left-hand end of the machine, and can be lowered or raised and moved sidewise to properly position the work in relation to the spindle. The faceplate is mounted directly upon the bed of the machine, thus providing a solid support for the work.



W & B BORING AND REGRINDING MACHINE

The tool head or carriage slides on ways on the bed, one of which is V-shaped and the other flat. The carriage is held down on the ways by arched-spring gibs located under the side apron. Felt wipers for the ways are attached to the carriage. The carriage is fed automatically by a screw and may be traversed by means of a hand-operated rack and pinion, when the feed is disengaged.

The feed change gearing is of the jaw clutch type. The clutches are disengaged by the carriage at the end of its travel and a patented spring-and-fulcrum device causes them to be re-engaged. This construction makes it impossible for the carriage to stop until its entire stroke has been completed. The feed screw is driven through a worm gear, and the maximum travel of the carriage is 22 inches.

The grinding wheel spindle is made from seamless tubing and the emery wheel spindle is of nickel steel.

A bronze bearing is provided at the wheel end, and Fafnir double-row ball bearings at the pulley end. The grinding wheels runs at from 4,500 to 5,700 r.p.m. The planetary action of the grinding wheel is obtained in the usual way by means of two eccentric sleeves, in which the spindle is mounted. The relation of these eccentrics determines the throw of the wheel and the planetary action is given by driving the outer sleeve by a belt.

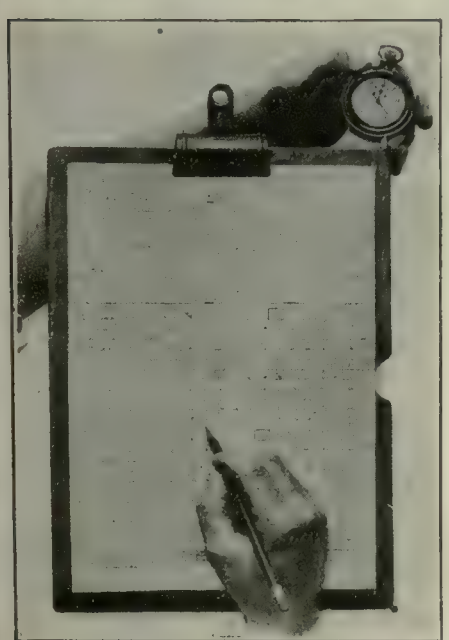
The wheel truing fixture is attached to the faceplate and may be screwed up out of the way when not in use. When in operation, the boring head is screwed on the end of the grinding wheel mandrel.

The machine may be driven by a direct-connected motor or through tight and loose pulleys by a belt. The faceplate will accommodate work up to 6 ft. in diameter. The net weight of the machine is 900 lb., and the floor space required is 64x20 inches.

Hough Time Study Board

To aid in the production of accurate time study records the Stein & Ellbogen Co., 31 North State St., Chicago, Ill., has recently placed on the market the Hough time study board, shown in the accompanying illustration.

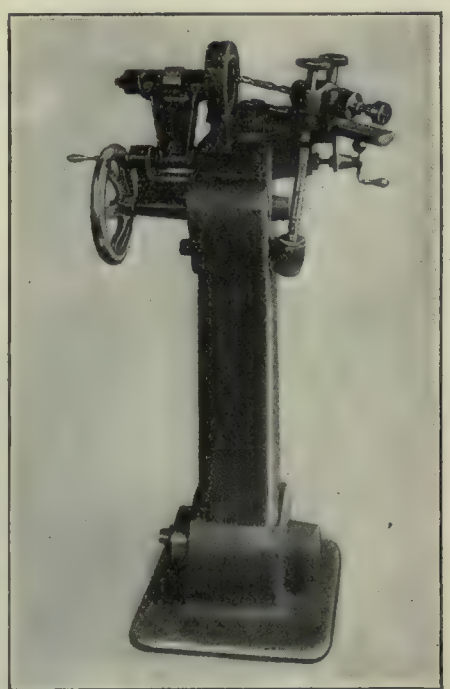
This board provides a writing surface upon which the record blank is held by a movable clip, enabling the operator to place the blank in the most convenient position. At the back of the board is arranged a storage place for relevant data and blank sheets. The time study watch is held in such a position that it can be easily operated by the left hand while the left arm holds the board, leaving the right hand free for making the record. The holder protects the watch and holds it securely in the best position to prevent glare and insure good visibility.



HOUGH TIME STUDY BOARD

Oliver No. 2 Automatic Drill Pointer

A machine for grinding drills from No. 60 to ½-in. inclusive, and which is known as the No. 2 automatic drill pointer, has recently been added to its line of tools by the Oliver Instrument Co., Adrian, Mich. The machine, shown in the accompanying illustration, is so designed that the motions of grinding a drill are entirely automatic and are produced by fixed mechanisms. It is of the pedestal type, the motor being located in the base of the machine and all working parts enclosed in the body of the machine, which also serves as a chamber for lubricating oil.



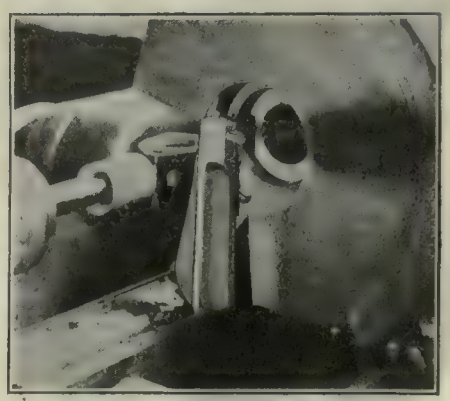
OLIVER NO. 2 AUTOMATIC DRILL POINTER

The grinding wheel is of the cup type, running at a speed of 3,950 r.p.m., and power is delivered by a ¼-hp. motor which runs at 1,750 r.p.m. The motor is built for any commercial service current, and is standard equipment. The drill-holder is made to take a No. 2 taper shank, and a No. 1 Morse taper sleeve is furnished for small drills. Straight shank drills are held in a Jacobs No. 3 chuck with a No. 2 Morse taper shank, which is placed in the drill-holder.

The drill-holder is connected with a cam action which is controlled by a handwheel, operation of the mechanism producing a synchronized motion by which the drill is rotated and advanced in timed relation to a forward and backward motion of the grinding wheel. The drill is rotated as the wheel oscillates past the point of the drill, the wheel advancing as it passes the drill and producing a clearance, the angle of which increases as the center of the drill is approached. It is claimed that the application of this principle will produce a theoretically correct drill point. Every size and type of drill is ground in the same manner, no skill being necessary for the operation of the machine. The machine is built to grind two-lipped drills only. The floor space required is approximately 24x36 in., and the net weight of the machine is 310 pounds.

Teromatic Improved Wheel Dresser

A change has recently been made in the location of the wheel dresser on the Teromatic internal grinding machine, which is a product of the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. The wheel dresser was formerly located on the carriage of the machine, where it required hand adjustment for dressing the wheel. It is now located on the headstock, as shown in the illustration. Each time the wheel is brought clear of the work and returned to grinding position, which is usually after the piece has been



TEROMATIC IMPROVED WHEEL DRESSER

changed, it passes the diamond and is dressed. The cut taken across the wheel is very slight, but is enough to keep the wheel continually dressed and eliminates the necessity for losing time while dressing the wheel. After the wheel dresser has been set, it requires no further adjustment unless the wheel is changed.

Oilgear Self-Contained Double-Column Hydraulic Press

The Oilgear Co., Milwaukee, Wis., has recently placed on the market a line of self-contained, double-column hydraulic presses, built in several sizes ranging from 15 to 50 tons in capacity. The 15-ton press is shown in the accompanying illustration.

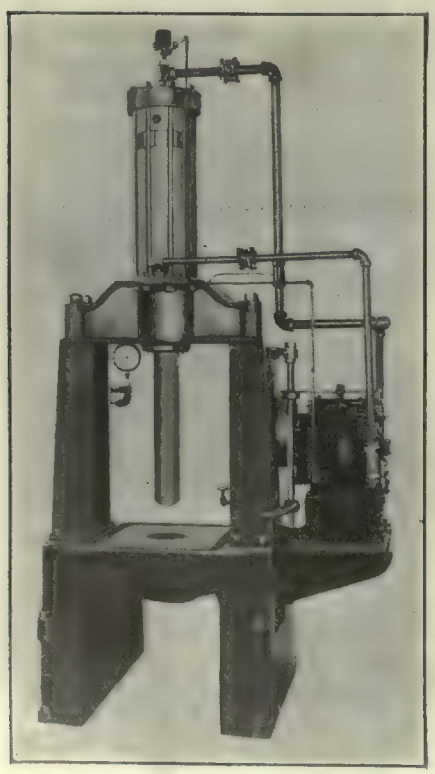
The press is equipped with the Oilgear, type-W, variable delivery pump, which was previously described on page 232, Vol. 59, of the *American Machinist*. This pump has a maximum delivery of 3,060 cu. in. of oil per min. and supplies the oil at a maximum pressure of 1,000 lb. per sq. in. Various control devices may be furnished for the pump including the plain hand control, shown in the illustration, a treadle, or a semi-automatic control.

A differential quick advance for the ram is available with the hand or foot control, which will allow the ram to be advanced to the work at double the pressing speed. The pump is so protected that the ram may be run against a positive stop without injury. It is also stated that the ram may be run against the work to any predetermined pressure, and held at that pressure indefinitely, without experiencing the pulsations that usually accompany such action on presses using the plunger type of pump.

The height of the platen above the floor in all sizes of this press is either 14 or 30 in., the greater dimension being obtained by an extension base as shown in the illustration. The machines are available with widths between the columns varying from 24 to 36 in., and the space between the bottom of the ram and the base with the ram up is made from 24 to 60 in.

The down speed of the ram varies from 103 in. per min for the 15-ton press to 30 in. per min. for the 50-ton size. The up speeds and the differential quick advance are approximately twice as great as the down speed values.

Among the advantages claimed for these presses may be mentioned sensitive control, smooth positive motion to ram, no accumulator required, no expensive operating valves, driven from any constant-speed source of power, protection against damage, endurance and speed. For motor driving a 5- to 7-hp. motor is recommended, to run at a constant speed of 1,200 r.p.m. and connected to the pump by a belt.



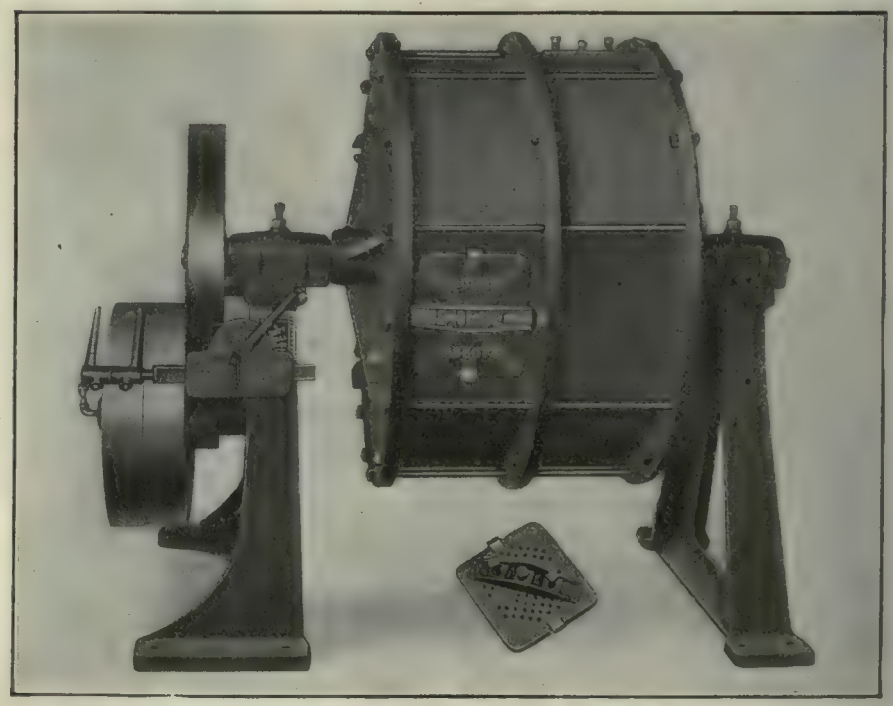
OILGEAR SELF-CONTAINED DOUBLE-COLUMN HYDRAULIC PRESS

Abbott Improved Burnishing Barrel

All of the burnishing barrels made by the Abbott Ball Co., Hartford, Conn., are now being equipped with gear guards and belt shifters as shown in the accompanying illustration. These features have been installed on some special machines manufactured previously by this company, and will hereafter be furnished as standard equipment.

Another improvement, designed to facilitate the washing out of the barrel, is a strainer cover, shown in the illustration below the machine. This cover is cast with a number of ½-in. holes in it, and is covered on the inside with a piece of wire cloth. The cloth is of the proper mesh to retain the smallest balls used. The strainer cover is used in place of the regular cover when rinsing out or draining the liquid from the barrel.

These barrels are made with one, two or three unit compartments, the one illustrated having two so that it is possible to run different kinds of articles in the same barrel. Each unit consists of an annular shell having flanges by which the units are held together. A sheet iron disk is placed between adjacent units to prevent communication from one to the other.



ABBOTT IMPROVED BURNISHING BARREL

News Section

November Output Is 325,125 Autos

Automobile production in the United States in November totaled 325,125 cars and trucks, a new high record for any corresponding month, and an increase of 50 per cent over the same period last year, according to records compiled by the National Automobile Chamber of Commerce. The total compares with an output of 365,107 cars and trucks in October and with 237,301 in the same month last year. In the eleven months ended with November production totaled 3,717,709 cars and trucks and total production of 4,000,000 cars and trucks is expected for the full year.

"Leaders in the automobile industry," says the statement issued by the Chamber, "believe the increases to be due to the national need for more transportation facilities, to the rapid development of suburban areas, and to the fact that better car values for the money are being offered than at any previous time, due to the economies of large scale production. Dealers throughout the country predict that motor car sales in the next few months will exceed last Winter. Improvement in the motor truck market also is expected in the larger cities."

Oakite Salesmen in Sales Conference

Fifteen years of Oakite service were completed at the seventh annual sales conference held at the general office of the Oakley Chemical Co., New York City, on Dec. 3, 4 and 5. Delegates to these conferences, the field organization of the company, are entertained from the minute they arrive at the hotel where rooms are reserved for them until their departure, and the meetings are scheduled so as to avoid confusion and delay.

On Monday morning after brief talks group photographs were taken and luncheon enjoyed at the Savarin. The afternoon session was devoted to the subjects of confidence in the company, the organization and its methods, the materials, the territory, and the sales plans. An open discussion on selling was continued in the evening after dinner.

The second day was devoted to the uses of Oakite in the various industries. These included textiles, dairies, laundries, mineral oil, metals, grinding, railroads and garages. In each case the best method of selling the industry followed the talk on the uses of Oakite in that industry. After dinner the party attended a musical comedy.

Power plant equipment, and vitreous enameling plants were the subjects for discussion on the morning of Dec. 5. These were followed by talks on methods of extending the use of Oakite materials in a plant. The afternoon talks were out of the ordinary, beginning with one by Maxwell Lakeman entitled, "Business Is as Good as We Make It." C. F. Radley spoke on the subject "Widening the Field of Activity"; A. W. Perry spoke on "Aggressiveness in Selling"; John A. Carter, "Habit and Sales Efficiency"; H. Liggett Gray, "Organization Gets Results"; J. Fred Tonn, "Know Then Thyself," and a talk by David S. Ball on "The Other Fellow." President D. C. Ball was in the chair.

The banquet at the McAlpin Hotel in the evening was most enjoyable with C. F. Radley as toastmaster. The prize winners of the different contests were announced. In the sales contest the winners were: J. A. Maguire, first; O. W. Hoster, second; and D. X. Clarin, third, while C. E. Barber, J. F. Ewing, T. H. Gritman and E. Lacy received honorable mention. The awards were based on the presentation of the most difficult sales story. In the 100 per cent Town Contest, the following field men qualified: C. E. Barber, G. M. Barnes, C. Burgin, A. L. Conant, M. W. Dennison, J. W. Eaton, J. H. Ellingsen, C. W. Everson, J. F. Ewing, J. E. Ginandt, H. Kennedy, G. W. Miller, C. P. Murphy, C. P. Orr, H. H. Reama, R. P. Reynolds, H. L. Trembicki, D. B. Turley and F. J. Wall.

The last session held the following morning was devoted to a conference of all district managers and in the afternoon the office girls of the company were entertained with a luncheon and a theatre party, so that all shared in the spirit of the occasion.

Richard P. Joy Treasurer of the Packard Co.

Richard P. Joy, president of the National Bank of Commerce, Detroit, has been elected treasurer of the Packard Motor Co. to succeed F. R. Robinson, resigned, it was announced last week following the annual meeting of the stockholders. The old board of directors was elected without change.

Mr. Joy's election to office, brings back to active interest in the company a name that has been more closely associated with it than any other since the organization of the Parkard Motor Co. in 1903.

Henry B. Joy, who was the first president, with a number of Detroiters, took over the interests of Warren Packard who was making motor cars in Warren, Ohio. One of the stipulations in the sale to the Detroit group in 1903 was that the product of the company was to bear the name Packard.

Mr. Joy was succeeded as president in 1916 by Alvan Macauley who has since presided as president of the company. In addition to the election of Richard P. Joy as treasurer, M. A. Cudlip, formerly assistant secretary, was promoted to the office of secretary.

October Earnings of Rails Large

Net earnings of the Class I railroads throughout the United States for the month of October were 4.72 per cent, according to the American Railway Association. These figures were based on an annual basis, so that while the percentage return was less than it has been for all but two months this year, the October earnings crossed the $100,000,000 mark for the first time this year. Net earnings figured in dollars totaled $102,746,000.

This is the largest amount that the railroads of the United States have earned in any one month for more than two years, and compares with a total earning of $85,205,600 in the same month of last year, which was at the annual rate of 4.05 per cent in September of this year the net earnings were at the rate of 4.46 per cent with a total of $98,238,384.

A large part of the increase in comparison with same month of last year was due to the increase in operating revenue, which amounted to approximately 7 per cent and which totaled $586,694,200. At the same time the operating expenses amounted to $444,937,800, an increase of $17,013,400 in comparison with October of 1922.

The Western district led in the rate earned with a percentage of 5.36, while the rate earned in the Eastern District was 4.02 per cent, and 5.26 per cent in the Southern district.

For the ten months this year the net operating income of the Class I railroads represented an annual rate of return of 5.20 per cent on their tentative valuation, amounting in dollars to $821,795,800, compared with $613,528,600, or 3.97 per cent for the same period last year.

Additional Factories for Fisher Corp.

Building of two new plate glass manufacturing plants, which are expected to result in the Fisher Body Corp. being able to supply its own demands for this material, was announced last week by Charles T. Fisher, vice-president of the corporation.

According to Mr. Fisher, the building program provides for the reconstruction and enlargement of the plate glass plant now at Blairsville, Pa., and for the erection of another plant at Ottawa, Ill., larger than the present plant in use there now.

These plants are both now operated by the National Plate Glass Co., a subsidiary of the Fisher corporation, headquarters of which are in Detroit.

It is estimated that the cost of the reconstruction of the Blairsville plant and the erection of the one at Ottawa will exceed $10,000,000.

Forty-Fourth Annual Meeting of A.S.M.E. Proves Successful

Fred. R. Low elected president—Medals presented to Frederick A. Halsey and John R. Freeman —Interesting papers in machine shop practice division—Many social features

IN THE auditorium on the third floor of the Engineering Societies Building, West 39th St., New York City, on Monday evening, Dec. 3, Fred. R. Low, editor of *Power*, was installed as president of the American Society of Mechanical Engineers. The installation was held directly following the retirement of John Lyle Harrington, who has served for the past year and who on this occasion delivered a masterly address to the assembled engineers attending the annual meeting that was in session Dec. 3 to 6 inclusive.

Mr. Harrington told of the achievements of the society since its inception and the ever present need of keeping the engineering profession free to perform its best duties. He stressed the point that engineers should receive more recognition for the services that they are rendering and he prophesied that this would be forthcoming within the very near future.

Mr. Harrington then presented to Frederick A. Halsey and John R. Freeman the Society Medals and diplomas for meritorious engineering work.

Following the installation of Mr. Low as president, Calvin W. Rice, secretary of the society, told of the work that the women could do in helping their husbands and also in founding scholarships in the various cities of the country for deserving young men who wished technical education. During Mr. Rice's talk he stated the astonishing fact that in the engineering profession, the members were continually changing their places of residence and that his records showed that fifty per cent of the members of the A.S.M.E. moved from one city to another at least once a year.

The retiring president and Mrs. Harrington, the newly elected president and Mrs. Low, Mr. and Mrs. Freeman and Mr. Halsey formed a receiving line in the left corridor of the auditorium and after members and guests had been given an opportunity of congratulating them, a reception was held on the fifth floor of the building where dancing and refreshments were enjoyed.

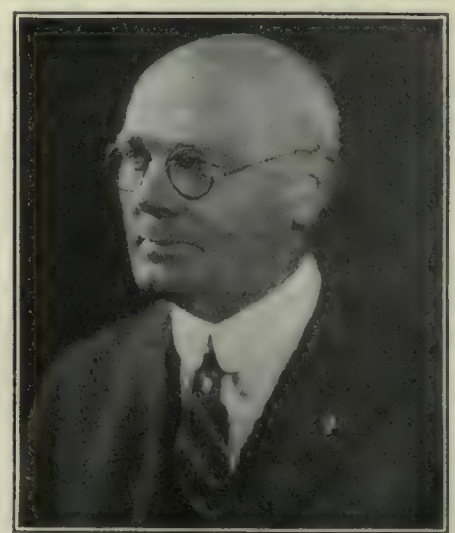
The Origin of the A.S.M.E.

Nearly 44 years ago, on Feb. 16, 1880, to be exact, a little group of engineers met in the office of the *American Machinist* to start what is now the largest engineering society in the country, the American Society of Mechanical Engineers. Since then the organization has grown mightily in numbers and prestige, certainly far beyond the wildest dreams of its founders. And now that the Society has grown to be a power in the industrial life of the nation, it is no more than fitting that it should select for its next president the editor of a paper closely associated with the *American Machinist*.

Mr. Low, editor of *Power* for 35 years, has probably done at least as much for the A.S.M.E. as any other one man. He has served on committees and held many of the offices at various times and has given unsparingly of his time. The highest honor the Society can bestow comes to him as a well-earned tribute to long and faithful service.

Of especial interest to the machine tool makers was the general session held Tuesday morning. H. A. S. Horwarth of the Kingsbury Machine Works, Philadelphia, Pa., presented a graphical study of journal lubrication and there were other problems discussed.

On Wednesday the economic phases



Underwood & Underwood

FRED. R. LOW

of coal shortage were discussed by F. G. Tryon of the United States Geographical Survey, Washington, D. C., in the fuel session, while in the ordnance session, Capt. H. W. Churchill, executive assistant in the New York district ordnance office, spoke on "Some Production Problems in the War Department's Preparedness Plan."

In the afternoon at the management session, R. T. Kent, consulting management engineer of Montclair, N. J., W. L. Churchill, of the Industrial Engineering Service, of New York City, and E. H. McKitterick of Lockwood, Green & Co., Boston, Mass., presented a symposium on the relation of mechanical engineering to management in the metal working, woodworking and textile industries.

Machine Shop Practice Session

One of the best meetings ever held by the machine shop practice division took place on Thursday morning. The retiring chairman of the division, F. O. Hoagland, presided.

The principal topic of the meeting was the pressworking of metals and two excellent papers were presented on the subject. The first one was read in very much abstracted form by Douglas P. Cook, president, Boston Pressed Metal Co., Worcester, Mass. Mr. Cook's subject was, "Pressed Metal Engineering: Some Principles and Examples." He gave an excellent picture of the strong strategical position of the young pressed metal industry and enlarged on the great opportunities awaiting the pressed metal engineer.

A number of slides were shown to illustrate a few of the many interesting cases of replacement by pressed metal designs of parts, sub-assemblies and complete assemblies made up of cast, forged and machined parts. In each case Mr. Cook gave figures on the actual savings in time and cost and pointed out the various other improvements due to the use of pressed metal. He concluded his presentation by showing a short motion picture of the various steps in producing one of the parts of a telephone. The picture was shown by courtesy of the Western Electric Co.

Mr. Galbreath's Paper

The second paper was given by W. W. Galbreath, president, Youngstown Pressed Steel Co., Warren, O., assisted by his general superintendent, John R. Winter. Mr. Galbreath took as his subject, "The Development of Modern Stamping Practice," which is published on page 883 in this issue. The discussion brought out the need for a lot of careful missionary work in order to acquaint the industry in general with the possibilities of pressed metal engineering.

The final paper of the meeting was a preliminary report on the present status and future problems of the art of cutting and forming metals. It was presented by the chairman of the committee entrusted with the problem, D. H. Blood, general manager of the Pratt & Whitney Co., Hartford, Conn. An abstract of this report appeared on page 841, Vol. 59, of the *American Machinist*.

To close the meeting Mr. Hoagland expressed the appreciation of the division for the work of the retiring members of the executive committee and asked the secretary, K. H. Condit, editor, *American Machinist*, to read the names of the committee for the ensuing year. The make-up of the committee is as follows: Chairman, James A. Smith, general superintendent, the General Electric Co., Schenectady, N. Y.; vice-chairman, George E. Greenleaf, chief engineer, the Niles-Bement-Pond Co., Plainfield, N. J.; chairman subcommittee on papers, J. A. Baker, research engineer, the Willys Overland Co., Toledo, O.; chairman sub-committee on publicity, F. O. Hoagland, the Saco-Lowell Works, Lowell, Mass.; chairman sub-committee on planning, Mr. Greenleaf; chairman sub-committee on membership, C. R. Gabriel, consulting engineer, the E. W. Bliss Co., Brooklyn, N. Y.

It is expected that steps will be taken immediately by the new committee to carry out the suggestions of the plan and scope special committee, whose report was accepted at the Montreal meeting last May.

The first papers presented at the aeronautic session dealt with the use

of various aluminum alloys and their resistance to salt water corrosion. The first was by D. Basch, research engineer of the General Electric Co., and M. F. Sayre of Union College, Schenectady, N. Y. The second was by Henry A. Gardner of the Gardner Laboratory, Washington, D. C., who added cleansing and protection to the data on corrosion.

Extracts of Archibald Black's paper on commercial aviation have already appeared in the *American Machinist*. The paper elicited considerable discussion on both sides. One contended that no planes of the capacity, he mentioned 600 hp., could be put into service in a year, while another stated that his company had such a plane which could take the air as soon as an engine could be installed.

Airplane Insurance

The insurance side of aviation was brought out forcibly by the statement that while ten companies started to insure planes a short time ago, only one remains and that they would only insure up to 50 per cent, the remainder being carried by Lloyds. Still another pointed out that the insurance companies were now following the lead of automobile custom and not insuring for such minor damage as smashed landing gear, etc., except at a special premium.

It was also pointed out that while night flying was essential for competition with the high speed, long distance trains, it was also advantageous for much express service, if it was to be of the greatest value. The contour of the country has much to do with the feasibility of night flying at present as emergency landing fields must be provided at frequent intervals.

The non-mathematical side of night flying was discussed in a paper by Lieutenants H. R. Harns and D. L. Brunner of McCook Field.

The social side of the annual meeting was thoroughly enjoyed by the attending members and their wives. Several interesting excursions were arranged to plants and stores in the city and there were teas, card parties and dances for the women.

On Tuesday evening at the Hotel Astor Roof a smoker and dinner was held and on Thursday evening the annual dinner dance was held in the Hotel Astor ball room.

Gage Sub-Committee Makes Report

The Plain Gage Committee of the American Society of Mechanical Engineers met on Dec. 4 to hear and discuss the report of the sub-committee on gages and gaging methods. The report was both exhaustive and illuminating and will do much to advance manufacturing methods if its suggestions are put into practice.

The report began with suggestions as to the use of gaging in manufacture of various kinds then defined the terms used and finally illustrated the various types of gages and suggested their uses. This is an important part of the work of the general committee and will be a valuable contribution to a very important subject. At the next meeting, Feb. 14 and 15 at the Bureau of Standards in Washington, D. C., it is hoped to get this report into shape for early publication.

Power Show Attracts Many Visitors

The many thousands of engineers who visited the Grand Central Palace in New York City during the week of Dec. 3 were rewarded by an extraordinary array of exhibits. Last year's "National Exposition of Power and Mechanical Engineering"—the first ever held—was a big success, but this second show has definitely surpassed it both in quantity and quality.

The exhibitors of last year had grown to 260—practically double—so that the entire mezzanine floor, as well as every nook and corner of the main floor, was needed to house exhibits. It seems highly probable that the final record of admissions for the week will greatly exceed the 47,580 that attended last year's show.

In addition to the large number of local engineers and executives, including members of the N.A.S.E. and A.S.M.E., there was a considerable attendance of out-of-town engineers. Many of these had been brought to New York by the double-headed attraction of a National Power Show and the annual meeting of the A.S.M.E. held simultaneously. Aside from the number of exhibitors and visitors the show was notable for the quality of its exhibits. Working models (and in some cases full-sized commercial units) of coal-handling equipment, stokers, powdered-fuel systems, water-softening systems and many other things held the interest of visiting engineers. In addition there were movies, special lectures and highly original demonstrations. This show must rank not only as the greatest Power Show, but also as one of the greatest industrial exhibitions ever held in this country. The exhibitors reported good business from the show.

Japan's Appreciation of Friendship

A friend in Japanese official circles shows his appreciation of American aid in the following effective manner.

"You can hardly imagine how thankful our people are for American aid. Your Ambassador was the most active of all the diplomats, being the first to see the urgent need of assistance and the most active in rendering aid, which he is still doing.

"The sympathy of all your people has made a deep impression upon the minds of our whole nation and I hereby heartily thank you, as a citizen of the U. S. A. The attached cartoon tells the story, the title being 'When it comes to sympathy, as in many other things, America is first of the whole world.'"



Industrials Buying Machine Tools in New York Market

With the exception of the New York Central R.R. practically no railroad buying of machine tools is reported this week in the New York City district. The Central has had a list out for about a month and is closing on some of the items this week. Other roads that have lists are not going to buy until after the first of the year when a rush of orders is expected from nearly every important road in the East. There is no question as to the needs. but the appropriations will not be forthcoming until 1924.

Dealers in machine tools state that the year has been a good one and that while some of the periods were a trifle slow, the twelve months taken together were very satisfactory. The month of November did not come up to expectations and December is not going to be any too bright unless there is an unexpected change before the end of the year.

One encouraging feature of the New York market this week is the number of general industrials that have purchased tools during the past two weeks. It is taken by the dealers as an indication of confidence in the future on the part of the industrialists.

Good business is reported by dealers in small tools and it was stated by one manufacturer's representative that there had been a better regular business during the past year than ever before, while improvement had also been noted in special designs, which is an important part of this branch of the machine tool business.

Used machine tools found a fair market during the week, but this business was not up to the pace of a month ago according to dealers in this line.

Indiana Prepares for January

Due largely, it is believed to seasonal influences, demand for machinery and tools is slowing up a little. The larger dealers in Indianapolis believe there will be but little demand until after the first of the year when the annual inventory period is over and a resume of the work done during the past year and the orders in sight for the next, determine the policies of the various companies duing 1924.

Some of the manufacturers in Indiana of specialized machinery say the volume of inquiries indicates a good business immediately after the first of the year. The general situation is somewhat spotted, some industrials buying both tools and machinery and others curtailing their purchases. Both tool and machinery men are optimistic and declare the general hedging of purchases during the early Winter months really a good thing inasmuch as it was not deemed advisable for a too rapid production expansion following the peak year of a couple or three years ago.

Woodworking Machinery Demand

Officials of E. C. Atkins & Co., manufacturers of saw-milling machinery, declare they can see no decrease in the demand. The large Southern and West coast lumber mills, while having curtailed their production somewhat, are preparing for further expansion after the first of the year to prepare for the early Spring lumber demand.

The demand from automotive industries in Indiana has been better this Fall than ever before in the history of the business, machinery men here say. Their tooling demands have been above the average, and in spite of financial difficulties in two of the oldest companies, production continues. The big increase in closed bodies has caused many of the plants to install much special machinery for this work. The Studebaker Co. is one of these and at the present time is unable to secure sufficient woodworkers to keep its body plant to the production desired.

Brick manufacturers are purchasing some machinery, but the demand is falling off and the trade here believes the season's purchases in this line are about completed. The coal mines have curtailed their purchases, due largely to the poor demand for bituminous coal in Indiana.

Chicago Has Many Inquiries

While inquiry for machine tools continues to improve in the Chicago district, the number of orders placed has not materially changed. The railroads were not active this week and the bulk of the orders placed was by industrials who bought mostly single machines. The A. O. Smith Corp., Milwaukee, Wis., will not make purchases on its rather large list until next year, and dealers anticipate that the closing of other pending inquiries will not take place until after Jan. 1.

What the Railroads Want

The New York Central R.R. is inquiring for three or four punching and shearing machines. The Illinois Central R.R. is in the market for a 24-in. x 10-ft. engine lathe and a slotting machine. The Atchison, Topeka & Santa Fe Ry. is in the market for an automatic self-feed knife grinder. The Chicago & Northwestern Ry. is inquiring for a portable crank pin truing machine. The Michigan Central R.R. has placed an order with the Whiting Corp. for a 10-ton electric pillar crane. The Atchison, Topeka & Santa Fe Ry. has placed an order with the Shaw Electric Crane Co. for a 7½-ton electric traveling crane. The Victorian Government Rys. of Australia will receive bids until Jan. 9, 1924, for the following machinery: one spring coiling machine and all necessary equipment, including set of electrical motive apparatus; one taper rolling machine, including electrical motive apparatus; one combination turret lathe, including screws and nuts and taper turning attachment; one gear cutting machine; automatic cross cut saw; one cross grooving and trenching machine; one planing and thicknessing machine, including side cutters. The Chicago, Indianapolis & Louisville R.R. is in the market for an 18-in. tool room lathe with a 10-ft. bed equipped with taper attachment, to be motor driven, with motor using three phase, 60 cycle, 440 volt current.

Local industrial buying and inquiry indicate a special demand for sheet metal machinery and disk grinders. Planers are also active. Sales of second-hand machinery are larger in volume than might be expected when compared with new machine sales.

Cleveland Factories Enlarged

While not much can be expected in the way of new business for machine tool makers during the balance of this year, preparations that are being made by industries in the Cleveland district indicate that the new year will start off more satisfactorily that is usual so soon after Jan. 1. This belief appears to have a well-founded basis in the changes and expansions contemplated by manufacturing concerns.

In spite of what some may term as a lull in general business in the Cleveland territory, it cannot be denied that certain interests are not letting that theory deter them from an aggressive campaign for new business. To this end new quarters have been, or soon will be, acquired by not a few operators, and this in turn will mean, to some extent, an appreciable inquiry for new operating equipment.

Some of the latest plans announced in this connection include a new building for manufacturing purposes by the Chicago Pneumatic Tool Co., costing $50,000; another smaller structure for the Stotter Metal Co., to be used for foundry purposes; a $40,000 structure to be erected for and leased to the Electrical Auto Maintenance Co. and a $60,000 structure to be leasesd to the Acetylene Stove Manufacturing Co.

Reports of shutdowns of semi-finished material plants in the Cleveland district are significantly fewer in the last fortnight. In fact some are reported to have resumed operations again, or are about to do so.

South Has Year of Good Business

There have been substantially no changes worth mentioning in the machine tool conditions over the Southeastern territory during the past two weeks, distributors in Atlanta, Ga., report, with business generally quiet as it usually is at this time of the year, so far as orders for immediate delivery are concerned.

November sales proved to be slightly better than October, due to increasing activity in the placing of orders for delivery the early part of next year, while as compared with the November of 1922 sales this year appears to have been approximately 9 to 10 or 11 per cent better than last season. Reports of different distributors in this regard, however, show a very spotty tendency, one large dealer stating that his sales were around four to five per cent off as compared with last year. Most

dealers, however, enjoyed an increase both as compared with the previous month and the same month last year.

Inquiries are improving a little, but still appear to be slow. As was the case in November, though, inquiries are developing larger business than usual, due to the active demand that is being shown by the Southern railroads. But for this business machine tool sales would be considerably off as compared with a year ago. Railroads are doing more equipment buying in the South than they have ever done before, with the larger systems spending millions of dollars, and anticipating an even more active program during the coming year. Destruction of three or four large shops in the Southeast the past six months by fire has also served to create considerable machine tool business in this field, at least two of these fires destroying more than a million dollars worth of property. The railroads, too, are adding largely to their terminal and shop facilities, and establishing new shops in various important centers, and the demand for heavier machine tools is therefore much more active than usual.

Textiles Improve

The textile industry is beginning to show some signs of activity again with better inquiries being received that will result in some fairly good sales after the first of the year.

As yet the smaller shops are not increasing their activity, but a recent investigation by the secretary of the Southern Metal Trades Association, of Atlanta, indicates that these smaller shops are looking for a considerable activity early in 1924, which will likely serve to make them active buyers again of machine tools.

Spot cotton has continued to advance steadily, and is now above 35 cents at the Southern markets, the Federal Reserve Bank of Atlanta reporting that these increases place the South in the best financial shape it has enjoyed for years.

Machine tool and supply distributors of the district are growing more optimistic daily over the outlook for business during the early part of the coming year.

Detroit Outlook Is Encouraging

Swinging into December with every indication that conditions similar to those which have existed for the first 11 months of 1923 will prevail until the year is finally gone, Detroit manufacturers have announced but slight curtailment in production schedules, though the holiday and inventory period may cut down December totals materially.

There is nothing in prospect, however, to alter the prediction that the output for the year would reach 4,000,000 motor vehicles, as against 2,527,000 in 1922. Official figures for November have just been announced placing production at 325,000 autos and trucks which compares with 287,000 in the same month last year and 365,000 in October of this year.

Machine tool manufacturers consider the outlook for 1924 bright in view of the prevalent optimism in the automotive field. Just at present there is a slight lull in operations, but this is not unexpected, and in fact plans had been made to meet it.

Several new models of cars have been announced during the past week, and with the approach of the National Automobile Shows in New York, Detroit and Chicago during January, manufacturers are feverishly laying plans for securing the large orders usually attending these exhibitions.

December is holding its own in the automotive field, in the view of industrial leaders who affirm their belief in a continuation of Detroit's marvelous prosperity during the past year.

What is regarded as concrete evidence of healthy conditions is the report of 300 manufacturers affiliated with the Motor and Accessory Manufacturers' Association showing a great decrease in the volume of past due accounts and notes outstanding and a large increase in sales volume as compared with previous months and years. Sales to car and truck manufacturers of original equipment during October showed an increase of $7,000,000 over September, $15,000,000 above the total for October, 1922, and $31,000,000 greater than the October, 1921, volume.

Employment figures show an increase for the past week in spite of a slow and gradual decline for the previous five or six weeks. Present figures, according to the Employers' Association, are 214,377, an increase of 1,980 over the 212,397 of the previous week.

Philadelphia Awaits 1924 Activities

Resumption of railroad buying in considerable quantity will be delayed until Spring, according to the best information available among business men in the Philadelphia district. Railroad men in a position to know the plans of the roads assert there are indications of a repetition of enlargement of equipment and purchases in considerable quantities at that time.

At present the roads are finishing up an active Fall and early Winter season for which they made extensive preparations in the Spring by placing their equipment in shape for the busy freight moving season. Unless present indications fail, activities will again be resumed in the Spring of 1924.

Machine tool manufacturers in Philadelphia are watching with keen interest the railroad situation. Machine tool business has not changed materially from what it was two weeks ago. This was in line with what had been anticipated, with a seasonal lull in many branches of industry being apparent.

General Conditions Improved

The Federal Reserve Bank finds in its monthly summary of business that conditions generally present a tone of improvement, although in some industrial lines the condition is unsatisfactory. The employment situation is reported little changed from the previous month. There was a slight decrease in the number of wage earners in the Reserve District, embracing eastern Pennsylvania, New Jersey and Delaware. In 1,054 plants in the district there were 415,210 wage earners at work during the month, the bank's report states.

Business Is Fair in Cincinnati

There has been little change in the production of machine tools in the Cincinnati market during the past two weeks. There has been a slight slowing down in activity among a number of the houses as the end of the year approaches and conditions are likely to be rather quiet until well into January. Production during November measured up approximately to the same volume as October, but December will undoubtedly witness a decrease in the total sales and output of the Cincinnati plants. Orders have been somewhat spotty in most branches of the industry, while inquiries have maintained an even pace during the last two months. An encouraging feature of the present market is the active buying that is being done by the automotive industry. Orders from this source have been coming in steadily during the last few weeks and there is no sign that there will be lessened buying during the rest of the year. The orders actually placed by railroads have not been numerous, but inquiries have been brisk and manufacturers look for substantial orders to break at any time.

December Is Dull

Manufacturers of milling machines and lathes state that their business is fair for this time of the year. Inquiries and sales are fairly good with little change recorded during the last month. The outlook for the next few weeks is not particularly promising, because the inventory period is now close at hand and many buyers will not place their orders until after the first of the year when their appropriation for purchases will have been authorized for 1924. The automotive industry has placed a number of good orders for lathes lately. Railroad buying has been at a minimum.

Several manufacturers of planers report that November was a fairly good month and showed sales in excess of October. December has started off well with these manufacturers who believe that the volume of production this month will compare favorably with that of last month. Several substantial orders for planers have been placed by automobile manufacturers while railroad buying has shown some strength. The orders for upright and radial drills have been rather spotty with business quiet. It is expected that this condition will continue until after the first of the year.

A steady volume of business has been maintained by the Cincinnati electrical tool houses. Manufacturers report that the purchases by the automotive industry have been exceptionally good in the past month. Officials of various plants believe that the good business will continue throughout December They attribute the steady sales to the wide field that they have to draw on and to the fact that their business is not seasonal.

The used machinery market is in fairly good shape. Taking the year as a whole, there has been much better business during 1923 than during 1922. Sales in November were encouraging and the volume of sales in December is expeced to be fair. Small lathes and grinders have been selling and inquiries have been plentiful.

The Industrial Review

Excellent prospects for the first quarter of the coming year—This year's business good

MACHINE tool dealers in all parts of the United States are looking eagerly toward the schedules that are being prepared for the first quarter of the coming year, and indications at this time point to a business that will equal the first quarter of 1923 —some dealers being optimistic enough to predict an increase. These claims are based upon the buying that it is reasonable to expect from the railroads, the automotive field, the general industrials, Japan and other foreign countries.

The schedules of most automobile manufacturers point to an increased production over that which has been enjoyed during 1923. The Ford company plans big increases, the General Motors Corp. has announced increases in all its plants and several of the other notable auto makers have expressed every belief that their production will be considerably greater than in 1923. From these statements recently given, the four million mark that was easily gained in 1923, will again be equaled by motor car builders during the coming year.

The railroads, that have done exceptionally well during the present year, plan to keep up their records during the coming year. This, of course, will mean expenditures for machine tools, and expansions are likely to occur in railroad repair shops as the earning power of the roads increase. With favorable legislation, railroad buying is expected to be more active next year than it was during this year.

Industrials Expanding

During the last quarter of 1923 expansions were noted in the general industrials which were somewhat unexpected and taken by machine tool dealers as an indication that these manufacturers have faith in the future. Business was not any too active from this source during the past twelve months, and it would seem that buying should be imperative during the first three months of the new year.

By the recent consolidation in Japan of three big companies making electrical goods, the reconstruction work will be speeded up and the ultimate purchasing of machine tools will come sooner than has been predicted since the disaster. At the New York offices of the various companies involved in the merger, it has been stated that definite lists of machine tools will be forthcoming during the latter part of January or the first part of February, and that actual buying will commence shortly afterward. Until that time, machine tool manufacturers will have to content themselves with the indirect benefits found in the selling to truck makers, machinery makers and others who are selling at the present time in Japan.

This year will prove to have been better than 1922 by from twenty-five to thirty per cent in volume of sales, according to prediction. The first six months of 1923 were satisfactory; the third quarter suffered from seasonal ills and also from an over-conservative buying attitude that was felt in all industries; and the last quarter showed an improvement over the third quarter, but a decrease as compared with the first two quarters.

Reports from various cities show that Cincinnati, Pittsburgh, Buffalo, Chicago and New England have done a steady business during the past two weeks; New York and Indianapolis have both shown an increased number of inquiries, but a decreased number of sales; Milwaukee and St. Louis have shown decreases in both sales and inquiries, while Philadelphia, Cleveland and Detroit have all shown increased activity in both sales and inquiries.

Electrical Business Good

Central station purchases of line construction material for the purpose of pushing outside construction work to completion before the coming of the first Winter storms was a feature of the market this week, both in New England and the northern states of the Middle West. Aside from this the main interest of both the wholesaler and the retailer has centered on the holiday market which is steadily increasing in its activity.

New England jobbers are buying other lines in small quantities, but the general feeling is that business is good. Electrical manufacturers are busy. In the New York section general business fell off a bit, but this was not considered important inasmuch as the dealer is intent on holiday trade. Good crops in the Southeast have stimulated building which is beginning to react in the electrical market on the demand for wiring material. Steady buying of radio and appliance lines continues in Chicago and there is a lively expectation there that there will be an increase in the price of rigid iron conduit and wire. Construction material and high-tension equipment holds steady. On the Coast Christmas selling seems to be running well ahead of previous years. Telephone and power extensions are active and creating a steady demand for wiring material. The building movement continues unabated, showing that general business is in a very satisfactory condition.

Railroads Electrifying

The interests of steam railroad men in heavy electric railroading is attested at the goodly number of such officials in attendance at the tests of electric locomotives held at Erie on Dec. 4. Great construction activity is looked for in the railway field if the electrification projects under consideration are carried out. The Illinois Central R.R., of course, is actually at work on the electrification of its suburban lines at Chicago. The Long Island R.R. has in contemplation the expenditure of $80,000,000 in the extension of its suburban electrification. Perhaps the most important project around New York is the so-called West side electrification in New York City proper. Kinks regarding grade-crossing electrification remain to be ironed out before this work goes ahead, but these things are expected to be settled at the coming session of the Legislature. Perhaps a little less than these are the proposed electrification undertakings by the Pennsylvania R.R. at Philadelphia and the electrification of the Mountain line west of Harrisburg. It is also known that the Baltimore & Ohio R.R. and the Chesapeake & Ohio R.R. are laying plans for somewhat similar work.

Bus Business

The bus business took on substantial gains during the past two weeks and indications are that this mode of transportation will become better organized as time goes on. Bus terminals and repair shops are noted in Newark, N. J., Bellingham, Wash., Sumner, Wash., Minneapolis, Minn. and other cities throughout the United States. The repair shops in Newark are being built by an association of bus owners and will cost $60,000 for the building and equipment.

Mines Working

Copper mining in the state of Michigan has fallen heir to a sudden prosperity and is making the most of it in buying new machinery and planning expansions. Other mining interests are doing as well as the weather will allow and reports from Arizona, Minnesota and Ontario are all favorable for December, and in fact for the entire mining year.

Coal mining is experiencing resistance to price and exceptionally bad weather for coal selling. However, production is healthy, although smaller than usual and conditions may be characterized as from fair to good.

Industrial Building

One of the important developments that machine tool makers should consider is the amount of industrial building that has been started during the months of October and November. Contracts for manufacturing expansion for over fifty million dollars were let during October as compared with approximately $23,000,000 in October, 1922, and during the month of November this year the contracts totaled about twenty-five and a half million dollars, whereas the average for the three previous years was less than $16,000,000.

These facts mean that buildings will be ready for machinery and machine tools in the Spring and that inquiries for requirements will be made during January and February.

Taking all industries into consideration, there is every indication of what may be termed a "bumper crop" of prosperity in store during 1924, and most schedules and plans of manufacturers for the coming year have been made accordingly.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THOUGH the United States last week had to consider such important events as the President's message and the British elections they were both subordinate, in so far as their influence on business is concerned, to the continued inflow of gold from abroad and to the reported decision of the Federal Reserve authorities to resume the purchasing of government securities in the open market.

The reasons for the decision are varied. One is that the unemployed resources of the Federal Reserve System are now so great that open market operations are necessary to earn enough to pay the banks' extremely heavy overhead expenses. It has been estimated that a billion dollars a year must be steadily employed merely for this purpose.

To put the necessary amount of idle funds to work two alternative methods are feasible. One is to buy commercial paper, bankers' acceptances and similar obligations; the other to buy government bonds and treasury certificates. The effects of the two policies are very different. The first would enlarge the funds at the service of business and tend to reduce interest rates on them, while the second, which the board has chosen, will merely advance prices of securities, in effect taking them over from present holders at a profit with a possibility of later selling them back at a loss.

The choice clearly indicates that the policy of the Federal Reserve Board is to keep interest rates up instead of allowing them to follow their natural course. It is entirely consistent with the policy of camouflaging the true extent of our gold supply by forcing "yellow backs" into circulation, a policy which is only partially successful because imports continue extraordinarily heavy and advices from abroad indicate that they will be still heavier in coming weeks. Even the government officials who last Spring were saying that the gold tide would begin to flow away before the end of the year and that part of our store should be set aside for export are now compelled to sing a different tune.

Secretary Hoover points out that foreign buying of American securities has helped avert the expected gold outflow. As everyone knows, the use of our currency abroad is increasing steadily, and even steamship rates on British and French lines, from their own ports, are now fixed in dollars.

The fact is, whether the arbiters of credit choose to recognize it or not, that circumstances have again given the United States the opportunity to become the bankers of the world, ascending to the position of financial dominance which was Great Britain's before the war, when the notes of the Bank of England were virtually an international currency as the dollar is today.

But this opportunity will never be realized if interest rates are artificially maintained, and though I do not believe that any effort to keep them up can be entirely successful, even the attempt will subvert a share of the pre-eminence and the prosperity which the world is seeking to lay in the lap of this country.

So far as our domestic business is concerned, a definite assurance that we could enjoy the low interest rates to which our enormous credit reserves entitle us would be the most effective serum that could be injected into the business body to overcome the caution and hesitancy which mark the attitude of many men.

"On the other hand, some of the recent developments have helped business sentiment considerably. The President's vigorous support of Secretary Mellon's proposals for tax reduction confirms the belief that the secretary consulted 'headquarters' before making them public and increases the possibility of their passage, though most of the reliable reports from Washington say that the danger of the bonus is very real. The President's message in its entirety receives the warm approbation of practical men and is disappointing only to those visionaries who hoped for startlingly new proposals to solve some of our more pressing problems."

The mixed aspect of the business outlook is indeed due principally to the conflict of its factual and psychological phases. For one thing the proponents of the business cycle theory have succeeded in convincing many that a mild depression is to be expected until the middle of next year. For another, fear of high prices and "consumer resistance" is apparent in many places. If men govern themselves as though business is going to be dull of course it will be.

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Equally powerful in its psychological influence is the continued good tone of the stock market and the knowledge that there is plenty of money for the courageous who want to borrow it. This is the subtle effect of the unadmitted gold inflation which the Federal Reserve Board is trying to check, and which in the long run is likely to exert a decisive influence on the course of business.

Turning to facts, they are principally encouraging. The two mainsprings of last Spring's great activity, building and automobile manufacturing, are still wound up. The largest Winter building in our history, which is already assured, will employ thousands of men who are normally idle and lay the ground for booming materials markets when the Spring demand is added to the present buying. The persistence of automobile manufacturing at such high levels is one of the remarkable phenomena of this age; it has so confounded the prophets already that none dare say when the slump will come. Car loadings continue close to a million a week and would be even higher except for the seasonal drop in ore loadings.

Most of the basic commodities are steady in price. Although cotton is sharply lower for the week, a 2½-cent decline is not a very significant part of the 17-cent advance which it has had. Though iron and steel production is still declining prices are firmer and a revival of steel buying is generally expected after the inventory period is ended.

The British elections, resulting in a mandate for the retention of the historic free trade policy, are for the moment without significance to American business. But the possibility that Premier Baldwin's government will be forced out and replaced by another Coalition is worth considering for the more decided attitude such a government might take toward France. Meanwhile there is talk again of a loan to Germany which will probably not materialize, because it is unlikely that France will allow her claims to be subordinated to it.

Except for a revolt in Mexico, whose seriousness cannot yet be estimated, there is nothing in the foreign news of worse tenor than the dispatches of other weeks, and American business men have obviously made up their minds to remain impervious to even the worst reports from Europe.

Personals

J. B. HUNTER will have charge of the newly opened office of the Van Dorn Iron Works Co., Cleveland, Ohio, in Chicago. His headquarters will be at 311 Chamber of Commerce Building.

W. C. LEFEBVRE has been appointed manager of the traffic section, advisory staff of the General Motors Corp., with headquarters in Detroit, Mich.

W. F. PATTENGELL, who was credit manager of the Brier Hill Steel Co., Youngstown, Ohio, has resigned as secretary and treasurer of the Metropolitan Steel Co. and will become assistant to the president of the United Machine & Manufacturing Co., Canton, Ohio.

H. S. STOCKDALE has been appointed district sales manager with offices in Pittsburgh for the United Machine & Manufacturing Co., Canton, Ohio, engineer and manufacturer in the sale of its line of stokers, and separators.

ARTHUR B. LAKEY has been transferred from the San Francisco office to the Philadelphia office of the Kingsbury Machine Works.

CARL G. BARTH is leaving for Japan during December to act as technical expert for the Timius Olsen Testing Machine Co., Philadelphia. He will be gone for three years.

GEORGE G. HAMILTON recently resigned from the National Engine Hoisting Co. to become secretary-treasurer of the newly organized H. & O. Machinery & Engineering Co., Newark, N. J.

C. A. DUNN, recently appointed manager of the Delaware Seamless Tube Co., Auburn Pa., manufacturer of seamless cold drawn steel tubing was formerly sales manager of the Weldless Tube Co., Wooster, Ohio.

THOMAS H. THORN has been appointed district manager for the Terminal Engineering Co. of New York, for the Pittsburgh district. The company makes TEC trucks.

C. L. NAGEL will represent the Hilo Varnish Corp., Brooklyn, N. Y., in the Western territory, making his headquarters in Chicago at 2420 Washburne Ave.

KURT C. MARQUARDT has accepted a position as salesman with the New York office of the Union Twist Drill Co., Athol, Mass.

JAY J. SEAVER has been elected vice-president of Arthur G. McGee & Co., Cleveland, succeeding Donald D. Herr who was killed in the Japanese earthquake.

F. S. AUTY has been appointed advertising manager of Drying Systems, Inc., Chicago. Mr. Auty is on the staff of *Chatter*, the publication of the Machinery Club of Chicago.

EDWIN C. ANDREWS has been elected president and director of the Pierce-Brown Foundry Co. of North Tonawanda, N. Y., succeeding ALBERT M. EVERHARDT, who died a few months ago. Mr. Andrews has also been elected head of the Niagara Radiator & Boiler Co. of North Tonawanda, N. Y.

H. W. YEOMANS was elected president and W. B. PRINCE, vice-president of the Bishop & Babcock Co., Cleveland, Ohio, at a recent meeting of the directors.

JOHN R. LEE, former Ford Motor Co. executive and one of the founders of the Wills-Sainte Claire Co. with headquarters at Maryville, has been appointed assistant to the president of Dodge Brothers, Inc., according to announcement made last week by Frederick J. Haynes, president. Mr. Lee has been connected with the Dodge organization in an executive capacity for about a year. C. Harold Wills and he were the founders of the Marysville corporation, Mr. Lee being being vice-president and Mr. Wills president. Mr. Lee was generally credited with having been the father of the sociological aspects of the Wills-Sainte Claire venture, with its far-reaching plan for the model city of Marysville.

E. A. EMERSON, manager of the export department of the American Rolling Mill Co., Middletown, Ohio, has arrived in London from India and expects to sail for the United States during December. Mr. Emerson has been making a trip around the world in the interests of the export business of his company.

THOMAS DOUGHERTY, recently made manager of the sheet department of the Central Steel Co., Massillon, Ohio, was for the past few years connected with the claim department of the Sharon Steel Hoop Co., Sharon, Pa. He has already assumed his new duties.

A. A. ARNOLD, superintendent of the Galion Metallic Vault Co., Galion, Ohio, has resigned. He formerly was connected with the machine shops of J. B. McClintock & Co., known as the Galion Machine Works.

J. F. NEWMAN, for 12 years purchasing agent for the Weirton Steel Co., Weirton, W. Va., has become president of the Lawrenceville Bronze Co., Pittsburg, to succeed the late JOHN F. ROBERTSON. The Lawrenceville company manufacturers copper and bronze castings, specializing in blast furnaces, tuyeres, valve seats and rolling mill bearings.

P. T. LAWS has been named Southern district manager for the United States Cast Iron Pipe & Foundry Co., according to a recent announcement, with general offices in the American Trust & Savings Bank Bldg., at Birmingham, Ala. It is also announced that THOMAS P. ANTHONY has been appointed chief engineer of the company with offices at Burlington, N. J.

WALTER N. BALLOU has been appointed manager of the transportation division of the Atlanta office of the Westinghouse Electric & Manufacturing Co. and will have charge of the light and heavy traction business of the company in that territory.

SAMUEL REA, president of the Pennsylvania R.R., was elected president of the Long Island R.R. recently to succeed Ralph Peters, deceased. The election was in accordance with the policy of the railroad that the president of the Pennsylvania shall act as president of the principal companies of the system.

Business Items

The firm name of the Standard Tool & Manufacturing Co., Detroit, Mich., has been changed to the Standard Tube & Manufacturing Co.

The Standard Motor Parts Co., Racine, Wis., has changed its corporate name to the General Parts Corp.

The Colonial Tool & Forge Co. will move its plant and equipment from Columbiana, Ohio, to Elkton, Md. Eastern capital being interested in the expansion is the cause of the removal. There is being erected at Elkton a larger building than was used in Columbiana. The company was first incorporated in 1916 as the Harrold Forge & Tool Co. The name was changed about three years ago.

The New Metal Products Co., of San Francisco, has been incorporated with a capital stock of $750,000. The directors are Howard Spreckels, R. O. Bokee, W. E. Kettering, A. K. Harford and Wm. Kehoe. The latter, with offices in the Merchants Exchange Building, San Francisco, is attorney for the company.

The International Combustion Engineering Corp., New York, and Vickers, Ltd., of England have joined hands in the manufacture of power plant equipment, according to George E. Learnard, president of the International company. The arrangements, which were completed by Mr. Learnard, who has just returned from abroad, will in no way affect the business which is now being carried on by either company. Under the plan, a new company, to be known as Vickers & International Combustion Engineering, Ltd., will be organized in England with an initial capital of £500,000, owned in equal shares by the two compaiies interested.

Forthcoming Meetings

American Society for Steel Treating. Winter sectional meeting. Hotel Seneca, Rochester, N. Y., Jan. 31 and Feb. 1. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

Society of Automotive Engineers. Annual meeting, Jan. 22 to 25, at the General Motors Building, Detroit, Mich. Coker F. Clarkson, 29 W. 39th St., secretary.

American Gear Manufacturers Association. Spring Meeting. April 28, 29 and 30, 1924. Lafayette Hotel, Buffalo, N. Y.

Society of Industrial Engineers. Eleventh annual convention. Buffalo, N. Y. April 30, May 1 and 2. Headquarters, 608 S. Dearborn St., Chicago, George C. Dent, executive secretary.

Southern Supply & Machinery Dealers Association, National Supply & Machinery Dealers Association, and American Supply & Machinery Manufacturers Association. Triple convention, May 19, 20 and 21, 1924. Hotel Cleveland, Cleveland, Ohio. F. D. Mitchell, secretary-treasurer, 1819 Broadway, New York City.

Foreign Trade Council. Eleventh annual convention at Boston, June 4, 5 and 6. O. K. Davis, India House, Hanover Square, New York City, secretary.

The General Committee of Dividion V, Mechanical of the American Railway Association. Convention and exhibits. Atlantic City, June 11-18, 1924.

Railway Supply Manufacturers Association. Exhibit. Atlantic City, June 11-18, 1924.

New and Enlarged Shops

Machine Tools Wanted

Kan., Pittsburg—Cadillac Service Co., 219 South Bway. W. Gooch, Purch. Agt.—14 in. x 8 ft. lathe.

Kan., Pittsburgh—Drive It Yourself Co., 205 South Bway., V. Brunetti, Purch. Agt. —gear press.

Kan., Pittsburg—Ebert Motor Co., 309 South Bway., W. F. Ebert, Purch. Agt.—arbor press, electric valve grinder and weaver dolly.

Kan., Pittsburg—Jessner Welding Co., 202 West 3rd St., O. F. Jessner, Purch. Agt. —electric grinder.

Kan., Pittsburg—Mathews Motor Co., 301 North Pine St., C. S. Mathews, Purch. Agt. —electric drill, forcing press, cylinder and grinding attachments.

Kan., Pittsburg — Moore & Jenney, 209 South Bway., N. U. Moore, Purch. Agt.—forcing press, files and hand tools for automobile repair work.

Kan., Pittsburg—R. Ryan Electric Co., 913 North Bway. (electric and armature work), A. J. Fletcher, Purch. Agt.—lathe.

Kan., Pittsburg—E. Spicer, 201 West 3rd St.—reamers, gear pullers, boring machine, emery stand and wheel for automobile repairs.

Kan., Pittsburg—Super Garage, 507 Locust St., H. C. Hanson, Purch. Agt. forcing press and drill press.

Mass., Boston—J. A. Glass, 27 Purchase St. (metal worker) — combination punch, shears and angle cutter to handle up to at least ¾ in. plates (used).

Mass., Chelsea (Boston P. O.) — Union Metal Wks., 80 Carter St. (machine shop) —two No. 2 Warner & Swasey turret lathes.

Mass., Fall River — Center Garage Co., 101 2nd St.—small tools, including drills, reamers, pipe cutters and threaders, punches, taps, dies, wrenches, etc.; possibly larger tools, including drill press, lathe and hacksaw, later.

Mass., Worcester—Worcester Mchy. Co., 140 Commercial St. (machine shop)—pipe cutting and threading machine to take from 4 to 8 in. pipe or more (used).

Mo., Carthage—Carthage Fdry. & Machine Wks., 500 North Main St., F. L. Moore, Purch. Agt.—reboring machine, milling machine and planer.

Mo., Carthage—Darrow Motor Co., 509 South Main St., F. P. Darrow, Purch. Agt. —reboring machine.

Mo., Carthage—J. M. Hibbs, 427 Howard St.—arbor press and emery wheel with motor grinder.

Mo., Carthage—Larabee & Perkins, 132 East Central St.—drill press and small lathe for blacksmith and repair shop.

Mo., Carthage—C. J. Metcalf, 147 North Main St.—drill press (used) and forcing press.

Mo., Diamond—Ryno Garage & Taxi Service, McCorkle Bros., Purch. Agts.—lathe and electric drill (used preferred).

Mo., Diamond—J. C. Salesman (machine and blacksmith shop)—drill press and emery stand with two wheels.

Mo., Diamond—Starbs Garage & Machine Shop—lathe and drill press.

Mo., Granby—M. Long, R.R. 1—drill press for blacksmith shop.

Mo., Granby—Service Motor Co., H. G. Cline, Purch. Agt.—lathe for garage.

Mo., Joplin—Bell Motor Co., 418 Wall St., W. Bell, Purch. Agt.—electric grinder and drill.

Mo., Joplin—Central Machine Wks., 5th and School Sts., C. B. Kittrell and J. Wisdom, Purch. Agts.—18 in. x 12 ft. lathe, also belt driven shaver and bandsaw.

Mo., Joplin—Drillers Supply Co., 4th St. and Cox Ave., F. Boyer, Purch. Agt.—one hollow spindle, one 18 in. x 14 ft. and one 8 in. x 24 ft. lathe, also pipe threader and drill press.

Mo., Joplin—Empire Electric Mchy. Co., 4th and Pennsylvania Sts. (manufacturer of motors), R. E. Covert, Purch. Agt.—drill press, shaper and balancing table.

Mo., Joplin—F. A. Holden, 2025 Wall St. (machinist)—shaper.

Mo., Joplin—Hudson Supply & Service Co., 6th and Wall Sts.—14 in. x 6 ft. lathe.

Mo., Joplin—E. A. Martin Machine Co., 5th and School Sts.—inside keyseater.

N. Y., Brooklyn—Grim & Cummings, 57 Frost St. (manufacturers of laundry machinery)—milling machine and lathe, 36 in. swing.

N. Y., Buffalo—C. Doetterl, 444 Monroe St.—equipment for garage repair shop.

N. Y., Buffalo—J. E. Hubbard, 204 Norwood Ave.—equipment for garage repair shop at 105 College St.

N. Y., Niagara Falls—R. D. VandeBogart, Elmwood Ave.—tools and equipment for garage.

N. Y., Utica—Gibbs & Benway, Cronk Bldg., Hotel St.. E. R. Gibbs, Purch. Agt.—small lathe and tools for garage repair shop.

O., Columbus—J. F. Ball Auto Service, 208 North 3rd St.—machinery, including grinder and small lathe, to enlarge repair shop.

O., Columbus — Madden-Atkinson Auto Co., 399 East Main St., I. Madden, Pres.—equipment for service station, including grinder and drill press.

O., Lisbon—Ford Motor Co., O. C. Hawk, Purch. Agt.—tools and equipment for proposed repair department.

O., Oakharbor—Miller Garage, A. Miller, Purch. Agt.—tools and equipment for extension of repair department.

Ore., Eugene—Central Stage & Terminal Co., R. Shepard, Pres.—vulcanizing plant, machinery and tools, including lathes and shapers for proposed garage.

Pa., Juniata (Altoona P. O.)—M. C. Babcock, Roland Bldg., 511 4th Ave.—repair shop tools and equipment for garage.

Pa., Plymouth—Vercoe Motor Co., 12 East Main St.—small tools, press and repair shop equipment.

Pa., Somerset—Somerset Motor Sales Co., West Church St.—tools, equipment and small lathe for garage, to replace fire loss.

Wis., Milwaukee—A. Golabowski, 1039 11th Ave.—air compressor, drilling machine and emery wheel.

Wis., Milwaukee—V. M. V. Corp., c/o P. W. Voland, 3202 North Ave. (manufacturer of automobile accessories)—drill press and plating equipment.

Que., Montreal — G. Belleau, 1494 Ave. Hotel de Ville—machine shop tools and machinery.

Que., Montreal—D. Dion, 1029 Marquette St.—press, tools and equipment for garage.

Que., Montreal — E. Galarneau, 617 Colonial Ave.—garage repair tols and equipment.

Que., Montreal—H. Gourgon, 219 St. Philip St.—boring machine and emery wheel for garage.

Que., Montreal—N. Granato, 2854 Blvd. St. Laurent—small lathe and tools for garage.

Que., Montreal—W. Gunson, 759 St. Paul St., W.—lathe and facer for automobile repairs.

Que., Montreal—A. Jenner, 587 Aylmer St.—lathe, etc., for garage.

Que., Montreal—A. Jones, 2054 St. Lawrence Blvd.—drill press, etc., for automobile repairs.

Que., Montreal—M. Kiely, 243 William St.—equipment and tools for machine shop.

Que., Montreal—J. P. Leherault, 1712 Papineau Ave.—press and tools for garage.

Que., Montreal—J. Malo, 1330 De Montigny St., E.—general equipment for garage.

Que., Montreal—Martineau & Labelle, 38 Prince Arthur St., E. (plumbers)—tools and equipment, including pipe threader.

Que., Montreal—A. Neveu, 10 Monk Blvd. —small lathe and tools for garage.

Que., Montreal—I. Plention, 409 Ontario St., E.—boring machine and chain hoist for automobile repair shop.

Que., Montreal—Provost Freres, 2575 Notre Dame St., E. (machinists)—small grinder and drill press.

Que., Montreal—A. Racine, 1990 St. Dominique St.—tools, press and equipment for automobile repairs, etc.

Que., Montreal—J. Rolle, 581 St. Timothy St. (machinist)—catalogues and prices on drill press and lathe.

Que., Montreal—A. Thiverge, 489 Laval Ave.—automobile repair equipment.

Que., Montreal — E. Vanier, 504 Henri Julien St.—garage tools and equipment.

Que., Montreal—White & Ware, 51 City Councilors St. (plumbers)—pipe threading and cutting machine.

Que., Montreal—J. E. Wilder, 321 Bleury St.—complete equipment, including gasoline tank and pump, for garage at Notre Dame de Grace.

Que., Outremont—R. Joannett, 219 Van Horne Ave.—lathe and drill press for garage.

Que., Quebec—Pare, Ltd., 78 Augustin St., F. Pare, Purch. Agt.—repair tools and other equipment for garage.

Machinery Wanted

Ill., Chicago—R. E. Martin, 6657 Ellis Ave.—one single stage, 12 x 12 in. belt driven air compressor (used).

Ill., Chicago—Mining Gazette Co., c/o Western Newspaper Union, Box R-110—16 or 20 page stereotype machine, press and complete outfit.

Ill., Lombard—The Printer, Box 396—job printing press, paper cutter, pulleys, hangers and belting.

Ia., Guttenberg — Kuempel Co. (job printers)—28 in. paper cutter.

Kan., Junction City—C. H. Manley—job printing press and Miller feeder.

Kan., Pittsburg — B. & W. Motor Co., 4th and Locust Sts., W. L. Williams, Purch. Agt.—automatic air compressor, also combined post and hand drill.

Kan., Pittsburg—C. & A. Garage, 405 North Locust St., J. Goodwin, Purch. Agt. —portable crane.

Kan., Pittsburg—J. Lenski Tires, 106 West 3rd St.—tire changers and spreaders.

Kan., Pittsburg—Pittsburg Constr. Co., 318 South Bway., W. S. Shaw, Purch. Agt. —complete outfit for planing mill.

Kan., Pittsburg—Pittsburg Cornice Wks., 110 West 3rd St., W. C. Wilson, Purch. Agt.—slitting shears, square break.

Kan., Pittsburg—L. Russell Battery Sta., 412 North Locust St.—electric equipment for battery station.

Kan., Pittsburg — United Iron Wks., Locust St. along tracks of St. Louis-San Francisco Ry.—regrinding machine.

Ky., Louisville—Office of United States Engineer, P. O. Box 72—one hand hammer rock drill, heavy type, self rotating; 24, 36, 60, 84, 108 and 144 in. steels to fit above drill.

Mass., Boston—Hollingsworth & Whitney, 185 Devenshire St.—equipment for pulp and paper plant at St. Stephen, N. B.

Mich., Atlantic Mine—D. A. Stratton Co. (manufacturer of handles)—shaving machines and wood turning lathes.

Mich., Detroit—Peerless Portland Cement Co., 2408 1st Natl. Bank Bldg.—mechanical equipment, including crushers, conveyors, kilns, etc., for proposed $1,500,000 cement plant.

Mich., Highland Park (Detroit P. O.)—Ford Motor Co.—material handling equipment for proposed car delivery building at Seattle, Wash.

Mo., Carthage—H. E. Williams Mfg. Co., 440 North Main St.—machinery and tools for the manufacture of automobile accessories.

Mo., Center—Herald—newspaper folder.

Mo., Granby—J. H. DeBusk—finisher for shoe repairs.

Mo., Joplin—Erwin-Chapman Co., 222 West 4th St. (tires and tire repairs)—skiver and electric drill.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Pig-iron sales smaller. No. 2 foundry iron $21@$22 per gross ton at Birmingham. Coke higher. Finished steel prices firm. Mills receiving inquiries involving large tonnages. Improved railroad demand for steel plates. Oil-storage tank plate requirements small. Structurals continue at $2.50 base, with $2.40 quoted on exceptionally large tonnages; bars, $2.40 per 100 lb., Pittsburgh.

Advances—Tone of copper market still optimistic; electrolytic rose ¼c. per lb. in week. Tin and lead markets strong; former up 1⅜c. and latter, ⅝c. per lb. Solder advanced 1¼c. and cotton waste 1c. per lb. in New York, during week.

Declines—Zinc market sagging; declined ¼c. per lb. in week. Steel sheets down 5 to 10c. per 100 lb. at Pittsburgh mill; drop reflected in New York warehouses. Antimony market easy; down ¼c. per lb.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.05
Northern Basic	24.00
Southern Ohio No. 2	24.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	28.00
BIRMINGHAM	
No. 2 Foundry	22.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.25
Virginia No. 2	28.17
Basic	24.00
Grey Forge	24.00
CHICAGO	
No. 2 Foundry local	24.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	27.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.77
Basic	25.77
Bessemer	26.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.75
Cleveland	4.75
Cincinnati	5.00@7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh	New York	Cleveland	Chicago
No. 10	2.90@3.00	4.34	3.75	4.00
No. 12	3.00@3.10	4.39	3.80	4.05
No. 14	3.10@3.20	4.44	3.85	4.10
No. 16	3.30@3.40	4.54	3.95	4.20
Black				
Nos. 17 and 21	3.70	4.30@4.55	4.45	4.70
Nos. 22 and 24	3.75	4.35@4.60	4.50	4.70
Nos. 25 and 26	3.80	4.40@4.65	4.55	4.75
No. 28	3.85	4.50@4.75	4.65	4.85
Galvanized				
Nos. 10 and 11	3.85@4.00	4.50@4.80	4.70	4.85
Nos. 12 and 14	3.95@4.10	4.60@4.90	4.80	4.95
Nos. 17 and 21	4.25@4.40	4.90@5.20	5.10	5.24
Nos. 22 and 24	4.40@4.55	5.05@5.35	5.25	5.40
No. 26	4.55@4.70	5.20@5.45	5.50	5.55
No. 28	4.85@5.00	5.50@5.75	5.80	5.85

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4%; class A, plus 23%. Cast iron, standard sizes, 34% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.20
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.70
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	8.35
Floor plates	5.80	5.66	5.80
Cold drawn shafting or screw	4.40	3.90	4.30
Cold drawn flats, squares	4.90	4.40	4.80
Structural shapes (base)	3.64	3.46	3.30
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.10@3.15 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			13.75
Tin, 5-ton lots, New York			48.87½
Lead (up to carlots), St. Louis	7.25	New York	8.00
Zinc (up to carlots), St. Louis	6.30	New York	6.75

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.20	27.00	28.50
Antimony (Chinese), ton spot	9.75	10.50	10.25
Copper sheets, base	21.00	21.00@21.25	23.00
Copper wire, base	16.25	19.00	16.25
Copper bars, base	20.00	22.50	19.50
Copper tubing, base	23.50	27.25	23.00
Brass sheets, base	17.75	22.00	18.75
Brass tubing, base	22.00	27.00	20.50
Brass rods, base	15.50	18.00	15.75
Brass wire, base	18.25	22.00	....
Zinc sheets (casks)	10.25	10.45	....
Solder (½ and ½), (case lots)	33.75	31.75	30.00
Babbitt metal (83% tin)	52.00	59.50	48@52
Babbitt metal (35% tin)	25.00	18.50	22@25
Nickel (ingot and shot)	29.00	....	....
Nickel (electrolytic)	32.00	....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00

Shop Materials and Supplies

METALS—Continued

Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.75	11.00	11.50
Copper, heavy, and wire	10.75	10.50	10.75
Copper, light, and bottoms	9.50	8.75	9.75
Lead, heavy	5.75	5.25	6.00
Lead, tea	4.75	4.00	5.00
Brass, heavy, yellow	7.00		7.25
Brass, heavy, red	8.75	9.25	9.00
Brass, light	6.25	5.00	6.25
No. 1 yellow brass turnings	7.00	5.75	6.75
Zinc	3.75	2.75	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$25.10	$22.85	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.40	18.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	13.00	14.50
	Terne Plates—Small lots. 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.11@0.14	$0.15	$0.14
Cotton waste, colored, per lb.	.09@.14	.12	.10½
Wiping cloths, 13¼x13¼, per lb	9.00	36.00 per M	.16
Wiping cloths, 13¼x20½, per lb.		52.00 per M	.16
Sal soda, per 100 lb.	2.40	2.25	2.65
Roll sulphur, per 100 lb.	3.60	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.95	1.00	.94
Lard cutting oil (50 gal. bbl.) per gal	.55	.50	.67½
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.297	.35	.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30–10%	30–10%	30–10%
Heavy grade	20–5–2½	30%	20–5–2½%
Rubber and duck:			
First grade	50–10–5%	50–10%	40–10%
Second grade	60–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton		4.50@5.00
Coke, prompt foundry, Connellsville	per net ton		5.50@6.50
White lead, dry or in oil	100 lb. kegs	New York, 14.00	
Red lead, dry	100 lb. kegs	New York, 14.00	
Red lead, in oil	100 lb. kegs	New York, 15.50	

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0354	$0.0354	$0.0304
Cold finished shafting	per lb.	0.044	0.0465	0.039
Brass rods	per lb	0.155	0.1475	0.17
Solder (½ and ½)	per lb.	0.3375	0.295	0.275
Cotton waste	per lb.	.11@.14	.10@.13	.09@.11½
Washers, cast iron (½ in.)	per 100 lb.	6.50	6.50	6.00
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.02
Lard cutting oil	per gal.	0.55	0.55	0.50
Machine oil	per gal.	0.297	0.297	0.33
Belting, leather, medium	off list	30–10%	30–10%	30–10%
Machine bolts up to 1x30 in.	off list	45%	40–10%	40%

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	45%	60%	50–5%
1⅛ and 1¼x3 in. up to 12 in.	15%	50–5%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	30%	$3.50 net	
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	35%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	
Hex. head and hex. nut bolts	List net		65–5%
Lag screws, coach screws	45%		60–5%
Square and hex. head cap screws	60%	70%	70–10%
Carriage bolts, up to 1 in.x30 in.	35%	50%	50–5%
Bolt ends, with hot pressed nuts	45%		55%
Tap bolts, hex. head, list plus	35%		
Semi-finished nuts, $\frac{9}{16}$ and smaller	65%		
Semi-finished nuts, ⅝ and larger	60%	70%	80%
Case-hardened nuts	50%		
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$4.00
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	4.00
Washers, round plate, per 100 lb. Off list	1.50	4.00	4.00
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.50	3.50
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.50	3.50
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.50	3.50
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.50	3.50
Rivets:			
Rivets, $\frac{7}{16}$ in. dia. and smaller	50%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.00	$3.60	$3.75
Cone heads, ditto (net)	5.20	3.80	3.85
1⅛ to 2-in. long, all diameters, *EXTRA* per 100 lb.	0.25		0.15
⅝ in. diameter *EXTRA*	0.35		0.15
½ in. diameter *EXTRA*	0.75		0.50
1 in. long, and shorter *EXTRA*	0.75		0.50
Longer than 5 in. *EXTRA*	0.50		0.25
Less than 200 lb. *EXTRA*	0.50		0.50
Countersunk heads *EXTRA*	0.45		$3.70 base

Mo., Joplin—F. M. Exendine, 1208 Jackson Ave. (cabinet maker and carpenter)—wood lathe (used).

Mo., Joplin — Peerless Machine Co., 4th and Michigan Sts., W. S. Sohosky, Purch. Agt.—duplex steam pump manufacturing tools.

Mo., Joplin—Vernon Asphalt Co., J. A. Lohmeyer, 208 North Sergeant St., Purch. Agt.—machinery for proposed asphalt plant at Nevada.

Mo., Kansas City—Wood Products Co., 3406 Garfield Ave., E. J. Bivins, Purch. Agt.—bandsaw.

Mo., New Hampton—J. W. Cover—newspaper press, job printing press, paper cutter, belting, hangers and pulleys (used).

N. Y., Buffalo — J. H. Knobloch, 79 Tamarack St.—equipment for the manufacture of concrete blocks.

N. Y., Buffalo—L. E. Wesselman, 318 Niagara St.—equipment for addition to laundry.

N. Y., Buffalo—C. G. Williams, 586 Jefferson Ave.—laundry equipment.

N. Y., Elba—W. Brown, Mechanic St.—blacksmith shop equipment and one acetylene welding outfit.

N. Y., La Salle — Kappauf & Alberts, Cayuga Drive—machinery and equipment for new planing mill.

N. Y., North Tonawanda—Wurlitzer Co., Niagara Falls Blvd. (manufacturer of organs)—machinery and equipment for extensive enlargement program.

N. Y., Ogdensburg—Banner Laundry, Catherine St.—machinery and equipment, to replace that which was destroyed by fire.

N. Y., Syracuse—The city, Bd. of Contract & Supply, F. E. Barry, Secy.—several lathes and sand papering machines for continuation schools.

N. Y., Troy—Van Zandts, Inc., 621 River St.—coal conveyor with elevator to handle 3 ton soft coal per hour, convey 125 ft. and elevate 18 ft.

O., Cincinnati — Amer. Laundry Mchy. Co., Ross and Section Aves.—machinery for expansion program.

O., Columbus—Amer. Column & Lumber Co., Brunson Bldg., M. W. Stark, Purch. Agt.—equipment for band sawmill in Virginia.

O., Columbus—Columbus Woodworking Co., 2034 Leanard Ave., W. A. Slatter, Genl. Mgr.—sticker, mortiser, molding machine and other woodworking equipment to enlarge mill.

O., Columbus—J. E. McNally Lumber Co., 1670 Snider Ave.—woodworking machinery to enlarge mill, about Feb. 15, 1924.

O., Fremont—Fremont Brass & Bronze Co., O. C. Wahl, Mgr.—general foundry equipment.

O., Marion—McQuate Rubber Co. (manufacturer of balls, etc.), W. W. McQuate, Purch. Agt.—machinery for addition to plant.

O., Middletown — W. B. Oglesby Paper Co., L. C. Anderson, Pres. three washer machines, four rotaries and other paper making machinery.

O., Portsmouth — Carlyle-Labold Brick Co.—equipment for proposed factory.

Okla., Commerce — Jefferson Highway Garage, E. Pierce, Purch. Agt.—complete welding outfit.

Okla., Quapaw—Quapaw Zinc Washboard Wks.—wood turning lathe.

Okla., Quapaw — T. W. Smith, Supt. of Schools—wood lathe, Universal saw, planer, belting and hangers (used).

Okla., Tulsa—Choctaw Portland Cement Co.—mechanical equipment for proposed $25,000 cement plant.

Pa., Sellersville—H. Geisel—machinery, tools and equipment for proposed $25,000 plant for the manufacture of cutlery at Perkasie.

Pa., Williamsport — Vallamont Planing Mill Co., 1009 Market St., J. C. Wilson, owner—machinery for proposed $150,000 mill.

Tex., Collinsville—E. C. Williams—complete outfit for sawmill.

Tex., Dallas — Trinity Portland Cement Co., Commonwealth Bldg.—machinery for proposed sacking department of cement mill, to replace fire loss.

Tex., Houston — York Eng. & Supply Co., 2201 Texas Ave.—pipe welding equipment, etc., for new shop.

Tex., McKinney—McKinney Examiner—14 x 22 in. job printing press.

Tex., San Antonio—H. T. Phelps, Hicks Bldg.—100 ton jaw crusher.

Wis., Fond du Lac—F. F. Pope, 23 West Division St.—one tire press for garage.

Wis., Lancaster—Herald—2 revolution, 7 column quarto newspaper press, belting and hangers.

Wis., Milwaukee—Advance Boiler & Tank Co., 3015 Walnut St.—one 2 ton triple chain hoist.

Wis., Milwaukee—Dallmann Machine & Mfg. Co., 912 Winnebago St. (manufacturer of gears, dies and tools), W Schmidt, Purch. Agt.—die making machines.

Wis., Milwaukee—P. J. Fischer, 241 Rusk Ave.—small tools, air compressor, gasoline storage tank and pump for garage.

Wis., Milwaukee—M. J. Goodnetter, 384 22nd St.—emery wheel, gasoline storage tank and pumps for proposed $40,000 garage.

Wis., Milwaukee—Main Express Co., 116 Oneida St.—gasoline pumps, tanks and small tools for proposed $40,000 garage.

Wis., Milwaukee—Misericordia Hospital, 2224 Chestnut St.—laundry machinery, including mangles, extractors and mechanical dryer.

Wis., Milwaukee—Northwest Fence & Wire Co., c/o D. V. Holcomb, 960 45th St.—special wire working machinery.

Wis., Milwaukee—United Feed Dealers, Inc., 3601 National Ave. (manufacturer of cereals, etc.)—feed grinding machinery.

Wis., Randolph—Friesland Canning Co., W. Jones, Pres.—canning and conveying machinery for proposed $75,000 cannery.

Wis., Rice Lake—Specialty Mfg. Co. (manufacturer of automobile accessories), L. J. Erickson, Purch. Agt.—buffer, tool room lathe, emery wheel and stand.

Wis., Ripon — Ripon Produce Co. — separators, vats, belting and shafting for cheese factory.

Wis., Sheboygan—Badger Furniture Co., 14th and Kentucky Sts., J. A. Will, Purch. Agt.—sticker, polisher and saws.

Wis., Sheboygan—Sheboygan Paper Box Co., c/o W. Gorter, 801 North 9th St.—cutters and other paper box making machines.

Wis., Wautoma—F. Grimm—rock crushing and screening machinery.

Wis., Whitewater — Whitewater Press — punch press for job printing.

Alta., Calgary—National System of Baking, Ltd., E. A. Heagle, Purch. Agt.—complete bakery equipment.

B. C., Prince Rupert—Prince Rupert Sulphite Fibre Co., Ltd.—machinery for a 90 ton bleached sulphite pulp plant.

N. B., Black's Harbor—Connors Bros., Ltd., P. W. Connors, Purch. Agt.—equipment for enlarged plant.

N. S., Halifax—L. Newcombe, Chelucto Rd.—complete dairy equipment.

N. S., River Philip—V. F. Davison—complete equipment for blacksmith shop.

N. S., Ship Harbor—J. Lewis—woodworking equipment to replace fire loss.

Ont., Barrie—Warren Organ Co., S. R. Warren, Mgr.—special machinery and equipment for the manufacture of organs.

Ont., Hamilton—International Harvester Co., Sherman St., N.—equipment for new binder twine plant.

Ont., Owen Sound — North Amer. Bent Chair Co.—special machinery.

Ont., Toronto—Dominion Envelope & Cartons, Ltd., 98 Ontario St., H. Breckenridge, Secy.—equipment.

Ont., Woodstock—Canada Furniture Mfg. Co., Ltd., M. Rowe, Secy.—woodworking equipment.

Que., Lachine—Lachine Printing Co., 24 12th Ave., J. Lamarche, Purch. Agt.—job printing press and type.

Que., Montreal—Allard & Bourque, 369 Papineau Ave.—emery stand and wheel for garage.

Que., Montreal—Allard & Desnoyers, 190 Pie 9th Ave. (sashes, etc.)—bench tools, rip saw and bandsaw.

Que., Montreal—The City, H. A. Terreault, Dir. of Purch.—receiving bids until Dec. 17 for shop machinery.

Que., Montreal—G. Delisle, 20 Marquette St.—air compressor for garage.

Que., Montreal — Dominion Textile Co., Ltd., Victoria Sq.—machinery and equipment for proposed plant at St. Lambert.

Que., Quebec—E. Plamondon, 176 St. Olivier St.—equipment, tools, etc., for blacksmith shop.

Que., Montreal—F. Tremblay & Co., 372 William St.—machinery and small tools for planing mill.

Que., St. Lambert—St. Lambert Lumber Co., E. F. Kimpton, Purch. Agt.—machinery and equipment for sawmill.

Metal Working Shops

Calif., Los Angeles—C. F. Crawford, 6029 Hollywood Blvd., Hollywood, awarded the contract for the construction of a 2 story, 50 x 150 ft. garage on Ottawa St., here.

Calif., Los Angeles—C. A. Doody, c/o Walker & Eisen, Archts., Pacific Finance Bldg., awarded the contract for the construction of a 4 story, 150 x 150 ft. garage on 6th St. and Kenmore Ave. Estimated cost $280,000.

Conn., New Britain—Landers, Frary & Clark, Commercial and Center Sts., manufacturer of hardware specialties, awarded the contract for the construction of a 6 story, 65 x 160 ft. factory on Ellis St. Estimated cost $100,000.

Ill., Chicago—The Acme Garage Co., c/o Morton, Leviton & Co., Archts., 123 West Madison St., is having plans prepared for the construction of a 1 story, 120 x 125 ft. addition to garage at 921-935 North California Ave. Estimated cost $75,000.

Ill., Chicago — Francisco & Jacobus, Archts., 39 South La Salle St., will receive bids about Dec. 15 for the construction of a 3 story factory on Grand St. near Kenton St. for the Continental Can Co., 111 West Washington St. Estimated cost $500,000.

Ill., Chicago—S. D. Jonas, 133 West Washington St., awarded the contract for the construction of a 1 story garage on Lake and Homan Sts. Estimated cost $40,000.

Ia., Sioux City—The Illinois Central R.R. Co., 135 East 11th Pl., Chicago, is having plans prepared for the construction of shops, roundhouse, etc., here. Estimated cost $500,000. F. L. Thompson, Ch. Engr.

Ky., Louisville—Joseph & Joseph, Archts., Francis Bldg., will receive bids until Dec. 27 for the construction of a 1 story, 120 x 200 ft. factory for the manufacture of highway material, culverts, etc., on 17th and Magnolia Sts., for the Highway Iron Products Co., Columbia Bldg. Estimated cost $106,000. Noted Dec. 6.

La., New Orleans—The Checker Cab Co., Inc., St. Charles Hotel, plans to build a garage on a 60 x 400 ft. site on Poydras St. near South Rampart St. Estimated cost $40,000. J. Bistes, Pres. Engineer or architect not announced.

Md., Baltimore—The Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, is having plans prepared for the construction of a 2 story, 171 x 350 ft. warehouse, 154 x 345 ft. enamel shop, 102 x 197 ft. cleaning house, 97 x 589 ft. foundry, 100 x 250 ft. machine shop, 107 x 132 ft. power house and a 100 x 120 ft. enamel power mill on 5th Ave. from 7th to Camp Holabird Sts., here. Estimated cost $2,000,000. S. Deischer & Sons, Farmers Bank Bldg., Pittsburgh, Archts.

Mich., Crystal Falls—F. E. Parmelee & Son, Archts., Iron Mountain, will receive bids until Dec. 15 (change of date), for the construction of a 1 story, 52 x 100 ft. garage, here, for the Webb Garage Co., Iron Mountain. Estimated cost $50,000. Noted Nov. 29.

Minn., St. Paul—The Willis Motor Co., 50 12th St., is having plans prepared for the construction of a 1 story, 100 x 150 ft. garage on Congress and Robert Sts. Estimated cost $40,000. Mather & Fleishbein, 442 Endicott Bldg., St. Paul, Archts.

Mo., St.—Louis — The Forest Spring Real Estate Co., 3710 Forest Park Blvd., awarded the contract for the construction of a 2 story, 75 x 182 ft. boring tool factory. Estimated cost $40,000. Davis Boring Tool Co., 3710 Forest Park Blvd., lessee.

Mo., St. Louis—W. P. McMahon, Archt., Title Guaranty Bldg., is receiving bids and will open same about Dec. 15 for the construction of a 4 story, 37 x 155 ft. automobile sales and service building for the Mendenhahl Motor Co., 2317 Locust St. Noted Nov. 8.

O., Cleveland—The Chicago Pneumatic Tube Co., 1241 East 49th St., is having plans prepared for the construction of a 3 story, 43 x 126 ft. addition to its factory. Estimated cost $50,000. T. P. Kinsman, Mgr. Private plans.

O., Cleveland—A. C. Spear, 13931 Kinsman Rd., is having plans prepared for the construction of a 1 story garage at 2612 Prospect Ave. Estimated cost $50,000. Private plans.

Ore., Eugene—The Central Stage & Terminal Co. will soon receive bids for the construction of a 3 story, 68 x 120 ft. garage, bus depot and hotel on Willamette St. Estimated cost $75,000. Private plans. R. Shepard, Pres.

Tenn., Etowah—The Louisville & Nashville R.R., 10th St. and Bway., Louisville, is receiving bids and will open same about Dec. 31 for the construction of a 1 story, 110 x 170 ft. machine shop, here. Estimated cost $50,000. W. H. Courtenay, Ch. Engr. Noted May 24.

Wis., Milwaukee—M. J. Goodnetter, 384 22nd St., is receiving bids for the construction of a 1 story, 40 x 120 ft. garage on North Ave. Estimated cost $40,000. Private plans.

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What Ford Has Done in the Lincoln Plant

By FRED H. COLVIN
Editor, *American Machinist*

The first of three articles giving details of some of the methods used by the Ford management to build a better car at less cost

ALTHOUGH we have been boasting of accurate work and interchangeable manufacture for many years, the notion lingers that really fine machinery cannot be built by large scale production methods. There is still a feeling, even among engineers who ought to know better, that the really fine automobile, for example, has to be built a few at a time, so that each car receives some special attention in the way of fitting its various parts. Few seem to realize that the machine that is built by thousands has to be made up of accurately machined parts before assembly can go on like clock work.

We owe much to Henry M. Leland, always noted as an excellent workman, for demonstrating that a high grade car can be *manufactured* instead of being built a few at a time. His work in developing the Cadillac car on a large production basis stands out as an achievement of which we may all be proud. The assembly of Cadillac cars from parts selected at random at a London automobile show some years ago, proved that he had the knowledge and the skill to secure results which many had considered impossible.

There were some misgivings on the part of those unfamiliar with what accurate large scale production really means, as to the quality which Mr. Leland put into the Lincoln car being maintained when it was taken over by the Ford Motor Co. For it is evidently not easy for the average man to realize that low costs do not necessarily mean cheap material and poor fits. Those who really knew the Ford organization had no fears whatever as to its ability to produce any grade of workmanship desired. A recent critical examination of the Lincoln plant proved beyond question that not only has quality been maintained but that many refinements and improvements have been added. For just as it is Mr. Ford's ambition to produce the lowest priced medium of transportation in the humble "flivver," so it is his aim to make the Lincoln the last word in mechanical perfection and comfort. And his great organization gives many advantages as to the purchase of materials and the placing of the cars in the hands of their users.

"WHAT will Ford do to the Lincoln car?" has been asked dozens of times. Even engineers, who know that modern machining methods produce accurate and interchangeable work, cannot quite see how the organization which builds the lowest-priced car in the world can at the same time produce a car of the highest grade. One reason is that it is difficult to associate good work with low costs, and how good the work on a low priced product really may be, is not appreciated.

This article and the ones to follow will point out a few of the methods that have made the Lincoln car what it is, and how refinements not only are being maintained but added to and improved in numerous ways, by the Ford organization. You'll find much of interest.

Because of this organization the present management has been able to effect many economies, while at the same time improving the quality. Due to thorough reorganization and placing of responsibility nearer to the source of supply and production, and the delivery of finished parts adjacent to assembly points, there has been effected a very noticeable decrease in the number of men employed in the manufacturing and assembly departments.

Many parts formerly made outside, and on which a profit was paid, have been absorbed into the plant manufacturing departments.

Extensive additional floor space has been added to the plant, as well as additional machinery and tools, making ideal working conditions which add materially to quality results. These additional facilities made possible the taking over of all body finishing, and the performance of it under ideal conditions and strict supervision in the plant itself.

LINCOLN
FINISHING ENDS OF BEARINGS—FIG. 2
BROACHING FOR BEARING CAP—FIG. 4
BORING CRANKCASE—FIG. 1
INSPECTION AND MASTER CASE—FIG. 3

These changes, together with the introduction of Ford simplicity in cost, time, and stock keeping methods, have had an appreciable effect on overhead, while at the same time the production of cars has made a satisfactory increase.

As an indication of the care used in connection with the building of the Lincoln car, we may cite the testing of every frame rivet by tapping with a light hammer to note the sound. This detects any loose rivets. The ends of the frame that project are rubbed down and repainted and special care is also taken in painting the motor itself. All screws, bolts and washers that hold fenders and other parts under the car are electro-zinc plated and have brass nuts. In most places the nuts are of double thickness so that no threaded portion of the bolt or screw is ever exposed to corrosion. In other places tobin bronze screws and bolts are used so that the repair man should have much less difficulty than usual in taking down parts under the chassis.

Machining the Crankcase

It is not easy to select for illustration a few of the many operations which go to make up a large car. But with a view of showing some of the more unusual operations and the great care which is taken, both in inspection and assembly, the crankcase and transmission were selected as subjects for this first article.

The case is first machined with the exception of the boring and drilling. The camshaft and crankshaft holes are then bored, locating them from the angular cylinder-seat faces, to which they must be in proper relation. Only the crankcase half of the crankshaft bearing is bored in the fixture shown in Fig. 1. The caps are bored (one-half hole) in a separate operation. Both of these are roughing out operations but are exceedingly close approximations to an accurate location for the final axis of the finished hole.

The camshaft hole has previously been rough bored to the same close approximation of axis center line. The crankshaft-bearing caps are assembled and the case is then put into a fixture, locating it from the angular cylinder-seat faces, where both the camshaft and crankshaft bearing holes are bored at the same time with bars which have single fly tools, and which remove approximately 0.005 in. of stock. These bars produce line holes which are afterward further lined and sized with Martel reamers.

All this work is preliminary to the drilling operations and comes after the major milling operations have been completed. The case is then mounted in a fixture on pins that fit the bored and sized camshaft and crankshaft holes and located endwise from the rear bearing, which is the bearing that gives the longitudinal position to the crankshaft. All holes are now drilled while the case is held in an indexing or revolving fixture or cradle, which travels on a track and registers through hardened pins and bushings, with each successive drill jig, under which it must pass. These drill jigs are integral with the drilling machines, which are of the multi-spindle type. This method insures the exact inter-relation of all the holes from a chosen base.

The crankcase is located longitudinally by two pins on the lower face, where the oil pan goes, one of them being shown at *A*. The case is actually located and held by the cover *B* which has hardened blocks, as at *C*, fitting the cylinder-block surfaces and holding the case centrally and firmly. The cover is counter-balanced by the weight *D* and locked by pins, as at *E*.

The fixture has center bearings, as at *F*, each carrying a revolving bushing with unusually ample bearing surfaces. These bushings are provided with two slots through which the single point (fly tool) boring cutters in the bar can readily pass. A "pick-up" arrangement is provided so that these slots are automatically aligned as the bar is advanced into the boring position, bringing them into exact relation so that the driving key in the bushings is brought into exact line with the spline in the boring bar. The boring bar is driven independently of the lathe spindle which carries the boring and facing tools shown. These tools are held in a special head bolted to the faceplate on the spindle, which runs at the proper cutting speed for the larger diameters. The boring bar, however, goes through the lathe spindle and has a separate drive from the feed gearing. It runs about six times as fast as the lathe spindle and so gives a better cutting speed for its five tools. Plenty of lubricant is supplied for cutting, and the bed of the fixture acts as a pan from which the lubricant is returned to the tank by the hose shown.

A somewhat similar type of fixture is shown in Fig. 2, and is for facing the ends of the bearings with the gang of milling cutters shown in front at *A*. As the cutters are inside the case when at work, the spare set is shown in order to indicate the manner in which they are used. The cutter arbor shown is put into its bearings in the fixture and the bearing caps bolted in place. The two gears shown mesh with the driving gears below, the latter being driven by special gearing.

With the crankcase clamped in position and the cutters in place, the case is fed down onto the revolving cutters by means of the two screws shown at *B* and *C*. These screws are driven by bevel gears in the boxes below and give a positive feed for facing the inside ends of both the front and rear bearings and both sides of the three bearings inside the case.

Duplicate Cutters Always Ready

The cutters are kept on their arbors and are sharpened in place. A duplicate set is provided so that there need be no delay when the set in use becomes too dull to do its best work. It will be noted that adjacent cutters of each pair have right and left rake, respectively, so as to present the proper cutting angles for obtaining the best results.

The bottoms of the bearing seats in the crankcase are milled on a vertical-spindle machine using a face-milling cutter. But for cutting the recess in the seats, in which the bearing caps fit, at *A*, Fig. 4, it was necessary to use another method, as the opening in the bottom of the crankcase would not permit driving a milling cutter of the proper diameter without resorting to some offset arrangement, which would hardly be rigid and substantial enough for rapid production work.

For this reason the recess is cut with a broach as shown in Fig. 4. The case is held in a fixture similar to those previously shown, the previously described facing operation having provided a finished surface to take the broaching thrust. The outer end of the broach is carefully guided and there is a support under each bearing so that the broaching bar cannot spring away from the cut. This method makes a good job which is held to very close limits by the "go" and "no go" gages shown at *B* and *C*.

In order to insure the duplicate manufacture necessary for easy assembly into a motor of this class, great care is taken in the inspection of all the com-

LINCOLN
REAMING FOR DIFFERENTIAL BEARING—FIG. 6
HAND REAMING TRANSMISSION CASE—FIG. 5
INSPECTING CRANKCASE—FIG. 4
INSPECTING TRANSMISSION CASE—FIG. 7

ponent parts. Figs. 3 and 5 show a few of the inspections on the crankcase and serve to illustrate the care that is taken all through the work. The gage in Fig. 3 tests the angle of the faces for the cylinder blocks. The crankcase is placed on the surface plate between the strips *A* and *B*, and the gage at the right moved until the upper end reaches over the angular surface.

Two dial gages, one at *C* and the other between the upper flanges, at *D*, show whether or not the angle of the face is correct. In order to be sure that this face is kept at the proper angle, the master gage *E* at the left is kept on the surface plate so that the gages can be tested at frequent intervals and without being sent to the toolroom for that purpose. Both the gages and the master are made of aluminum for ease in handling. The bearing surfaces, however, are of hardened steel.

A few more of the inspections on the crankcase are shown in Fig. 5. Needless to say all of the gages shown are not used at once but were put on in order to show as many of them as possible in one view. Beginning at the left, *A* is an arm which goes over the end of a mandrel that fits in the crankshaft bearings. This arm carries several dial indicators, only part of which are shown. Indicator *B* shows the squareness of the outer or transmission-case face with the crankshaft bores, while *C* shows the concentricity of the bore. Both of these surfaces affect the proper alignment of the transmission case.

For testing the faces for the starting motor and other auxiliaries, the bar *D* is put in place with the flanged collars *E* and *F*. The pin at *G* bears on the starter face and, as the collar is revolved, the indicator *H* shows the error, if any. The same collar tests the opposite surface, while collar *I* tests the gear-seat face in the front end.

The block *J* tests the distance of the face of the side opening from the bar *D*. Gage *K* shows the height of the face under the indicator point from the cylinder-block faces. Cylinder bolt-holes are gaged by a screw plug gage *L*. The two gages at *M* test the relaton of two right angled holes as shown in detail in Fig. 9, while gages *N* and *O* show whether the valve-slide guide holes are central with the camshaft or not. Details of these gages are shown in Fig. 10.

Details of Two Gages

Referring to Fig. 9, the large plug *A* fits into the end of the case and is located by the flange *B*. Plug *C* fits the right-angle hole and the front or "go" portion *D* slips past the end of *A* if the distance *X* is correct. If it is too small the end *D* will not pass the end of *A*, and if too great, the larger, or "no go" part *E*, passes the end of *A*.

The action of the camshaft gages *N* and *O* is shown in Fig. 10. The body *A* goes into the guide hole until the flange *B* rests on the face. In the position shown the plunger *C* touches the camshaft at one side of the center, and the indicator *D* is set to zero at this point. The body *A* is then turned half way around until the plunger is in the position shown by the dotted lines at *E*, and a reading is again taken. If they agree, the hole is central with the cam shaft.

The crankcase casting passes through three inspection operations, where it is observed for general appearance, shrinking spots or shrinking cracks, faulty chipping or snagging, and for thoroughness of cleaning. It is examined to see if soldering, welding, or possibly peening can be used to cover small sand holes, and is tested for leakage with gasoline. It is also tested on a fixture which holds it in the same position as on the first machining operation, to see if all bosses are properly located, and if it has the proper amount of finish.

As it progresses through the machining operations, the case passes six inspection stations or stages, where it is tested for possible defects as follows: First station, 5 points, second station, 9 points, third station, 4 points, fourth station, 19 points, fifth station, 29 points, sixth station, A 28, and B 23 points, or a total of 117 inspections. The cylinder block has a total of 26 inspections and the crankshaft 52, before it goes to assembly, where it is balanced and inspected.

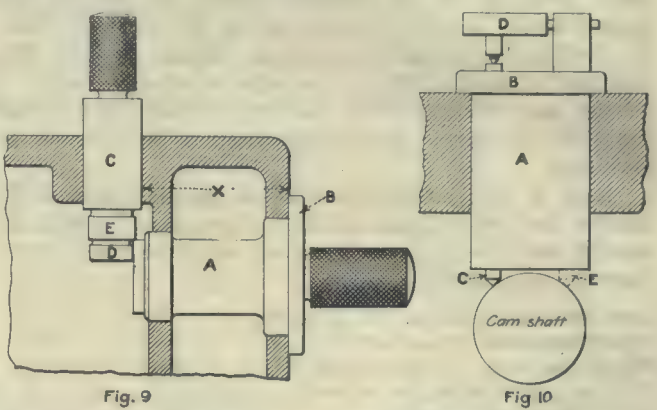


FIG. 9—MEASURING SHOULDER DISTANCE. FIG. 10—GAGE FOR VALVE-SLIDE GUIDE HOLES

It was found that the drive-shaft bearing in the transmission case did not always fit just as it should, and the quiet-room tests traced a little noise at this source. The fault was discovered to be due to a slight distortion of the metal between the studs and the bearing seat, due to screwing in the studs. This difficulty has been eliminated, as shown in Fig. 6, by reaming the bearing seat after the studs are in place.

In order to insure perfect alignment of gear-shaft holes, and also the correct center distances, the transmission case is hand reamed in the fixture, Fig. 8. It is located against an angle plate *A* in front and aligned by mandrels *B* and *C* in the drive-shaft bearing and gear-shaft holes. Then the auxiliary-shaft holes are reamed as shown. This view also shows at *D*, the gages used in inspecting the various holes.

For testing the concentricity of the transmission case, the fixture shown in Fig. 7 is used. The pilot *A* fits the lower bearing in the housing, and the plug *B*, which fits the upper bearing, also fits over the upper end of *A*, brings the two main bearings into line. Then the case is revolved on its bearings while the gages *C* and *D* test both the concentricity of the pilot or projection which fits into the crankcase, and the squareness of the flange face with the bearings. These tests insure correct alignment with the crankcase, which has been previously tested in about the same way.

After assembly the transmissions go into the quiet room, which has hollow tile walls and is completely isolated from shop noises. Here every transmission is given a number of severe tests for noise, and passed, or sent back for further refinement. The load on the transmission is not applied in the room, but the drive shaft extends through the wall so that no sound except that due to the transmission itself, can be heard in the quiet room.

Other features of Lincoln methods and refinements will appear later.

Hiring Men by Questionnaires

By John R. Godfrey

JOHNSON was all "het" up the other afternoon when I dropped in to see how his new motor was getting on. I'd hardly got my head inside the door before he said: "Glad to see you Godfrey, you're one of the best goats I know of, and I've got to let off steam or bust. No, nothing's wrong in the shop, thanks be, but I've just had a seance with a man who wanted to install a 'hiring and firing' system for us. I want you to see some of the forms and questionnaires he left me to look over.

"Look at this list of questions a man is supposed to answer before he gets a job in the shop!" And he handed me a list that took a whole sheet of legal paper. Among the questions were:

How much money have you in the bank?
What church do you attend?
What else do you do Sundays?
To what societies do you belong?
Have you any children?
Are your domestic relations harmonious?
Do you own your own house?
How much did you earn at the last place?
Do you own an automobile and what kind?
Do you use tobacco?
Do you drink?
Do you gamble?
Are you musical?
What is your hobby?

and so on till it looked like a laundry list in a hotel.

"Did you ever see so much damphoolishness in so little space in your life, Godfrey? How would you like to have to answer that list of questions in order to get a job in the shop which might not last over a week, if business slacked off?

"You ought to have been here when I told him a few things that made his hair curl. The poor fish seemed to think that because a man works with his hands, or works at all for that matter, he has to tell his life history before he can get a job. If a man shoved a list of questions like that under my nose, to answer before I could go to work, there'd be fireworks in about ten seconds. I'd have to need a job worse than I ever did to prevent me from telling him to g t h, with appropriate trimmings.

"Some people seem to forget that when a man works for you he has to give you more than you pay him, or else you couldn't run the shop. But this hire and fire expert acts as though the machinist was an applicant at a soup kitchen or an old man's home.

"Wouldn't it be a lot more appropriate if the machinist asked me how much money I had in the bank so he could know whether to take a chance on getting his money or not?

"Are your domestic relations always harmonious, Godfrey? Not more than mine are, I'll bet. Now don't get the notion that Mrs. J. and I waste any time scrapping —any more than you do. But we don't always agree by a long ways, and there are times in any family when harmony gets an awful kink in it for a little while. His alibi for such a question is that family relations affect a man's work. Of course they do. But if none of us who ever had family arguments got a job, there'd be several million permanently unemployed.

"This quizzing a man as to personal history always gets my goat, Godfrey. What I want is a fair day's work for what I pay, reliability within reason and as much loyalty as I deserve. A lot of us think it's all one sided, you know. But as long as the boss fires a man on a minute's notice he hasn't much of a kick coming when a man leaves for a better job or a better boss, on equally short notice.

"I know the theory that all these factors affect a man's work and it's largely true. But by the same token the outside doings of the boss also affect the man's job both as to its being agreeable and permanent. If the boss plays poker he has a husky nerve to ask an applicant for work if he gambles. And too frequently his hobby, whether it is golf or indoor sports, takes so much time and energy that the business suffers and the man's job goes to pot.

The Liar Who Made Good

"Questions like those have no place in any good shop, Godfrey. No red blooded man can answer them without cussing inside, even if he wears a cast iron smile while he does it. The man who proposes such questions has the idea that we are doing a man a favor to give him a job. In reality it is, or ought to be, a fifty-fifty proposition. We really need the man just as much as he needs us. Idle capital is a liability instead of an asset and does not produce any more than idle men.

"There's another side to this questionnaire business too, Godfrey. One large shop I know used them a while. They found that the best answers always came from the 'floaters' because they had filled in so many papers they knew just about what sort of answers the hire and fire man wanted. That same shop had one funny experience, too.

"They hired one man who turned in a fine answer sheet. He owned his own home, had money in the bank, went to church regularly and came so near being a he-angel that I'd have looked for wings sprouted under his coat. After he had been at work a while, they found out that he'd lied about every last thing on the list. When they asked why, he told 'em he'd had enough experience to know what kind of answers they wanted and he needed a job."

"Did they fire him?" I asked.

"No, by thunder, they didn't. They took a tumble to themselves and their system. This self acknowledged liar proved to be one of the best workmen in the shop, and so instead of firing him they fired the questionnaire. Some people do recover from the disease, you see, though it's rare."

Synthetic Foundry Iron

The feasibility of producing a good grade of foundry iron from steel scrap in the electric furnace has been demonstrated in experimental work performed by the Department of the Interior at the Northwest experiment station of the Bureau of Mines at Seattle, Wash. This development permits any manufacturing plant to use all its iron scrap on the spot in making castings equal to if not better than those from cupola iron. Improved methods of charging the 300-lb. experimental furnace used by the Bureau of Mines gave more rapid carburization, and carbon content as high as five per cent were reached. Several heats were made in a one-ton commercial electric furnace of the Heroult type, at Hoquiam, Wash., and in a one-ton indirect-arc, rocking furnace in a foundry at Detroit, Mich. In every case, these tests were successful in producing sound, strong gray iron from steel scrap and iron turnings.

Manufacturing a Precision Tool

BY ELLSWORTH SHELDON
New England Editor, *American Machinist*

Preparatory operations on frames—Frames and sleeve in one piece on all sizes below 9 inch—Threading the main and adjusting nuts by tapping—Rigid inspection methods

THE MICROMETER caliper as a means of making precise measurements has long since become an indispensable tool, not only to toolmakers and others whose work regularly involves the "splitting of tenths" but to the average manufacturer whose product does not in itself demand an extraordinary degree of accuracy, yet who finds it necessary to hold parts in progress to within very close limits in order to facilitate assembling and cut down production costs. Limit and snap gages are invaluable as accessories to the production of small parts but such gages can only inform the user that the work is too large or too small, they cannot tell how much, and there is a marked tendency toward the substitution of the micrometer for them because of its wider range of application.

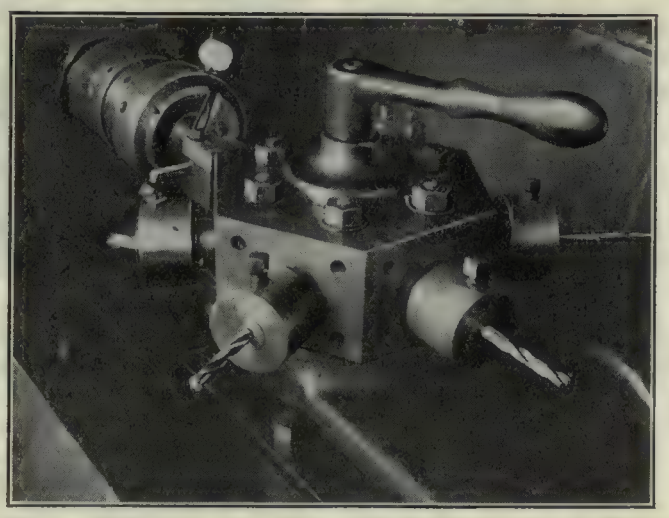


FIG. 1—DRILLING, REAMING AND TURNING THE SLEEVE

The steadily increasing demand for micrometers has necessitated the application to their manufacture of intensive production methods. Though there still remain many operations in which the skill of the workman counts for much in the accuracy of the final product, special machines and devices have been evolved for performing tedious and exacting repetitive operations, thus rendering the personal equation of less relative importance and insuring exact duplication of parts.

Among the earlier producers of micrometer calipers was the J. T. Slocomb Co. of Providence, which company's devices, adaptations and methods of manufacture are here shown and described. The special devices were all designed and made in the factory as the growth of the business warranted. The above named company was among the first to place on the market the enameled drop-forged frame familiar to all users of Slocomb micrometers, and though micrometers with other styles of frame, as well as the Davenport "direct-reading" micrometer, are manufactured by them, the methods applied to the principal parts are as here described.

In all Slocomb micrometers up to the 9-in. size, the frame and sleeve are in one piece. Preliminary operations in the way of sand-blasting, filing and straightening the forgings being attended to, the first machining operation is drilling, reaming and turning the sleeve in the Warner & Swasey turret lathe as shown in Fig. 1. A special chuck is made for the spindle nose of the machine to hold the frames, which are held in place and aligned with the tools by a single thumbscrew.

All six positions of the turret are used, the successive steps in the operation being centering, first and second drilling, reaming, and rough and finish turning. The two latter operations are performed by box tools fitted with a central stud, or arbor, to preserve the alignment. After the finish turning, the sleeves are ground to finish size, 0.005 in. being left by the turning tools for the grinding wheel. A standard grinding machine, shown in Fig. 2, is used, without special equipment other than the cut-out driving plate and extended center to be seen in this illustration. The work is held on centers.

Following the grinding operation the hole in the sleeve is hand reamed and the frame then goes to a drilling machine for drilling the small blind hole in the opposite end of the bow to receive the "tip," or anvil. Long drills, passing through the hole in the sleeve and supported close to the work by jig bushings, are used for this purpose. The end of the bow is then form milled to correspond to the large end of the tip, though the latter is not set at this stage.

The frames then go to a special device which rolls the twenty-five-thousandth graduations on the sleeve, corresponding to each complete turn of the measuring spindle. The device consists of a frame carrying two parallel (horizontal) jaws of hardened steel, one of which is smooth and, except for a screw adjustment for the purpose of regulating its distance from the opposed jaw, stationary. The opposed jaw is a die having cut in relief upon it the 30 short lines and the 11 longer lines of the graduation. The eleven numerals from 0 to 0, as shown in Fig. 3, are also cut on this die.

The lower jaw, which is the die, is fitted to slide endwise with relation to the upper one. The operator places a micrometer frame in position with the sleeve

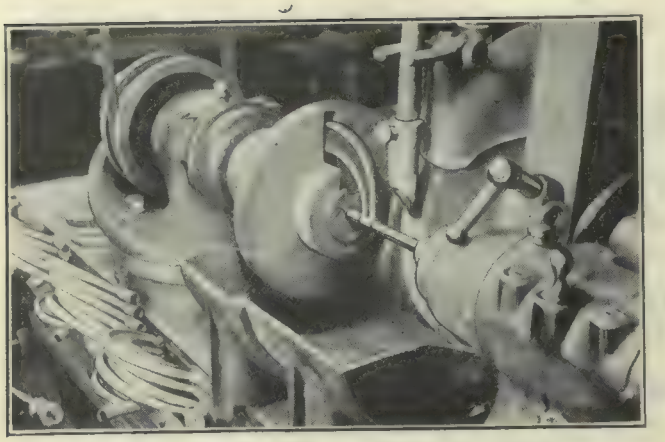


FIG. 2—GRINDING OUTSIDE OF SLEEVE

between the jaws, brings down the upper jaw by means of the screw adjustment to grip the sleeve, and moves the lower jaw to the left with a hand lever. This movement causes the sleeve to roll between the jaws and as it passes over the relief lines and numerals of the die the impression of the letter is left in the soft metal of the sleeve. An arbor is wrung into the hole in each sleeve before setting it in position in order to forestall possible distortion.

Up to this stage there is a through hole of uniform diameter in the sleeve. In the next operation a short bushing is pressed into the sleeve at the end next to the bow, reducing the diameter of the hole at this point

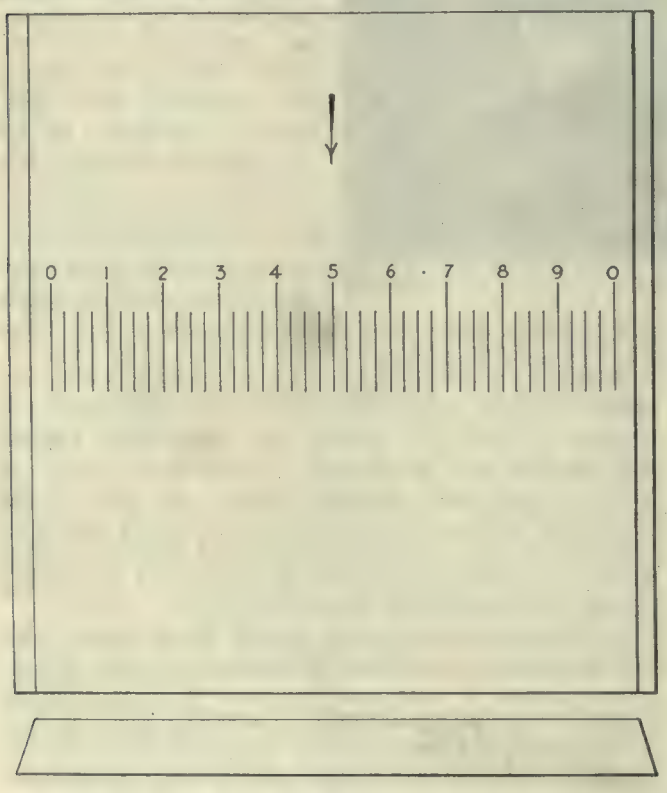


FIG. 3—DIE FOR GRADUATING THE SLEEVE

to the size of the measuring spindle. Both ends of the hole through the sleeve as well as the blind hole in the opposite end of the bow are now closed with metal plugs and the frames go to the enameling department.

Enameling is done by the dipping method, four coats being applied and baked successively. Though care is exercised to keep the enamel away from the already finished parts when dipping the frames, it is necessary to pass them through several minor hand operations in order to free the sleeves from enamel, to strip the enamel from the little pad upon which the size of the tool (when the size is larger than one inch) and the trademark is to be stamped, and to polish the sleeve. Fig. 4 shows the racks of work upon which the work is transported, just after the frames have come from the enameling department.

Tapping the sleeves for the main nut completes the work upon the frames up to the point of assembling. In the meantime the anvils, measuring spindles, main and compensating nuts and thimbles have been brought up to this stage, partly upon screw machines and

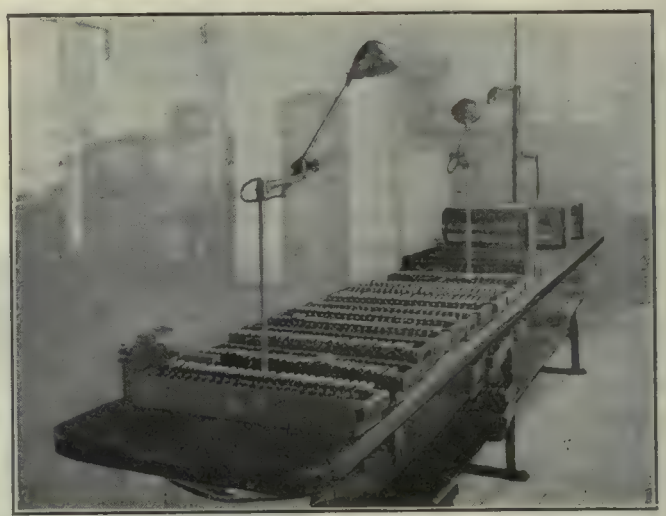


FIG. 4—THE WAY THE WORK IS TRANSPORTED

partly upon special machines and devices to be described.

The anvils and bushings are almost entirely the product of screw machines, the thimbles nearly so, and the main and compensating nuts are completed up to the point of threading except for the serrating of the mating surfaces of the latter, which is done upon a small automatic milling machine specially designed for the purpose.

The threads upon the measuring spindles are cut upon automatic machines having master-screws of large diameter and of the utmost possible degree of accuracy. Even with all the care exercised in the building of these machines, there will be variations from true pitch because of temperature changes, and each machine must, therefore, incorporate somewhere in its mechanism a compensating device by means of which all errors from this cause may be eliminated.

Every spindle is subjected to an exacting test before it is assembled into a micrometer. An error in pitch of one ten-thousandth inch in any part of the length is sufficient cause for rejection, yet so cleverly are the machines devised and so skilfully operated that the number of rejects is surprisingly small.

Though the thread of the measuring spindle is the vital feature of a micrometer caliper, the nut in which it turns is of almost equal importance, and the manufacture of these nuts involves some very careful and painstaking work. Each nut is in two parts—a main and a compensating nut—as shown in Fig. 5. Once the internal threads are cut upon these two parts, each pair becomes an individual unit and must not be separated at any succeeding stage of the assembly.

Any two of the pieces as they come from the preced-

ing operations may be placed together in the tapping jig shown on the end of the lathe in Fig. 6, in which they are clamped with their serrated faces held together by the pressure of the binding screw. While in this jig, and before tapping, a witness mark is scribed across the periphery of the two shoulders in contact so that in later operations the two parts may be placed together always in the same relation. The witness mark is invaluable to the user when he desires to make readjustment of the tool to compensate for wear.

Three taps are run through the combined nuts, making a continuous thread clear through both parts, and any disturbance of the relative position as indicated by the witness mark will break the continuity of the thread. Peg boards are provided to handle the work after the tapping is done, and the pairs of nuts are never removed from the pegs (except one pair at a time as subsequent operations require) until the nuts are finally assembled into their respective frames.

The internal thread is a sharp V, of 60 deg. included angle and 40 pitch. As these threads are necessarily an exact replica of the taps, the latter are the parts upon which extreme care must be expended in order to produce accurate results. Once the taps are made and found to be correct it would be impossible to produce other than correct threads in the nuts.

The next operation is that of cutting the threads upon the outside of the main nut. In Fig. 7 may be seen a peg board with the pairs of nuts as they come from the tapping operation. The operator removes one

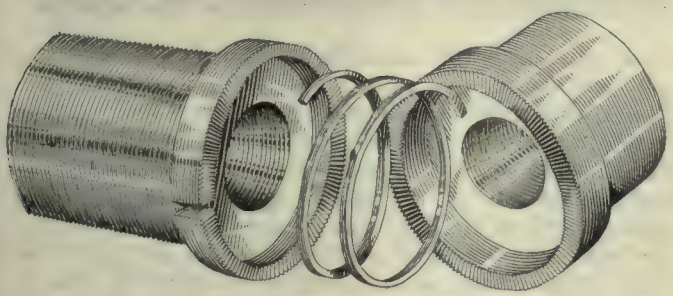


FIG. 5—THE DOUBLE ADJUSTING NUT

pair of nuts from its peg, lays the adjusting nut aside for the moment, runs the main nut on a threaded arbor and cuts the thread with a single point tool in the usual manner. The two parts are again placed together and restored to the peg from which the pair was taken.

The external thread, also a 60 deg. sharp V, is of 32 pitch. Though it is made with the same care as is given the other parts, it bears no relation to the internal thread so far as measuring is concerned and, except for the purpose of making an adjustment, it has no movement with relation to the frame after it is assembled into the micrometer. The machine used for cutting it is a standard engine lathe fitted with a special lever-operated single-point threading tool. As the tool reaches the clearance space at the end of its cut the split nut of the leadscrew is opened automatically, the threading tool withdrawn and the carriage of the lathe returned to a stop by means of a weighted cord passing over a sheave attached to the shears of the lathe.

The principle of the double nut in the Slocomb micrometer is as follows: The outward thrust of the measuring spindle (in the direction in which thrust would be caused by setting the measuring surfaces of the tool in contact with a piece of work to be measured)

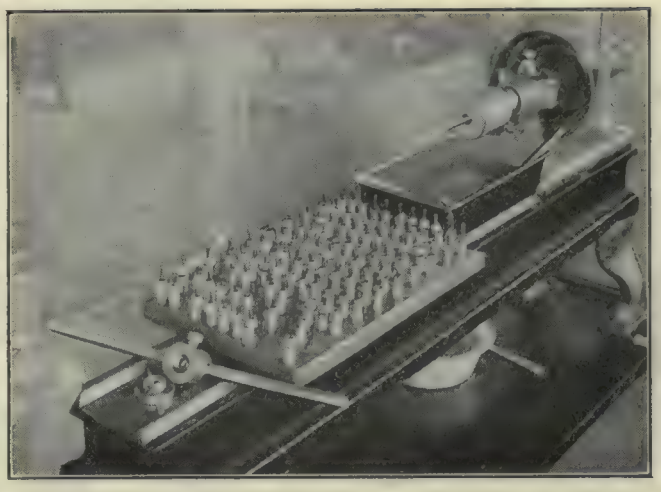


FIG. 6—TAPPING THE NUTS

is always borne by the main nut. When, in course of long usage, the thread becomes sufficiently loose to allow end-play of the spindle the inward thrust would be borne by the adjusting nut because the latter tends to move away from the main nut by reason of the energy of the coil spring between them.

When there has been sufficient wear to allow an endwise movement of the spindle the latter is withdrawn just far enough to clear the thread of the main nut and the adjusting nut is turned forward (toward the bow) over one of the serrations of the mating faces. This has the effect of bringing the inward bearing angles of the thread in the main nut and the outward bearing angles of the thread in the adjusting nut closer together and thus elminates the looseness. No tools are needed to make this adjustment.

To compensate for wear of the measuring surfaces or for any redressing of them necessitated by wear or accident, the measuring spindle is run back only for a distance that will expose the shoulder of the main nut



FIG. 7—THREADING OUTSIDE OF MAIN NUT

and the latter turned forward by means of a small spanner that is furnished with each micrometer. One complete turn of the main nut will cause it to advance in the frame a distance of 0.03125 in., but at the same time it has *unscrewed* from the measuring spindle one turn of the 40 pitch thread, or 0.025 in., resulting in an actual advance of the spindle of but 0.00625 in.; equal to the difference in pitch between the two threads. This

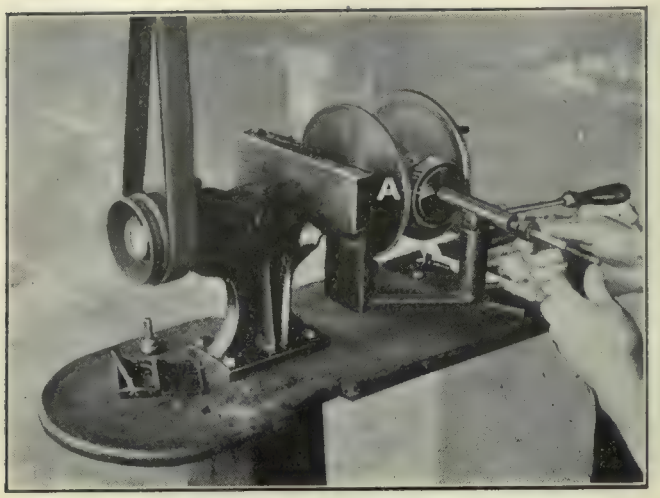


FIG. 8—DEVICE FOR RUNNING IN THE SCREWS

differential movement renders minute adjustments easy of accomplishment.

The first operation of assembling is the fitting of the nuts to the frame after which the small bushing previously mentioned as being forced into the hole in the sleeve is hand reamed by means of a reamer that passes through and has a bearing upon the threads of the nut,

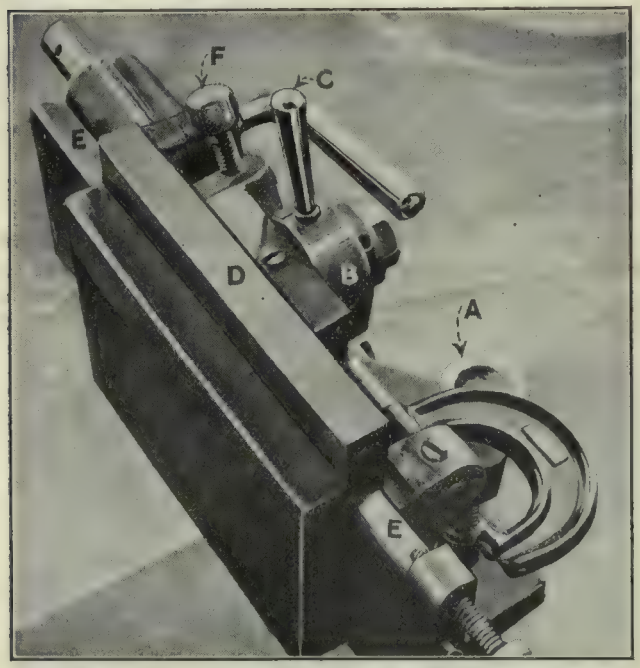


FIG. 9—LAYING ON THE MAJOR LINE

thereby insuring alignment of these two parts. Each frame is then fitted with a measuring spindle, which thereafter remains with it through all subsequent operations.

Fitting the measuring spindle to the nuts is a hand operation in which the operator, while retaining complete control of the work, derives no little assistance from the device shown in Fig. 8. The operation consists mainly of running the spindle rapidly back and forth through the nuts until it acquires a smooth free action but is without shake. Though this operation is referred to as lapping, the only material used upon the threads is vaseline.

Holding a micrometer in his hand the operator grips one end of the measuring spindle in the chuck of the machine and causes it to run first in one direction and then the other by pressing the small rubber-tired wheel *A* alternately against the revolving disks on either side. The action is no different than would be accomplished by turning the spindle by hand, but is much faster and less fatiguing to the operator.

It will be remembered that the die shown in Fig. 3 carried no long line at right angles to the graduations, and the micrometer user may have wondered at the omission. It is because this long line, approximately parallel to the axis of the sleeve, must be absolutely parallel to the line of traverse of the measuring spindle

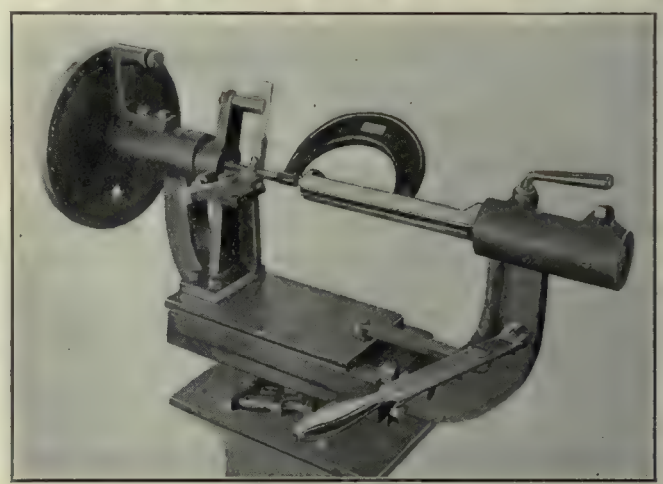


FIG. 10—MARKING THE DIVISIONS ON THE SLEEVE

(not necessarily the axis of the sleeve), else the tool will not measure correctly.

This line, called in the shop the "major line," is laid on by the device shown in Fig. 9, in which the micrometer is held by the spindle, that has now become an inseparable part of it, instead of by the frame. The stationary part of the device is provided with means of centering and holding the micrometer by the spindle at both ends. When so held, the micrometer is free to turn about the now stationary spindle and the weight of the bow is supported by the adjustable pad *A*, which may be elevated or depressed by rotating the knurled head. The marking tool is a steel cutting point set into the lower side of the eccentrically mounted holder *B*, which may be likened to the clapper box of a shaper in that the tool may be lifted from the work by press-

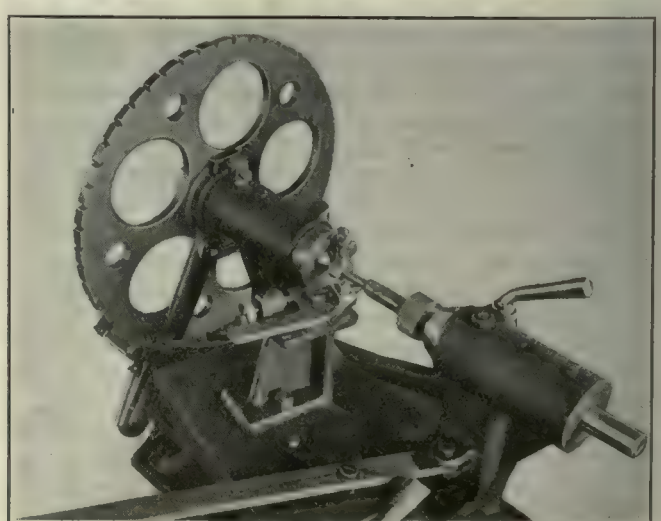


FIG. 11—PUTTING THE SHORT MARKS ON THE THIMBLE

ing back the small handle *C*. The tool holder is thus a part of the slide *D*, which in turn is accurately fitted to slide on the stationary bar *E*.

With a micrometer in the machine the operator adjusts the height of the cutting tool to the work by turning the knurled screw *F* and raises or lowers the bow by turning the elevating pad *A* until the tool just cuts the ends of the short lines already on the sleeve; using a magnifying glass for both of these adjustments. When the micrometer is located to his satisfaction he has but to remove his thumb from the handle *C* and draw the slide forward until it contacts with a stop screw; which completes the job.

Two machines are shown in Figs. 10 and 11 for laying graduation lines on sleeve and thimble respectively. On micrometers designed to show a vernier reading to 1/10,000 in. there are several lines on the sleeve parallel to the major line which must be spaced to an extraordinary degree of accuracy. The first of these machines is for this purpose. Here, as in laying on the major line, the micrometer is held by opposite ends of the measuring spindle.



FIG. 12—THE FINAL INSPECTION

The second machine marks the 25 evenly spaced short lines on the beveled end of the thimble. The machines are identical in principle but differ somewhat in detail according to the nature of their work. Both are entirely hand operated and occupy a floor space that is free from moving machinery and consequent vibration.

Something besides cleverly devised machinery and constant process inspection is necessary to the production of quantities of tools that are to meet requirements so exacting as those imposed upon micrometer calipers. During the process of manufacture each tool is adjusted with exactness, tested to insure smooth and free operation and made ready for the finished stock room, but it is not, even then, allowed to go into stock. The sole duty of the man shown in Fig. 12 is to find fault with the product and every micrometer must pass through his hands and receive his approval.

Each micrometer is tested by him for accuracy of reading at not less than four positions of its spindle, and the number of tests may be increased to ten, twenty, or even more positions if the first tests indicate a possible error. Johannsen gage blocks constitute the final authority, and the working gages are ground disks of steel, frequently checked against the "Jo-blocks" to forestall any possible error due to wear of the gages.

The Arc Welding of Alloy Steels

By C. J. Holslag

Chief Engineer, Electric Arc Cutting and Welding Co.

ONCE the theory of arc welding is understood, it would seem perfectly feasible to arrange for the deposit of any kind of alloy by simply introducing this alloy into the weld through the fusion of an electrode composed of the desired substance. This process, however, is not as easy as would at first appear, due to several causes. As a matter of fact, it has already been definitely stated that the absolute temperature of the arc is entirely too high for the simple melting of any metal. In actual welding practice, this temperature is reduced by various means—principally by holding as short an arc as possible, and by providing a surrounding mass large enough to absorb the surplus heat. This gives us the clue to the proper manipulation of the welding temperature, and makes clear the necessity for precaution in keeping the deposit unburned.

All commercial metals, especially iron and steel, contain a certain percentage of impurities, some of them desirable in the welding operation, and others a hindrance. It seems as if fate were intent upon allowing the desirable foreign substances to vaporize and escape at the high temperature of the arc, while the less desirable impurities remain behind. For instance, certain portions of the carbon, manganese, vanadium and other elements used in alloy steels will invariably escape when an attempt is made to deposit them in a weld. There is but one known method of depositing them intact, which is really a combination of two expedients. One of these is to incorporate in the weld certain compounds which produce inert gases, and so tend to minimize the oxidizing action under which the desirable impurities are burned out. The other is to provide the electrode with a heavy coating of some refractory substance, such as silicon, or silicon slag, which forms a physical coating about the bead and prevents oxidation.

Passing Alloys Through the Arc

In spite of these difficulties, the electric welding process has been developed to a point where it is perfectly possible to pass manganese, high carbon, nickel, chrome, or vanadium through the arc in any combination. It will at once be seen that there are excellent possibilities thus afforded, because most of these alloys give properties to the metal that are extremely desirable, especially where the original heat-treatment can be duplicated.

As far as arc welding is concerned, the alloy nickel has been developed to the most useful extent. The use of this alloy in relatively small quantities, together with medium carbon, will produce a marked increase in tensile strength and other advantageous physical properties. Welds made with nickel alloys appear to have a tendency to cause the appearance of what seem to be small incipient cracks on the surface. These cracks, however, do not extend in use, and appear to be more in the nature of scale cracks. They may be made to disappear entirely by using a combination of nickel, chromium and carbon in the electrode.

From the Journal of the American Welding Society, and to appear in a handbook published by the McGraw-Hill Book Co.

All usable alloys of steel contain carbon. Small amounts of manganese invariably accompany this carbon, and in this quantity, it is far from being undesirable for welding. Sulphur and phosphorus, however, are eminently undesirable in any amount, and unfortunately, there has as yet been developed no material aid in ridding the weld of their presence entirely. Silicon in or about the weld tends to float the sulphur and phosphorus to the surface, and so is helpful. It is best, however, to do away with these two impurities as far as possible in the electrode itself; then to provide means for holding the other and more desirable compound in the weld.

As already stated, certain alloys have been developed which are successful in being deposited thus intact, and one of the most remarkable as well as useful, is found in the combination of relatively high carbon, which will deposit a tool steel cutting edge on any mild steel base. The time seems not far distant when this process will become sufficiently well known to eliminate the tool steel industry as such.

This process is sufficiently interesting to be described in detail. In ordinary welding, the metal is melted into a viscous mass, which usually has sufficient coherence to remain where it is deposited. In tool steel welding, however, the metal must be kept perfectly fluid and molten, and is prevented from oxidizing or spreading by being deposited in a trough built up around the welding area of some plastic and refractory material. This trough may be made by molding carbon or carbon paste, graphite, asbestos, silicates or similar substances not affected by the arc, and is necessary because the metal must be prevented from running out of place while the required puddling action necessary to combine all the compounds in the world is performed. The metal is kept molten under the further protection of the slag covering of the electrode, which forms an envelope enclosing the metal while it crosses the arc from the electrode tip to the puddle.

This process is the only one in which the puddling operation should be thus performed. Other metals must be deposited relatively as cold as possible in order to insure a minimum of opportunity for the molten metal to absorb oxygen and nitrogen and so to burn out the desirable impurities.

Welding in Automotive Work

The welding of springs, bumpers, axles, and other parts of alloy metal in automotive work is, in most cases, entirely feasible and useful. The breaking of leaf springs is usually met with in this connection, and their repair is usually entirely practical by the electric arc process. A spring is welded to the best advantage if it breaks near the eye, through the center bolt-hole, or if the break occurs in any one of the smaller leaves. If the break should be found to be isolated in one of the large leaves, the efficacy of the weld will not be as good as in the other cases. Fortunately, however, as springs are now built, breaks usually occur at the points first mentioned.

It is perfectly feasible to weld a spring with every leaf broken in the center if the leaves are separated and welded one at a time, and the entire spring reassembled, after which if a pad or band is welded all around the entire spring, filling up the hole originally occupied by the bolt, the spring will be safe. The bolt head on the upper side of the spring may be duplicated by a welded button, and the rubber bumper bracket may also be tacked in place. All this work must not be done so rapidly or so continuously that the temper will be taken out of the spring. It is good practice to guard against this by dipping the spring in water at intervals, or by adding water to the welding surface.

If the break occurs near the eye it will be necessary only to deposit a sufficiently heavy pad to prevent any bending. When one of the smaller leaves is to be welded, before operations commence, the spring should be so clamped that each leaf bears its share of the load. In other words, each leaf must have its accustomed flexure or curvature while the weld is being made. While this condition usually demands skilled attention, it is not difficult to copy the original design when there are but one or two leaves broken.

Bumper breaks usually occur only in two places; where the bumper is bolted to the frame or bracket, or where the bend occurs. In welding a break at or near the bolt hole, it is always good practice to provide additional strength by adding a generous pad where the break occurred. For it is logical to suppose, that, if the section at this point was originally inadequate in strength, merely reduplicating it will not suffice, and therefore it is best to provide extra strength at this point. If the break occurs again, even after the extra padding has been added, it may be found expedient to grind or saw off the end so that the weld does not come at the hole. When the bumper breaks at a bend, it will generally be found that the defect was due to a flaw created in the bending process, and a weld made with ordinary care will be sufficient to correct the trouble permanently. When alloy axles break, there is no reason why their cross-sections cannot be increased by a pad sufficiently heavy to obviate the recurrence of the break.

Nickel in Welding Rod Advantageous

In all alloy welding done in automotive practice, the presence of nickel in the welding rod is a very material aid in preventing the vaporization and escape of the desirable compounds of the alloy. An ordinary welding rod should not be used because it will allow these compounds to escape through the molten metal, and the beads formed will present a mushroom or gingerbread-like appearance. This is caused by the escaping gaseous oxides, which force their way through the molten weld. Practically every alloy has a much lower melting point than steel, due mainly to the presence of carbon in these alloys in excess of that present in ordinary steel. This means that, in any case, the operator must exercise greater caution to prevent the burning-out of the metal.

In fine, as far as the development of alloy steel welding has thus far progressed, the best practice is found in duplicating the parent metal as far as possible in the electrode. In the great majority of cases, however, it has been found that various combinations of nickel in the welding rod will not only prevent the escape of alloy oxides, but that a nickel or a nickel-chrome electrode will sufficiently duplicate the physical properties of most alloys to produce entirely satisfactory results

A nickel-chrome welding rod deposited on a mild or carbon steel base will produce a weld possessing a tough, self-hardening surface that will prove ideal in resisting friction and wear. Where it is possible to effect no treatment but that of air-hardening, this deposit is often better than the original alloy for every purpose.

Selection of Milling Cutters for Helical Involute Teeth

BY ERNEST WILDHABER

A new formula for tooth number of formed milling cutter to cut helical involute teeth—Based on mathematical principles and easy to use — Different results from old formula

THE selection of formed milling cutters for helical involute teeth presents a problem which has not been satisfactorily solved hitherto. When the number of the cutter is determined in the usual way, the teeth of the helical gears produced tend to be undercut, the profiles actually produced receding from the correct profiles on the addenda and the lower tooth flanks. Such gears give short tooth contact.

The present inferiority of milled helical gears is due to improper selection of cutters, but it is possible to select a cutter so that correct helical teeth will be produced. A method for determining the number of the cutter is outlined in the following discussion and the application of the formula will be found very simple and practical.

The derivation of the expression is, however, neither easy nor simple, but the outline of the deduction will be given. All the steps are based on accurate mathematical proof, which is considerably involved and will not be given in detail.

An inclined milling cutter *M* is shown in Fig. 1 in cutting contact with a helical involute pinion, and Fig. 2 shows a view of the same cutter and pinion, looking in the direction of the cutter axis.

Finished Profile Depends on Cutter Position

A milling cutter cuts along its profile as long as it cuts straight teeth. In other words, if the cutter illustrated in Fig. 2 were to cut straight teeth, the finishing cut would be made along its profile, or meridian, which is projected into line *CO*. Provided the cutter had radial flutes, the cutting profile would be identical with the cutting edges of the teeth.

The cutter shown in Fig. 2, however, has rake flutes and in this case the profile of the cutter body differs somewhat from the profile of the cutting edge. In the following discussion the cutting profile will be understood to be the radial profile of the surface of revolution in which the cutting edges are situated.

When cutting helical teeth the milling cutter does not apply its finishing cut along its profile, on account of the warped nature of helical surfaces, and a normal section through the helical teeth does not fit the profile of the cutter body. On the contrary the fit, between the cutter and the tooth it produces, is along certain oblique lines *F* and *F'*, Fig. 2, where *F* represents the line of contact on the near side of the cutter and *F'* on the further side.

The lines *F* and *F'* are symmetrical lines which must, of course, be situated on the cutter body, and their location on that surface depends on the cutter diameter, the profile of the cutter, and the angular setting of the cutter with respect to the blank. We will call *F* and *F'* finishing lines since the cutter applies the finishing cut along these lines.

Points *P* and *P'*, which are the points in which the finishing lines *F* and *F'*, respectively, intersect the profile or meridian, can be readily determined by drawing perpendiculars to the cutter body through the pitch point *O*. Fig. 1 shows the cutter profile in a section

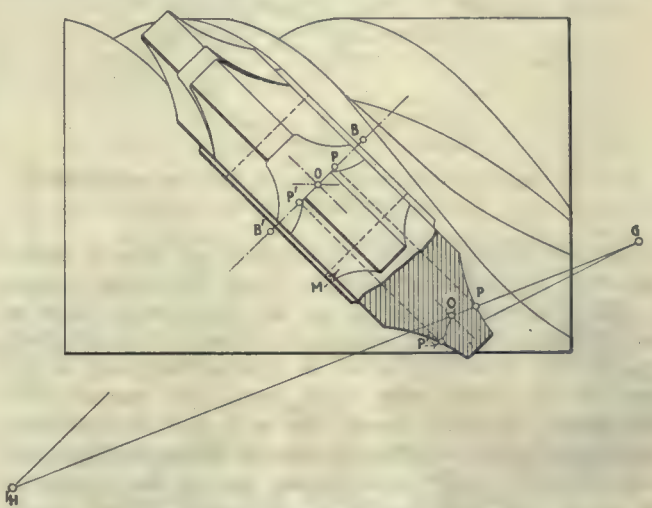


FIG. 1—PLAN VIEW OF INVOLUTE MILLING CUTTER CUTTING HELICAL TEETH

through the axis and parallel to the drawing plane, and the perpendiculars *OP* and *OP'* are indicated. *P* and *P'* are the points where the perpendiculars intersect the cutter body, and point *O* may be considered as the contact point between the pitch cylinder of the gear and the pitch cylinder of the cutter. *O* is situated at a radius *R* from the gear axis, and at this radius the helix angle equals the angle of inclination of the cutter.

As already mentioned, *P* is one point of contact between cutter body and tooth surface, and the two surfaces must, therefore, have a common tangential plane passing through *P*. We will further consider the surface areas of cutter body and tooth about the point *P* in an endeavor to determine the relations of these areas to each other.

A topographical map of the cutter surface around *P* is shown in Fig. 3. This map is based on the common tangential plane in the same way that a topographical

map of a section of the earth's surface is based upon the sea level, or other datum plane. Lines 1, 2, 3, 1′, 2′ and 3′ are lines of equal altitude or elevation from the tangent plane. Points on the cutter surface which are projected into line 1 are all the same small distance, dZ,

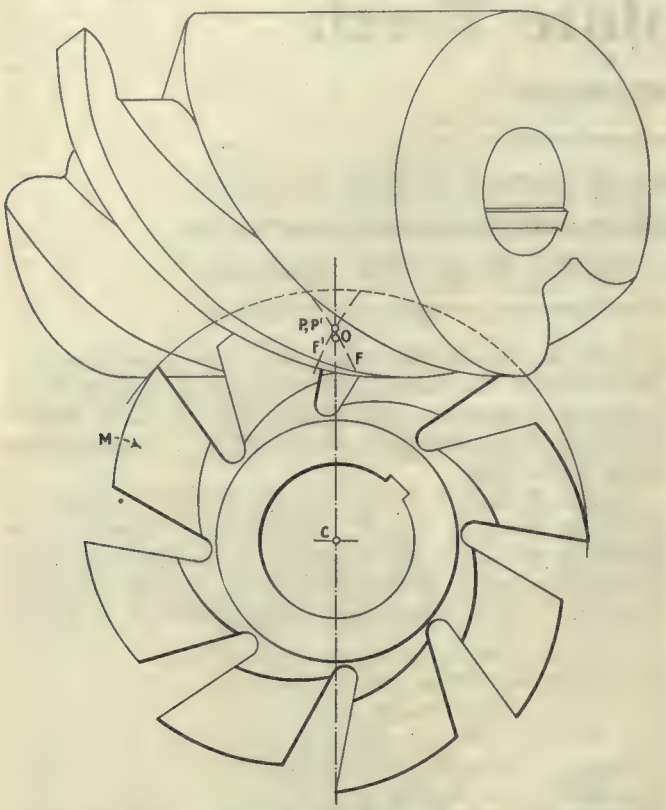


FIG. 2—VIEW OF CUTTER AND BLANK IN DIRECTION OF CUTTER AXIS

from the tangent plane, and points on lines 2 and 3 are $2dZ$, and $3dZ$, respectively, from the tangent plane.

The diagram in Fig. 3 can be considered either as an infinitely enlarged topographical map of an infinitely small area around P, or as an approximate map of the part of the cutter body which comes into contact with the blank. In other words, this map and the following figures consider only the curvatures of the surfaces and are mathematically accurate as far as the curvature is concerned. This method of procedure insures simple results which will, nevertheless be very closely approximate.

Curves 1, 2, 3, 1′, 2′ and 3′ of Fig. 3 are hyperbolas. This fact is determined from the curvature radius GP of the cutter profile, Fig. 1, together with the radius of curvature of the cutter surface in a section taken through PH perpendicular to the cutter profile. The profile of this lateral section of the cutter body is convex and its center of curvature is at H. An arc of a circle with the radius HP will most closely approximate the actual intersection curve.

In Fig. 4 a similar map of the helical involute tooth surface about the point P is shown. This surface touches the tangent plane along a straight line passing through P, which is tangent to the base cylinder. Other lines drawn through points on the tooth surface at equal distances from the tangent plane are also straight and parallel to the line through P.

The lines I and I' actually converge but since we are considering an infinitely large map of an infinitely small area around P, their intersection point has shifted away into infinity so that the lines become parallel. The curvature of the helical involute tooth surface through P is therefore equal to the curvature of a cylindrical surface, and the radius of this surface is PB, shown projected in Fig. 1. Point B is the contact point of the normal line through P with the base cylinder of the involutes.

Line PA, Fig. 4, is inclined at an angle w with the line PX of Fig. 3. If α be the pressure angle of the cutter, which is also the normal pressure angle of the gear, and h is the helix angle through O and, therefore, the helix angle in the pitch circle and the setting angle of the cutter, angle w may be determined by the expression:

$$\tan w = \sin \alpha \times \tan h$$

The two maps are superposed upon each other in Fig. 5 so that the points P and the lines PX coincide. We are determining the proper cutter body for the given tooth and it is evident that the proper cutter must fit the given cylindrical surface in Fig. 4. Corresponding lines 1 and I, 2 and II, at equal distances from the tangent plane must therefore touch each other. It is evident from Fig. 5 that the cutter body does not contact with the tooth along the cutting profile PY, but along an oblique line F drawn through P and the contact points.

Curvature Radii of Cutter Surface

The area around P on the other side of the cutter shows exactly symmetrical conditions, and the results having been determined for one side of the cutter, can be applied to the other side as well. Fig. 5 furnishes the following relation between the various radii of curvature, based upon the knowledge that the two surfaces contact with each other along a line F:

$$R_o = R' \cos^2 w - R'' \sin^2 w \qquad (1)$$

in which

R' = curvature radius of the cutter profile (GP)

R'' = curvature radius of the transverse section of the cutter body (HP)

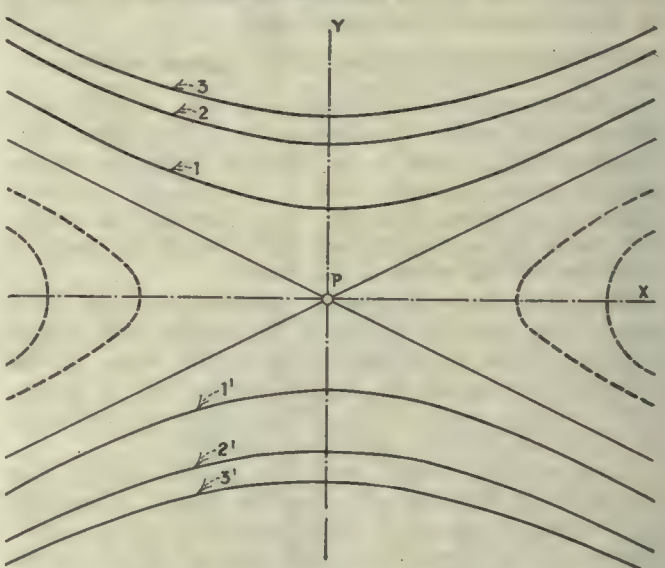


FIG. 3—TOPOGRAPHICAL MAP OF SMALL PORTION OF CUTTER SURFACE ABOUT P

R_o = principal radius of curvature through P of the helical involute teeth, and also the radius of the substituted cylindrical surface in Fig. 4.

From this equation an expression for the sought tooth number N_c, to which the formed milling cutter should correspond, can be found as follows:

$$N_c = \frac{N}{\cos^3 h} + P \times D_c \times \tan^2 h \qquad (2)$$

N = number of teeth in the helical gear
P = diametral pitch of the cutter
D_c = pitch diameter of the cutter, the other symbols being the same as previously noted.

This is the formula to be used in the selection of a proper cutter, and it is interesting to note that it contains the expression $\frac{N}{\cos^3 h}$ which has hitherto been used to determine the cutter number. The use of this expression has been based on the idea that the cutting profile matches the tooth surface in a section at right angles to the teeth, but we have seen that the cutter body and the tooth surface cannot fit each other in a normal section. They contact along finishing lines F and F' and this fact causes the presence of the second member of the expression in equation 2.

The amount of this second member, $P \times D_c \times \tan^2 h$, depends upon D_c and the larger D_c, the larger N_c will become, the cutting profile getting flatter. When the

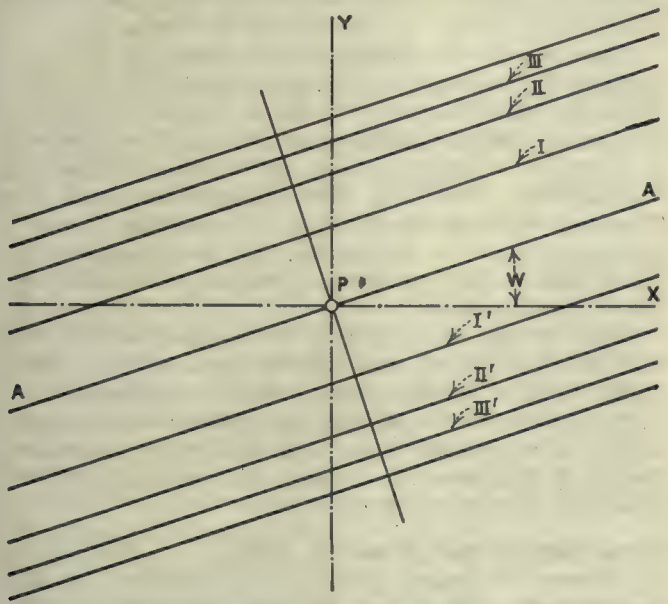


FIG. 4—TOPOGRAPHICAL MAP OF SMALL PORTION OF HELICAL TOOTH SURFACE ABOUT P

cutter diameter is very large compared with the pitch of the teeth, the profile of the required cutter is very nearly a straight line.

The application of the formula is exceedingly simple as is shown by the following examples:

Example 1—$N = 6$, $P = 6$, $h = 45$ deg., and $D_c = 3$ in.

$$N_c = \frac{6}{0.353} + 6 \times 3 \times 1 = 17 + 18 = 35.$$

This result shows that a cutter corresponding to 35 teeth must be used. In other words, a No. 3 cutter will produce the desired tooth profile.

Example 2—$N = 4$, $P = 6$, $h = 60$ deg., and $D_c = 3$ in. The teeth in this gear will be inclined at an angle of 60 deg. with respect to straight teeth, giving the pinion the appearance of a worm. Such a pinion might be used to run with a mating gear, the axis of the gear being at right angles to the axis of the pinion.

$$N_c = 4/0.125 + 6 \times 3 \times 3 = 32 + 54 = 86.$$

These two examples show that the new formula may produce results quite different than those of the formula which has hitherto been in use. In the first example N_c would be 17 according to the old formula instead of 35, and 32 instead of 86 in the second example. The

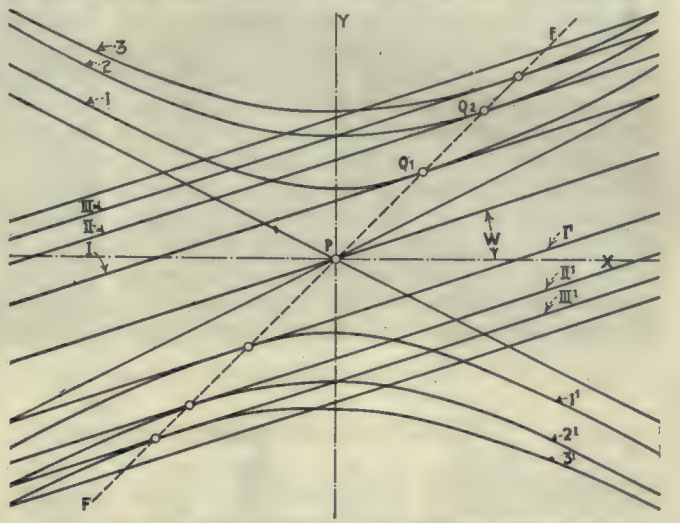


FIG. 5—MAPS OF CUTTER AND TOOTH SURFACES SUPERPOSED

difference is smaller with smaller values of h, but the formula is well worth consideration, since it is based upon strict mathematical principles. It will give better results, and it is simple as could be desired.

From formula (1) an equation which is useful in thread milling is also found.

$$R' = \frac{R \sin \alpha}{\cos^2 h} + R_c \sin \alpha \tan^2 h \qquad (3)$$

in which

R' = distance GO of the cutter, Fig. 1, and equals the radius of curvature of the cutter plus the distance PO
R = pitch radius of the gear
R_c = pitch radius of the cutter.

Reference to this formula will be made in a later article.

Embrittlement of Malleable Cast Iron Resulting from Heat Treatment

Recent investigations have shown that commercial malleable iron is often embrittled by quenching from certain temperatures in the "blue-heat" range, an abstract of Technologic Papers of the Bureau of Standards, No. 245, by Leslie H. Marshall on this subject states. The low shock resistance of such material after hot-dip galvanizing has brought this fact to the front. The present study of the problem showed that the magnitude of the Izod impact test was used as a convenient means for measuring the effect. The embrittlement was limited to a fairly definite range of quenching temperatures. Aging after treatment did not affect the results. The rate of cooling from the blue-heat range was important. If the malleable iron were slowly cooled instead of quenched from these temperatures, the impact resistance was much higher. It was also found that the upper limit of the embrittlement zone lay a few hundred degrees Fahrenheit below the critical point. Quenching from temperatures in this intervening zone increased the impact-resistance of the iron and made it immune to the blue-heat deterioration.

Piston Pins and End Plugs

By Fred H. Colvin
Editor, *American Machinist*

THE making of piston pins and the plugs that fit over the ends, for the engines of the Wright Aeronautical Co., Paterson, N. J., involves several details which are of interest. The pins are made from bar stock in National Acme automatics, the first operations being to turn the outside to 1.403 in., to drill a ¾-in. hole 5 in. deep, and cut off to 4⅞ in. in length. The drilling is done in three steps, the first being 1¾ in. and the second 3½ in., the third drill completing the hole. The outside tolerance is ±0.002 inch.

The pins are next carburized, after which they are chucked in soft jaws bored to suit, the ends faced and the holes enlarged to ⅞ in. to remove the case from

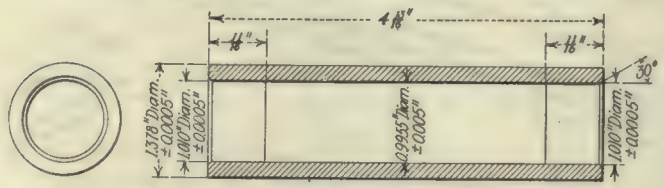


Fig. 1

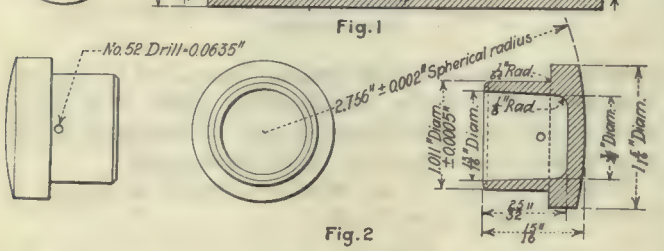


Fig. 2

FIG. 1—DETAILS OF PISTON PIN. FIG. 2—DETAILS OF PISTON-PIN PLUG

the inside. The ends of the holes are reamed to 1.01 in., with a tolerance of ± 0.0005 in., the ends chamfered and the pins hardened. Sandblasting follows, only the chamfered ends which act as centers being excepted.

Then a spot for making a scleroscope test is ground the whole length of the pin on a disk wheel. The test must read between 70 and 90. The hole is next polished to remove the scale, after which the outside is rough ground to 1.384 ±0.001 in. The ends are ground, 4 pins at once, to a length of 4⅛ in., grinding equal amounts from each end and getting the ends square with the outside diameter. Each end is then ground as shown in Fig. 1 after which the outside is ground to finish size, buffed to remove the sharp edges, inspected and wrapped in a waxed paper sheet, measuring 6x6 in. The pins are then ready for stock.

The requirements are that the inside be left soft and must be smooth so as not to afford a starting place for small cracks. The inside and outside diameters must be concentric within 0.010 in. and the ends square with outside within 0.003 in. The heat treating must give maximum refinement of the core with proper refinement and hardness of the case. The case is from 0.030 to 0.060 in. thick.

The piston-pin plug fits into the end of the piston pin and into a counterbore in the piston itself. Its object is to prevent the piston pin from ever making contact with the cylinder wall, for the piston pin is of the floating type. The plugs are of bronze and are made from cast rods that are first centered at each end and then turned to 1⅜ in. diameter in an engine lathe, using two tools.

The bars then go to a Warner & Swasey turret lathe, the hole is drilled, the outside cut down with a box tool, and the spherical head rough formed, allowing 0.005 in. on the back of the head for grinding. The dimensions are shown in detail in Fig. 2. Two small holes, No. 52 or 0.0635 in., are drilled in the sides. The spherical surface is then finished, the smaller diameter and the back of the head ground to size.

Book Reviews

Transactions, Vol. II., 1921-22, of the Newcomen Society. 164 pages, 7½x10 in. With 22 plates and other illustrations. Printed for the Society by The Courier Press, Leamington Spa, London. Price 20 shillings.

On the cover of the second volume of transactions of the Newcomen Society appears its new emblem which represents a heraldic griffin, symbolic of vigilance, looking backward but moving forward. The Latin motto may be freely translated, "Mindful of what has been done, we strive at the same time after the things yet to be done." It might be said for the benefit of those who are not familiar with the purposes of the Newcomen Society that it was organized for the study of the history of engineering and technology.

The present volume contains the papers on engineering history read before the Society since October, 1921. The more important of these are as follows: The Early History of Mechanical Handling Devices, The Liverpool & Manchester Railway, Greek and Roman Engineering Instruments, Mechanics and Engineering from the Time of Aristotle to That of Archimedes, Timothy Hackworth and the Locomotive and The Centenary of Naval Engineering (A review of the early history of the English steam navy).

There is also an analytical bibliography of the history of engineering and applied science from 1900-1920, a list of the members and the usual reports.

The Newcomen Society aspires to be an international body and to this end hopes to number more Americans among its members. At present there are only ten out of a total enrollment of 125.

Departmental and Standard Costs. By William S. Kemp, 85 pages, 7¾x10½ in. Published by the National Association of Cost Accountants, 130 West 42nd Street, New York City. Price to members $2, non-members $4.

A very concise description of the way in which departmental and standard costs can be handled in almost any factory. The system described is designed with the specific intention of not only functioning properly but of fitting into a business without friction or duplication. The method outlined takes into consideration buildings, various productive departments, heat, power, compensation and all the other factors which go to make up expenses of a manufacturing business. Examples of different forms are given, including pages from books actually used by real concerns. It shows many factors such as pro-rating heating costs to different departments, rental values of machines, etc. With the increasing interest in modern accounting methods such a book should be of value in almost any manufacturing plant.

One drawback to many proposed systems is the complicated forms and the keeping of records which are never used. This seems to be avoided in the methods suggested.



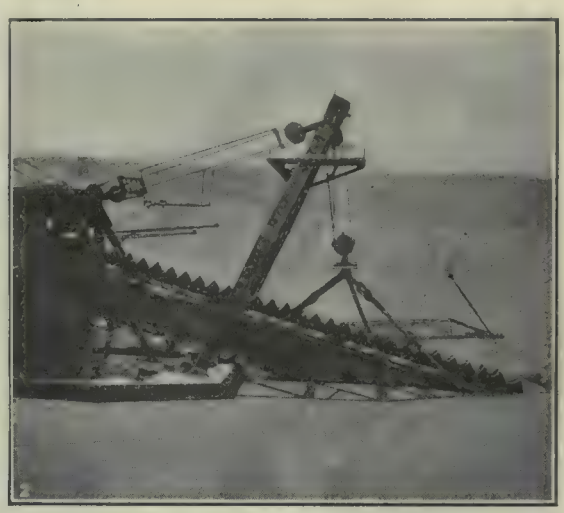


FIG. 1—GOLD DREDGE AT WORK. FIG. 2—THE DIGGING END OF THE DREDGE

Gold Dredges and Some of Their Repairs

SPECIAL CORRESPONDENCE

A few details of a type of machine little known east of the Pacific Coast—Repairing manganese steel buckets and replacing them in the chain

GOLD dredges are peculiar animals. Beginning with a huge hull on the lines of a scow or flat bottom float, built of heavy steel plate, they carry a large power plant which drives the chain of dredging buckets, the revolving screens which sort the material, the gold reclaiming mechanism, and finally the long conveying belts which carry the rock and surplus material out the back to spill it into the water behind. In this way, the dredge makes and moves its own pond as it travels, as can be seen in Fig. 1.

One of the dredges at Hammonton, Calif., having buckets of 18½-cu.ft. capacity, is shown in Figs. 1 and 2. During the month of May, 1923, one of these dredges handled over 17,000 cu.yd. per day, which is believed to be a record. The dredges are capable of digging from 82 to 85 ft. below water level, and piling up a bank 20 ft. above water level at the sides and rear.

The chain of dredge buckets in front is moved slowly from side to side by swinging the dredge itself. In this way, the buckets feed their way forward into the solid earth, and as all of their digging, except the gold which remains in the extracting mechanism, goes out at the back end, the water way remains practically the same size at all times. And the end of the dredging operation leaves the dredge stranded, perhaps miles from where it started.

The interesting part of the operation is, that while it does not make two grains of gold where one grew before, it is extracting large quantities of gold from the very districts which were supposed to be worked out years ago by the old hydraulic, and similar methods. It is claimed that by means of the gold dredge, these abandoned districts are yielding more gold than ever before.

As may be imagined, this kind of digging is very hard on the dredge buckets. On this account, the buckets are made with separate lips which can be replaced after they have worn beyond the economical limit. Both the bucket itself and the separate lip are made of manganese steel castings, all the holes for riveting being cored, as drilling is practically out of the question. The buckets weigh from 3,600 to 3,800 lb., while the weight of the lips varies from 400 to 600 lb. The pins by which they are connected together and formed into a chain weigh about 200 lb., making the total weight about 4,800 lb. per complete bucket.

When it is remembered that the large dredges carry 100 of these buckets in the chain, it will be seen that the total load of 480,000 lb., or 240 tons, requires very heavy machinery for its handling. And when approximately half the buckets are loaded with rock on their way to the back end of the dredge the amount of power required can be better appreciated. On most of the modern dredges, the power is supplied by electric motors, current being obtained either from local power plants, from sub-stations of high tension transmission lines, or from plants of the dredging companies.

The general appearance of the dredges themselves is shown in Figs. 1 and 2. Fig. 3 shows one of the buckets which has just been repaired by having a new manganese lip riveted into place. In Fig. 4 is shown the method of removing the rivets which hold the old lip, by means of a pneumatic "gun." The heads of the rivets are first knocked off, and then the large air gun shown is brought into position so as to drive out the shanks of the rivets. It will be noted that the gun is chained to the bucket being operated on, in order to make the blow as effective as possible.



FIG. 3—A REPAIRED DREDGE BUCKET



FIG. 4—KNOCKING OUT RIVETS WITH AN AIR GUN

The equipment for riveting on the new lips is shown in Fig. 5. The bucket to be riveted is brought within range of the jib crane shown, so that the portable compressed-air riveter can be brought to position for riveting on the new lip. The riveter hangs on trunnions and can be swung into any desired position to



...e cyli...
type. T...
rods that...
to 1⅜ in. ...
The bar...
the hole is d...

IG. 5—THE RIVETING OUTFIT



FIG. 6—REPLACING A BUCKET IN THE CHAIN

drive rivets at all the various angles. The rivet heating forge is conveniently placed, and the combination allows the dredge buckets to be repaired quite rapidly.

The method of replacing a bucket in the dredge chain is shown in Fig. 6. Here a bucket with a new lip riveted in place, is being supported by a sort of platform which rests on the huge boom arm and holds the new bucket in line with the others. The heavy pin which connects it to the bucket in front, is just being put into place with the aid of tongs and a hoist. The pin has a long head on one end, the head fitting into the recess shown, which prevents the pin both from turning and working out.

These views are from one of the large dredging companies near Marysville, Calif. The dredge was built by the Yuba Mfg. Co., also of Marysville.

Carbon Tool Steel Specifications

The specifications given herewith are from the 1923 Book of Standards of the American Society for Testing Materials and cover three classes of carbon tool steel, determined by the chemical composition.

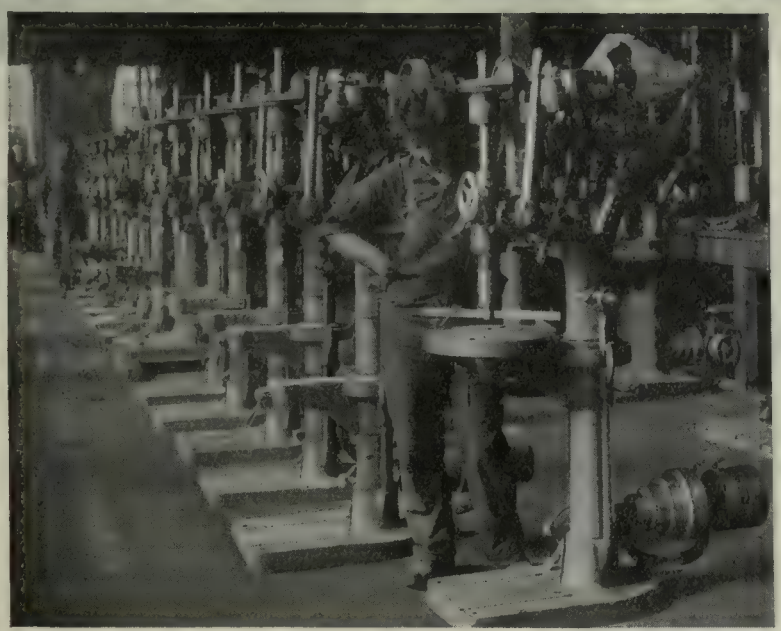
The steel shall be made by either or both the following processes: Crucible or electric, with the exception of Class C, which may also be made by the open-hearth process.

The steel shall conform to the following requirements as to chemical composition:

Elements Considered	Class A	Class B.	Class C
Carbon, per cent.....	The percentage of carbon may vary by ranges of 0.10 per cent with rejection limits plus or minus 0.025 per cent.	(Same as Class A)	(Same as Class A)
Manganese, max., per cent.....	0.40	0.45	0.60
Phosphorus, max.., per cent.....	0.02	0.025	0.035
Sulphur, max., per cent..	0.025	0.035	0.04
Silicon max., per cent....	0.35	0.35	0.25

As an illustration, tool steel may be ordered with a carbon range of from 0.60 to 0.70 per cent, with rejection limits of 0.575 and 0.725 per cent, or from 0.75 to 0.85 per cent with rejection of 0.725 and 0.875 per cent.

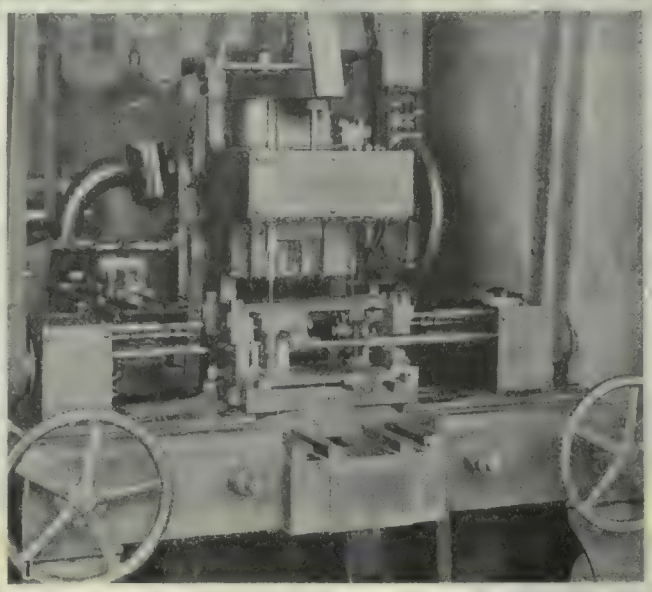


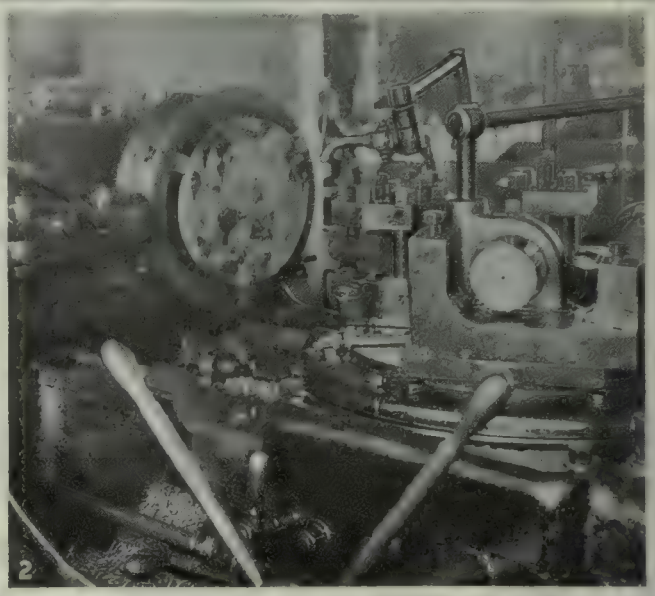


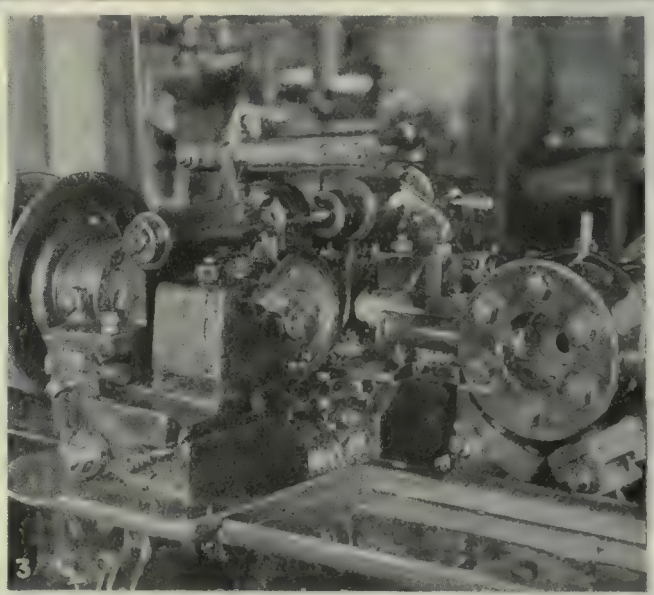
Where Machine Tools Are Made

Hoefer Manufacturing Co.
Freeport, Illinois
Founded 1892









Hatching Tin the Edison

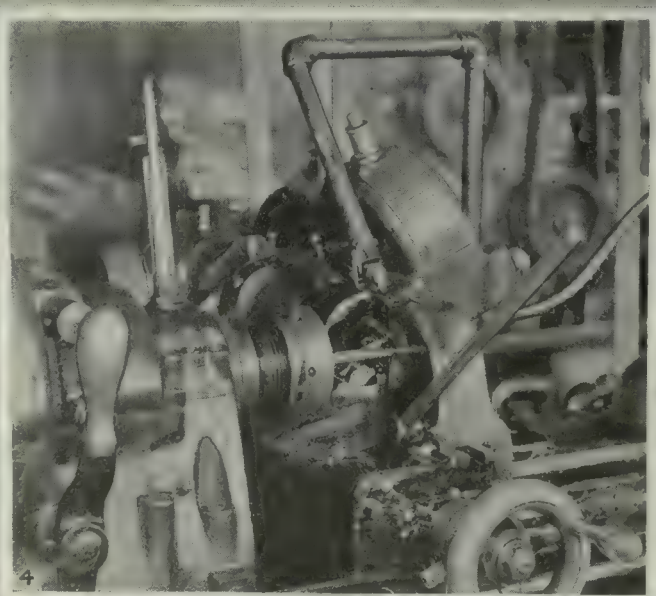
1—A home-made machine drilling ten holes in an Ediphone top plate

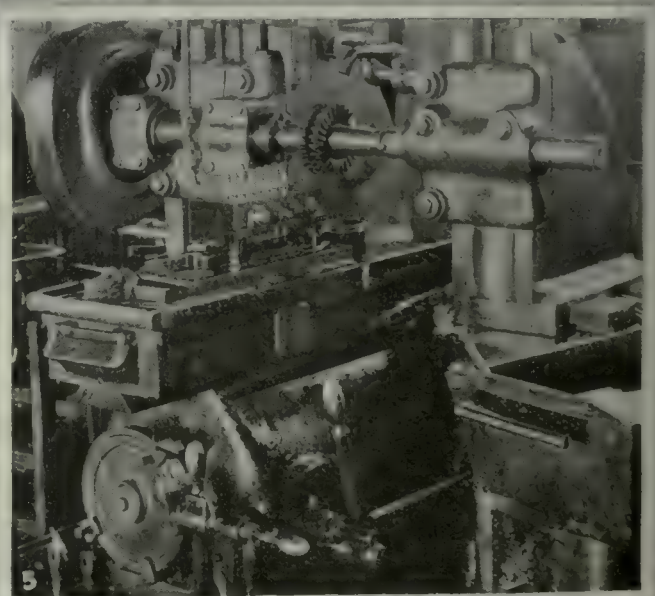
2—Making a mold plate for a disk record on a J. & L. turret lathe

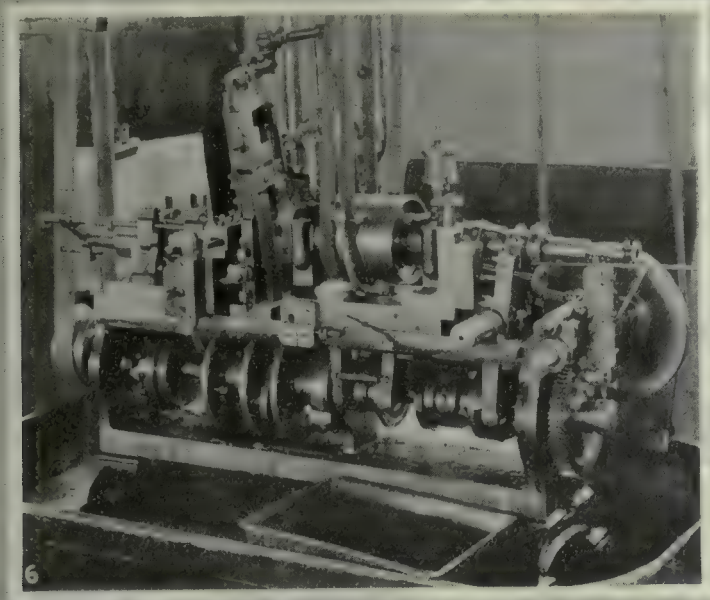
3—A Brown & Sharpe automatic screw machine chasing rack driving worms

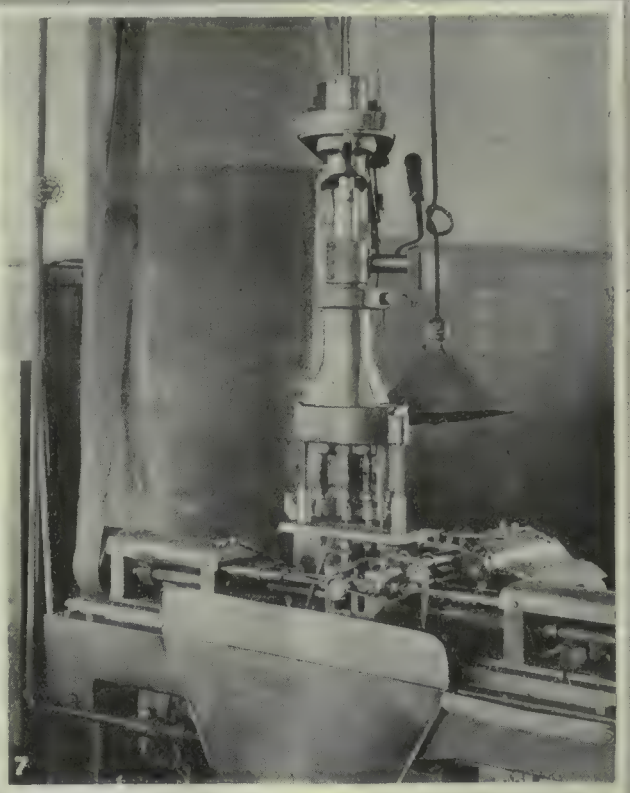
4—A Pratt & Whitney thread milling machine operating on a turn-table spindle

5—Straddle milling horn lift-shafts on a Pratt & Whitney automatic milling machine









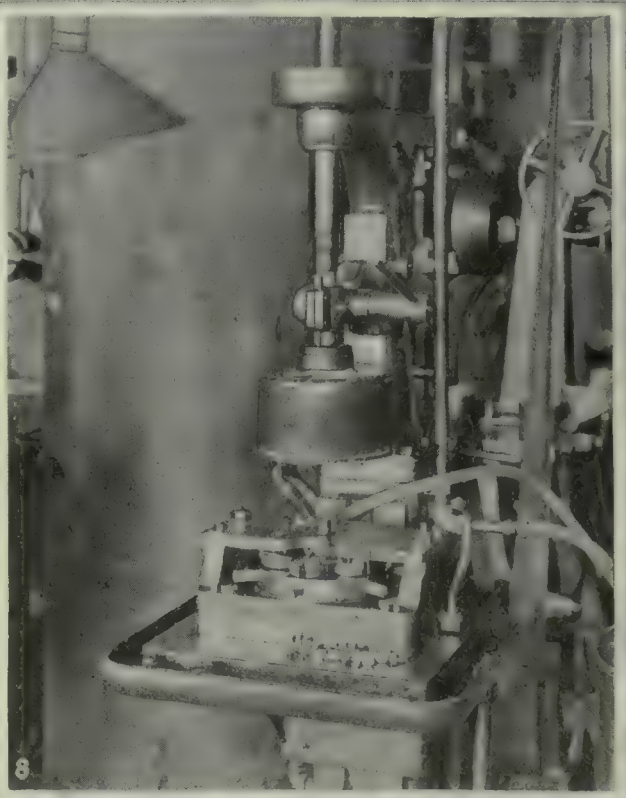
Stenographers at Works

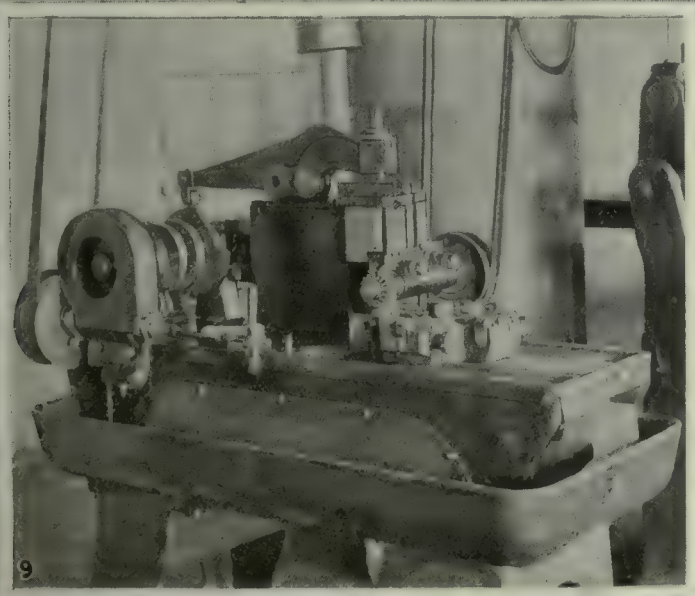
6—Stahley automatic screw machine with the cover removed from the bed

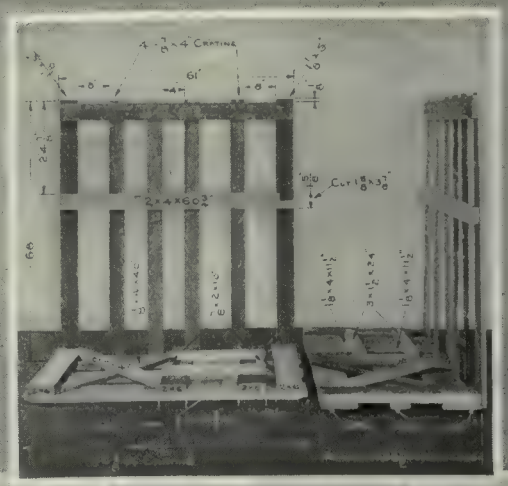
7—A special machine drilling eight holes in a barrel-shaft support bracket

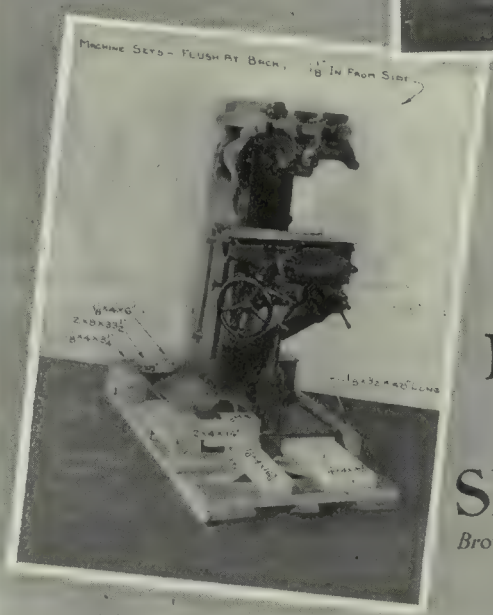
8—Drilling three holes in a disk reproducer swivel; Leland-Gifford drill press

9—Bilton automatic milling machine finishing lugs on disk reproducer weights



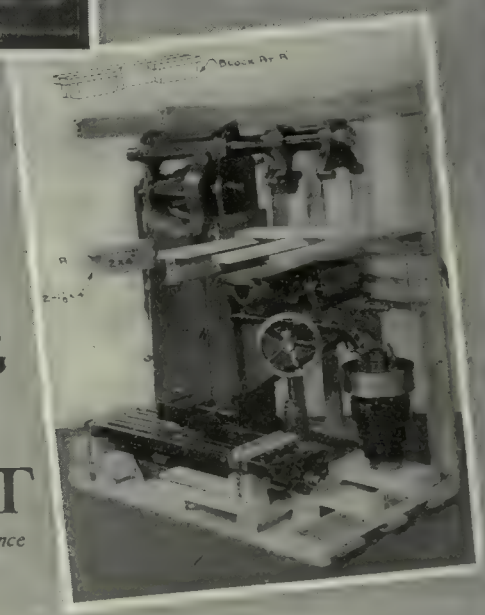






PACKING *for* SHIPMENT

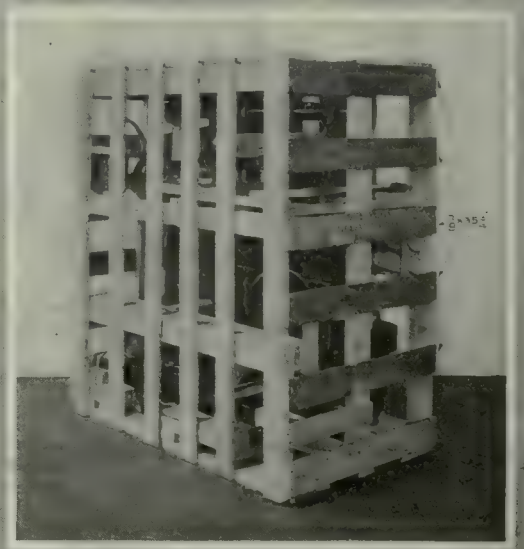
Brown & Sharpe Mfg. Co., Providence



These views show the steps taken and the material used in crating a No. 2 Plain Milling Machine. They are issued instead of blueprints to the men doing the work.

The methods employed are largely the result of a study made by one of the representatives of the company at the Forest Products Laboratories, Madison, Wisconsin.





Development of Machine Tools in New England

By GUY HUBBARD

The ninth article—The Robbins & Lawrence shop—Making rifles for the Government—Plant for building cars—Manufacture of the Sharps rifle—Armory built in Hartford

IN THE first part of Chapter XV of his "English and American Tool Builders," Prof. Joseph W. Roe says: "—— the old Robbins & Lawrence shop, at Windsor, Vt., in the back woods of northern New England, deserves a special chapter. When built, it was miles away from a railroad. It was never large, and the wheels of the original shop have long since ceased to turn, but few plants have had so great an influence on American manufacturing." A picture of this shop is shown in Fig. 50.



FIG. 50—PLANT OF THE ROBBINS & LAWRENCE CO., WINDSOR, VT., 1849

I will add to Prof. Roe's statement that the manner in which this famous industry suddenly developed from the obscure country gun shop of Kendall & Lawrence was no less remarkable than was its later influence. The story is best told by Richard S. Lawrence himself, as follows:

"One day in the winter of 1844, Samuel E. Robbins came into our shop and spoke of the Government asking for bids for rifles. We talked the matter over and decided to put in a bid for the rifles at $10.90 each, appendages extra. This was 10 cents below any other bid, and the contract for 10,000 rifles was awarded to Robbins, Kendall & Lawrence. This was at the beginning of the Mexican war and the Government was very much in need of rifles, so we made a contract to finish the job in three years.

"Guns were not made very fast in those days and we had nothing to start with—neither buildings nor capital—and we had the opposition from all the other Government contractors, who said that we could never do the work. We did have nerve and pluck, however, and were determined to carry out that contract. The real work fell on me, Mr. Robbins not being a mechanic, and Mr. Kendall not exactly calculated for such nice work—which made it hard for me. We went to work with a determined will, bought land, built factories, bought and built machinery, and started the business in good shape.

"About the time of the completion of this first contract Mr. Robbins and I bought out Mr. Kendall. At that time Mr. Robbins said to me, 'Lawrence, if it had not been for you as a mechanic, and for your attention to business, we could never go along with the heavy outlay on our hands.'

"We finished the first contract eighteen months ahead of time and made a nice thing out of it. We went on to Washington, and Gen. Talcott of the Ordnance Board told us that ours was the only gun contract ever finished within the contract time. The General said: 'What do you want now—you have done well and finished?' We replied, 'We want another contract for rifles.'

"'Come with me over to the office of Secretary of War Marcy,' said the General. Gen. Talcott told Secretary Marcy all about our work and wants, and the Secretary said, 'I will see about it.' On our return to Gen. Talcott's office he saw that we were a little disappointed, and he said, 'Go right home and a contract will be sent to you in a few days.' This contract came for 15,000 rifles, which placed us well above board.

"In manufacturing Government rifles a loss of about thirty-eight per cent was usual, this percentage being condemned for poor material or workmanship. In 1849-50 the great California gold rush excitement was raging, and guns were in such demand that we sold all our second-quality work, with good mixed in—anything to make up a working gun—for the full price of good guns. This was a great relief in every way and things looked very bright.

"Before 1849 we were very unfortunately situated about freight, as no railroad passed through Windsor, and most of our freight had to come from Boston by team. In 1849 the railroad was built through Windsor which put the market much to our advantage, and the railway contractor, Sewel F. Belknap, came to us and wanted to start the car business with us. He led us to believe that he could control all the railroad car work in that section, so we went into the business. He put in $20,000 as a silent partner and we (as the Windsor Car & Rifle Company, incorporated on Novem-

For the author's forthcoming book. All rights reserved.

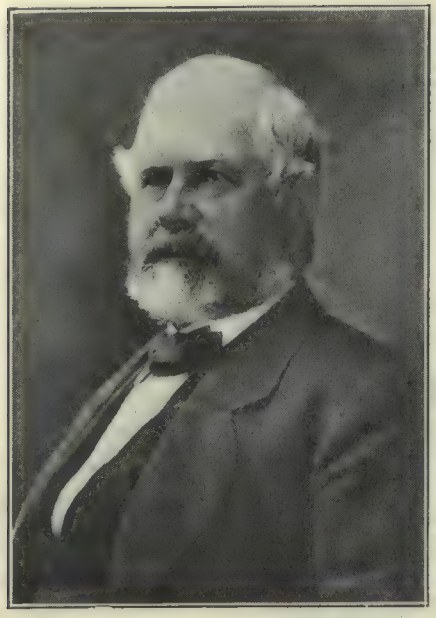


FIG. 51—RICHARD S. LAWRENCE

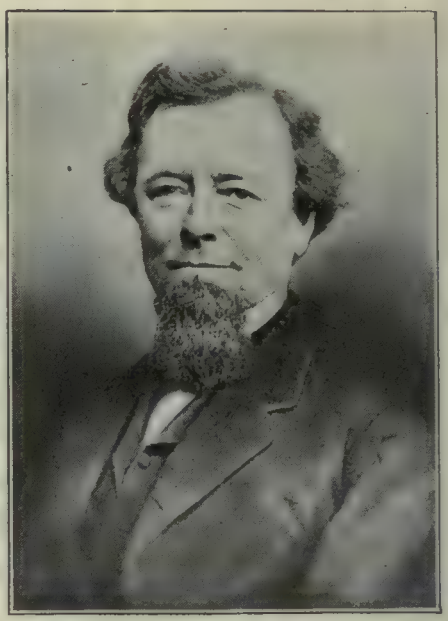


FIG. 52—SAMUEL E. ROBBINS

ber 7, 1849, the name being changed to the Robbins & Lawrence Company in 1850) went to a large outlay. It was at this time that I introduced the first machine for pressing on car wheels on a taper, without splining or keying—an invention which has since been adopted by all railroad shops. I made a great mistake in not securing a patent on on this. About the time we finished the first car, Mr. Belknap had a quarrel with the president of the road, and as a result we could not sell a car. We finally sold the cars to the Rutland & Burlington Road, took stock in payment and lost every cent to the tune of $40,000. Later, in the same way, we sold $14,000 worth to the Boston, Concord & Montreal; $5,000 worth to the Sullivan; and $75,000 worth to the Central Vermont—losing all of it. It was a great mistake going into this business, and this total loss of $134,000 was a drain on the gun work and cramped us terribly. On June 19, 1849, Mr. Belknap died suddenly, and in settling his estate his executors brought a charge of $105,000 against Robbins & Lawrence, as money lent. I knew nothing about this, but as near as I could learn Mr. Belknap and Mr. Robbins lost this money in stocks in Boston. We had to pay this charge, which made a total loss of $239,000—all paid up out of the gun business."

In Figs. 51 and 52 are shown portraits of Richard S. Lawrence and Samuel E. Robbins, while in Fig. 53 is a reproduction of a stock certificate of the Robbins & Lawrence Company.

When, on February 18, 1845, Robbins, Kendall & Lawrence took its first contract for the 10,000 interchangeable Harper's Ferry type U. S. Army rifles, shown in Fig. 54, its plant was nothing more than a small country jobbing shop located in a one-story wooden building on the north bank of Mill Brook, the same one formerly used by the American Hydraulic Co. The equipment consisted of only a few crude machine tools, most of which had been inherited from their predecessors, the National Hydraulic Company and N. Kendall & Company, and the force consisted of some twenty-five local workmen—also mostly inherited from the older concerns. By dint of advertising, both printed and by word of mouth, the company rapidly swelled its force to more than one hundred and fifty — recruiting not only most of the laborers and skilled mechanics of the Windsor region, but also many experts from such centers as the shops of Eli Whitney, Silver & Gay, Amoskeag, and the National Armories at Springfield and Harper's Ferry. As this force gathered, new buildings were rapidly constructed in which these mechanics went to work to build newly designed machinery under superintendents R. S. Lawrence, Frederick W. Howe and Henry D. Stone—who vigorously pushed the work.

Meanwhile, in April, 1846, the construction of a handsome brick armory was begun on the south side of Mill Brook, opposite the original gun and machine shops. By the time this Windsor Armory (which is today the sole survivor of the original works) was completed a full equipment of highly developed gun machinery was ready to be installed therein, so that the interchangeable manufacture of the rifles was carried on without delay by the same workmen who had built the machinery. In this case at least, there appeared to advantage the old-fashioned "all around mechanics" who were capable of turning their hands to any sort of mechanical work. An idea of the rapid growth and extent of this new Windsor industry may be gained by the following description from the *Vermont Journal* of Feb. 16, 1849—less than three years after ground was broken for the Armory:

"Up to this date nine edifices in all have been erected and put in use, among which is a rifle-factory and machine-shop, a brick structure 100 feet by 40 and 3½ stories; the car shop, a wooden building of about the same length and breadth, but of less height; 3 blacksmith shops of brick, of smaller size, containing 20 forges and 5 triphammers; and 4 other buildings of various dimensions, all of which, with the apparatus required for the several species and branches of work, cost the sum of 115,000 dollars. The foundry (carried on by Lycurgus



Courtesy of Frank R. Lawrence

FIG. 53—STOCK CERTIFICATE OF THE ROBBINS & LAWRENCE COMPANY

C. Hammond and Francis Draper) is a tall structure of brick, 80 by 50 feet, the building of which was commenced in September, 1847, and which cost between three and four thousand dollars."

It may be mentioned that as a result of the unfortunate car-building venture, the machine shops were connected by a long spur track extending from the main line of the railway, being used for freight purposes for many years after the abandonment of the car business.

As may well be imagined, this sudden industrial expansion in the little village of Windsor (whose fixed population was about 2,500) made the housing situation acute and resulted in much residence building. The *Vermont Journal* of December 1, 1849, says:

"Twenty-four neat cottages have been erected during the past spring and summer. Old dwellings have been renewed, shops and buildings of divers sorts have sprung up to our amazement. New streets have been opened, and shanties are found, where we little looked for them a few years since. In the south part of the village, a new street has been opened on an elevated plain just southwest of the Armory, called Buena Vista, (this name still persists, as an echo of the Mexican War which brought this fine residential district into being) on which are several handsome dwellings. Others are to be erected, we understand, in the coming spring. Every mechanic and laborer of any sort has been in requisition—and yet the want of convenient dwelling houses, to say nothing of shops, etc., is still very pressing."

To this it may be added that the Robbins & Lawrence Company rather went ahead of its times by building and maintaining a large four-story lodging and boarding house for the convenience of its single workmen and those without homes in Windsor—the board and room rent being deducted at the office of the company.

In 1850, new buildings were built and new machinery installed for the manufacture of that direct ancestor of the Winchester rifle—the Jennings repeater—for Courtlandt C. Palmer. In that same year Robbins & Lawrence also took the step which had so great an influence upon the industrial life of Hartford, Conn., in taking up the development and manufacture of the Sharps breech loading rifle, famed for its performance.



FIG. 56—SHARPS RIFLE PLANT, HARTFORD, CONN., 1853. FROM WHAT IS NOW CAPITOL AVENUE

Christian Sharps, who had been a workman under that early exponent of the interchangeable system, Captain John Harris Hall, at Harper's Ferry Armory, was inspired by Capt. Hall's breech loading rifle to invent his famous Sharps breech loading rifle—which he patented September 12, 1848 at Cincinnati.

After having experimental models built by various gunsmiths, Mr. Sharps in 1850 brought his invention to the Robbins & Lawrence Co. at Windsor, who contracted to perfect the gun and to build 5,000 of them on the interchangeable system, in the form of cavalry carbines, as shown in Fig. 55. During his experiments upon the Jennings repeater, Mr. Lawrence had invented the lubricated bullet, and the application of this invention to the Sharps sliding breech rifle, for the first time, made the rifle entirely practical and its success was thereby assured.

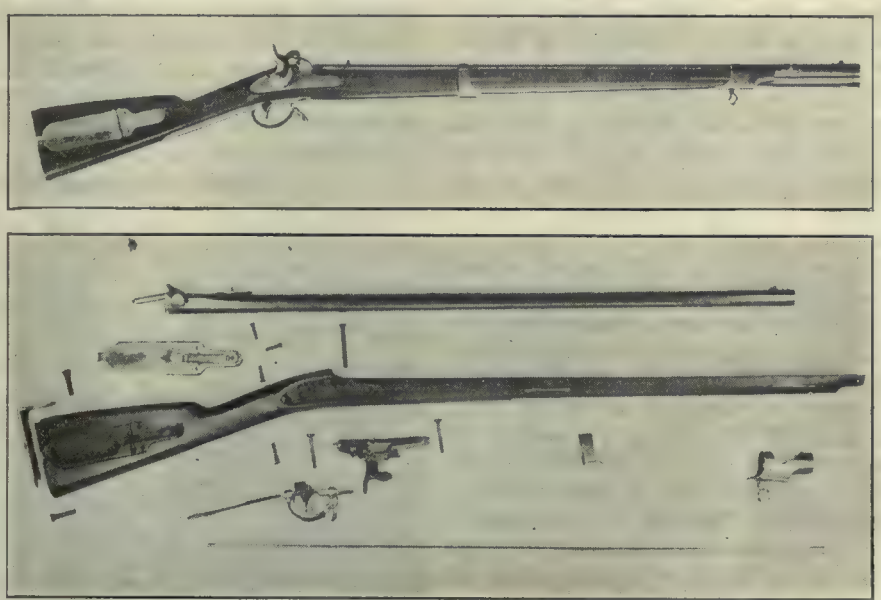


FIG. 54—ROBBINS, KENDALL & LAWRENCE RIFLE OF 1854
(From the author's collection)

The building of the first 5,000 rifles required much space and new machinery at Windsor, where the shops were already crowded to capacity, and when an additional contract for 15,000 Sharps carbines and rifles was received, the Robbins & Lawrence Co. decided to build in the more accessible city of Hartford, Conn. a separate plant for the manufacture of these popular breech loading arms.

To make this possible, a holding company for the Sharps patents was organized at Hartford in 1851, having a capital of $100,000; with John C. Palmer as president, George H. Penfield as sales agent, Christian Sharps as engineer, and Richard S. Lawrence as master armorer and superintendent. This so-called Sharps Rifle Manufacturing Co. advanced $40,000 to the Robbins & Lawrence Co. which purchased a twenty-five acre tract of pasture land bounded on the North and



FIG. 55—SHARPS CAVALRY CARBINE
(From the author's collection)



FIG. 57—SHARPS RIFLE PLANT, HARTFORD, CONN., 1853. FROM N. Y., N. H., & H. RAILWAY
(From a painting by C. S. Porter)

West by Little River (now Park River), on the East by the land of Trinity College (now Bushnell Park, the site of the State Capitol), and on the South by a country road which is today the busy Capitol Avenue. Under the plan and direction of Richard S. Lawrence, who removed to Hartford in 1852, the Windsor Co. erected in the midst of this tract, a fine two-story brick armory, 160x60 ft. with an L containing a forge shop, views of which are given in Figs. 56 and 57. In the meantime the mechanical equipment was built at Windsor and as soon as it was installed about two hundred and fifty mechanics were set to work. This was the second large machinery industry to locate in Hartford (Colonel Samuel Colt having established his revolver manufactory there three years before) and it opened up what is today the Capitol Avenue industrial district—one of the busiest in the country. These pastures of the fifties are today covered by the great plants of such concerns as the Pratt & Whitney Co., the Hartford Machine Screw Co., Hart & Hegeman, and the Underwood Typewriter Co. Of the history of the Sharps Rifle Manufacturing Co. more will be said in the next article of this series, which will be published in an early issue.

Reducing the Cost of Building

THE layman often says, "Oh! you are one of those fellows that want us all to live in the same kind of houses and dress exactly alike." The answer is, "NO." We don't want you to live in the same kind of houses at all, but there is no good reason why there should not be a certain number of standard sizes to choose from so that electrical fixtures, plumbing, etc., can be factory made in the base boards, etc., to save the enormous cost of fitting up each house by hand on the job.

You do not expect the lumber, doors, windows, etc., to be made by hand on the job. You do not expect I [illegible] plumbing and electric fixtures to be built on the learn [illegible] These items are more or less standardized, are stocks in [illegible] the manufacturer in large quantities, hence made a to[illegible]ford to have them. There is nothing to be gun busines[illegible]art or beauty by the designer of a house

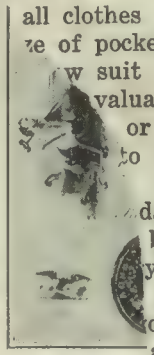
In Figs. 5[illegible]ms odd sizes. If he was a competent de-
S. Lawrence a[illegible]ld use certain proportions and these ought
is a reproductio[illegible] vary by inches. Many things about a
& Lawrence Com[illegible]tandardized without in any way affect-

When, on Febru[illegible]of the rooms or interfering with the
Lawrence took its fi[illegible] of the exterior. In place of taking
tract for the 10,000 [illegible] of the architect, it allows him to
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type U. S. Army ri[illegible]se which he is originating or
shown in Fig. 54, its plan

was nothing more than a

The Spice of Life

small country jobbing shop located in a one-story wooden building on the north bank of Mill Brook, the same one formerly used by the American Hydraulic Co. The equipment consisted of only a few crude machine tools, most of which had been inherited from their predecessors, the National Hydraulic Company and N. Kendall & Company, and the force consisted of some twenty-



all clothes alike, but I for [illegible]e of pockets standardized [illegible]w suit I don't have to [illegible] valuable information [illegible] or have to keep a [illegible]o fit the different

[illegible]dardized without [illegible] bank check. At [illegible]y small to very [illegible] reading matter [illegible]ould be a great [illegible]ade of the same

FIG. 53— [illegible]he Cleveland Engi-

uniform size as our paper currency, enabling us to carry them in the same bill folder without folding them up.

I believe that the industries have nothing to fear from the most critical examination of the effect of standardization because the fixing of a standard is not necessarily permanent. Standards can be improved, and most of them except basic standards are constantly being revised to suit the needs of the public and the industries.

Defining Standardization

Standardization cannot take away the incentive to invention or creation because standardization is not invention in any way. It is merely the selection of a small number of styles or sizes which are the most suitable of a given product, and giving the specifications of these in measurable terms so that large quantities can be made which will be uniform.

In the standardizing of milk bottles, for example, the number of varieties was reduced from 49 to 9, the caps for the bottles from 10 to 1. This was simply the agreement between maker and user to eliminate unnecessary varieties and sizes and will not in any way prevent the invention of better milk containers.

Accounting for Low Cost of Production

If we were to ask ten men in the manufacturing world to account for the low price of some automobiles, nine of them would no doubt say it was due to the large number being made; that is, it was due to mass production. This is not the primary reason, but the result of another cause.

The real reason is standardization.

If only one car was being built, the parts need only fit together so they will function properly. If a large number were built in the same way very little economy would result from the large number outside of the saving in purchases. But if these parts are standardized so that their dimensions are uniform within certain limits, then the parts can be made to gages and templets in large quantities by machinery set to produce rapidly the exact sizes wanted. This being properly done, the work goes together without individual fitting. This is what reduces the cost of manufacture and enables one to buy repair parts that fit, at reasonable prices.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Cutting Brass Tubing

BY GEORGE EDGAR

Some shops waste so much time doing easy jobs in a hard way that one wonders how they can keep going. A few days ago I was in a shop where three men were employed, on as many turret lathes, in cutting up brass tubing, the length of which didn't have to be accurate within a eighth of an inch, nor did the ends have to be absolutely square or smooth. This tubing was ½, ¾ and 1 in. in diameter, 22, 20 and 18 gage respectively, and was all being cut into 3-in. lengths. Machined brass flanges were slipped over the ends of these pieces of tubing and soldered in place, a sort of jig being used to hold the parts so that the outer ends of the flanges would be the right distance apart. The solderers all had files with which they took off slight burrs from the ends of the pieces of tubing, for the cutoff tools were not made to do this automatically.

As I watched the time and money being thrown away by these inefficient methods, I thought of another shop where ¼- to ¾-in. brass tubing was being cut to length with a swing-frame saw, as shown in the illustration. On the small sizes the operator cut two tubes at a time, and in the same time and on the same sizes of tubes, could probably cut twice as many pieces as the three men on the three turret lathes.

Of course, the apparatus shown is rather crude, but any good mechanic could easily make a real machine on the same plan, and a little care in feeding the tubing would give commercially accurate lengths with square ends and practically no burr. In any case a slight burr could be taken off easier on a wheel than with a file. Another advantage of the saw method is that short lengths of tubing may be used, and often short lengths may be purchased at a considerable less price than the longer ones.

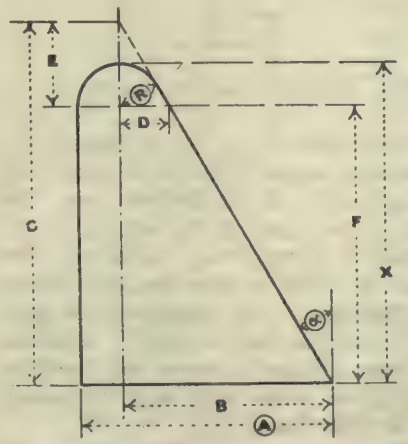


CUTTING BRASS TUBING ON A SWING SAW

A Trig Problem Often Met

BY EDWARD HELLER

One of the trigonometric problems that the man in the shop or drafting room invariably finds hard to solve is that in which two intersecting lines are connected by the arc of a circle. It seems that no matter how many of these problems one solves, the next one always has some catch that was not met with before. The difficulty seems to be in finding a starting point. Once that is gotten, the rest of it is easy.



PROBLEM OF FINDING THE DIMENSIONS OF THE GAGE

A problem of this nature was met by the writer in trying to get the dimension X in the profile of a gage. The dimensions R and A and the angle α were given. It will be seen at a glance that the making of the gage would be simplified very much if dimension X were found.

The problem was solved in the following manner:

$$B = A - R$$
$$C = B \cot \alpha$$
$$D = \frac{R}{\cos \alpha}$$
$$E = D \cot \alpha = \frac{R \cot \alpha}{\cos \alpha}$$
$$F = C - E$$
$$X = F + R$$

The figures in this particular problem were $A = 1\frac{1}{2}$ in., $R = \frac{1}{4}$ in. and $\alpha = 29$ degrees.

$$B = 1\tfrac{1}{2} - \tfrac{1}{4} = 1\tfrac{1}{4}$$
$$C = 1\tfrac{1}{4} \times 1.8040 = 2.255$$
$$D = \frac{\frac{1}{4}}{0.87462} = 0.2858$$
$$E = \frac{\frac{1}{4} \times 1.8040}{0.87462} = 0.5161$$
$$F = 2.255 - 0.5161 = 1.7389$$
$$X = 1.7389 + 0.250 = 1.9889 \text{ inches.}$$

These calculations give us everything that there is to know about the problem.

The Shaper as a Gear Generating Machine

By Joe V. Romig

The accompanying sketches show how an ordinary shaper may be rigged up as a gear generator when it is desired to cut a number of small gears to a more than usual degree of accuracy. A master-gear of the same size as the gears to be cut, a master-rack of corresponding characteristics, and a single tool of the same shape as a tooth of the rack, are required.

The essential features are shown in Fig. 1. A fixture,

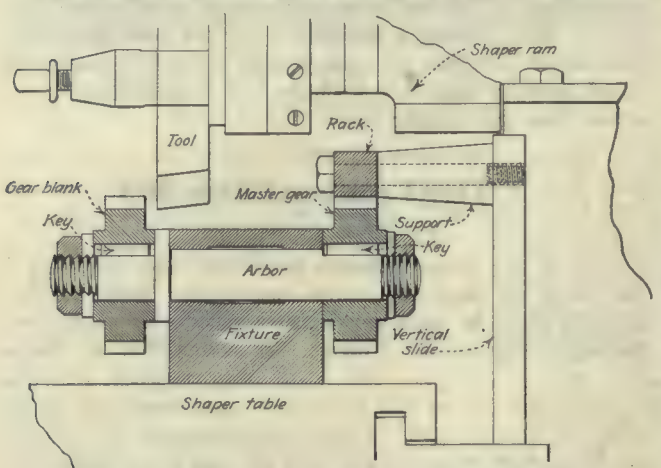


FIG. 1—POSITIONS OF THE VARIOUS PARTS

to be bolted or otherwise held to the top of the shaper table, carries a double-end arbor the axis of which lies parallel to the line of travel of the shaper ram. On the inner end of this arbor, toward the column of the shaper, the master-gear is permanently fastened. The outer end of the arbor is made to take the gear-blanks to be cut, which are held by a nut, supplemented by a key in the arbor. The master-rack is rigidly attached to the face of the shaper column in such position that the master-gear will be in mesh with and roll along under it as the table is traversed.

The meshing of the master-gear and rack may be adjusted by means of the vertical movement of the knee, and, once established so that the parts will mesh properly together without backlash, need not again be disturbed. The position of the cutting tool in the vertical slide of the shaper is quite independent of the movement of the knee and can be adjusted in any desired direction.

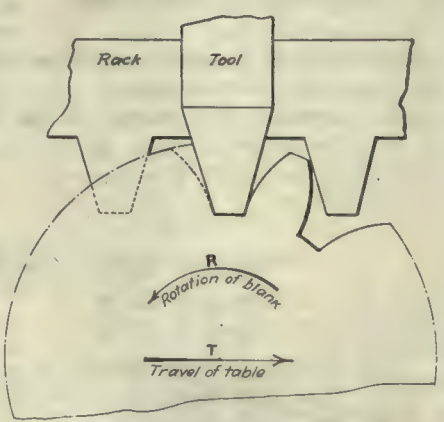


FIG. 2—HOW THE GEAR BLANK ROLLS UNDER THE TOOL

With the parts in proper relative position it will be seen that as the shaper table is traversed from side to side the gear blank will roll over the tool just as the master-gear rolls over the rack. Indeed, the tool represents one tooth of a rack in the path of the rolling gear blank. The action of the tool thus commences at the top of a tooth, planes downward over the face and flank, up and over the opposite side, and finishes at the top of the adjacent tooth.

Indexing is accomplished by traversing the table to one side until the master-gear rolls out of mesh with the rack, turning the gear one tooth or more, and returning the table with a different tooth of the master-gear in which position the master-gear is returned. In roughing a blank it is advisable to turn the master-gear nearly half way over each time in order that the heat generated in the blank by the cutting tool may be evenly distributed.

Any form of tooth may be produced by this means; the requisites being a master-gear and rack, and a correctly formed cutting tool. If an involute tooth is desired, the tool is not particularly difficult to produce, as the sides are straight lines. A clearance of about 8 deg. should be provided. The regular table feed can be used.

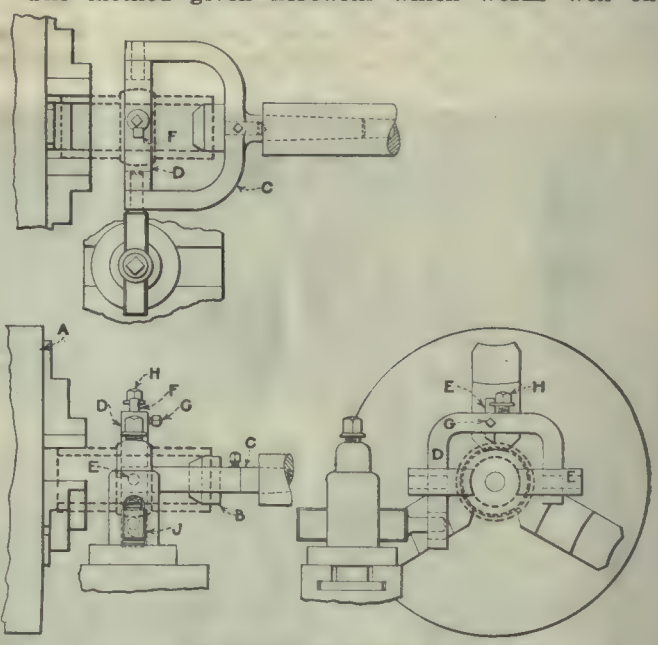
Hardened gears may be form ground with this rig by substituting a tool post grinder for the tool and setting the wheels to the proper relative position by trial. But one side of the tooth form can be ground at one setting; to grind the other side it is necessary to reset the wheel or turn the gear around on the arbor.

Boring and Turning Spherical Bearings —Discussion

By Harold J. Cramer

On page 267, Vol. 59, of the *American Machinist*, in an article under the title given above, Herbert F. Crawford shows a method of turning the seat radius of spherical bearings. This is only good for short bearings of large diameter, as he illustrated.

The method given herewith which works well on



RADIUS TURNING FIXTURE FOR LATHE

small bearings, has been used for some time in a manufacturing plant in which I have been employed.

The bearing is held in the lathe chuck *A*, and is supported and located by the plug *B*, which is inserted in the yoke *C*. This yoke is held in the tailstock with the arms level with the lathe center and of course parallel to the lathe bed.

The yoke *D* swings on the pivots *E* and carries the tool-bit *F*, which is held by a screw *G*. It is adjusted by the screw *H*. The center of the pivot *E* must be in line with the center of the bearing and must also be midway of the width of the seat on which the radius of the bearing is to be turned.

The distance from the point of the tool, from the pivot *E*, should measure the same as the required radius.

The lathe carriage is moved either by the power feed or by hand. The round pointed tool shank *J*, in the toolpost, operating in the slot in *D*, swings the yoke so as to give the tool a rotating movement on the pivots *E*.

This fixture will take the size bearing shown and also smaller sizes. When turning bearings with different bores, change plug *B* to fit bore. The radius is altered by adjusting the tool-bit *F*.

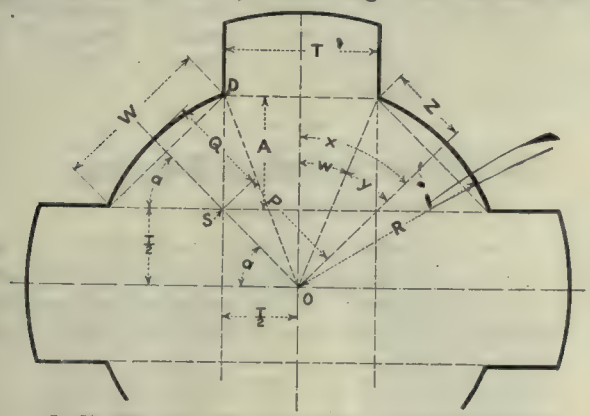
Formula for Finding Root Width of Splineways—Discussion

By Jack Dutton

There is an error in the discussion under the title of a "Formula for Finding Root Width of Splineways," by George E. Hodges on page 486 of the *American Machinist*. The formula as printed reads

$$W = 2C\left(R - \frac{\frac{T}{2}}{C}\right), \qquad (1)$$

where R is the root radius, T is the width of spline and C is the sin of a, which angle can be seen in the



LAYOUT FOR SPLINE SHAFT CALCULATIONS

accompanying illustration to be one-half the angle made by the center lines of the splines.

The value of P in the illustration is seen to be $\frac{T}{2} \div \sin a$; or as given in the article mentioned, $P = \frac{\frac{T}{2}}{C}$. This latter value when subtracted from R equals Q, or $\left(R - \frac{\frac{T}{2}}{C}\right)$. If Q were equal to A the formula previously printed would be correct, for then $\frac{\frac{W}{2}}{A} = C = \sin a$. Therefore, $\frac{W}{2} = CA$ and $W = 2CA$. If A equals $\left(R - \frac{\frac{T}{2}}{C}\right)$ then formula (1) is obtained.

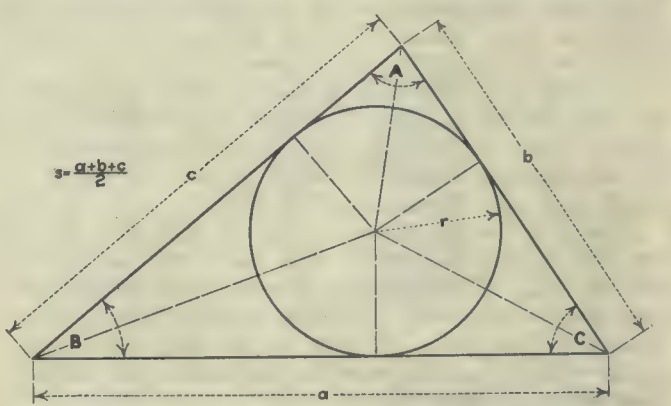
Furthermore, if the arc of the chord W were drawn from the center S instead of from O the formula would be correct and Q would equal A. Note that $P + Q = R$, but that R is the shortest distance between the two points O and D. Therefore $A + P$ is evidently greater than R, and A greater than Q.

As it is, the problem is far from complete, and gives only an approximate solution. The error in considering a four-spline shaft is much greater than when there are many splines, but it would not be safe to use the formula at all. Consequently it seems that the old way of solving for the angles w, x and y and the side of the triangle Z is still the best.

Diameter of an Inscribed Circle—Discussion

By Moses Finkelstein

On page 527 of the *American Machinist* I noticed that Edward Heller could not find a formula for the problem which he sent in. For his benefit, I am referring him to pages 82, 86 and 87 of Wentworth's "Plane and Spherical Trigonometry," second revised edition,



THE INSCRIBED CIRCLE IS THE LARGEST BEARING THAT CAN BE TURNED ON THE TRIAGULAR BAR

where he will find the formula for a circle inscribed in any triangle. I am also calling to his attention the fact that his formula holds for a specific case only; namely, when the triangle is a right triangle. The formula which he derived is correct, and is the same as formula (3) that follows.

For the benefit of other readers I am submitting the formulas that give the radii of the largest circles that can be inscribed in triangles of different types. The proofs can be obtained by trigonometry and geometry. The meaning of the symbols is shown by the accompanying sketch.

For any triangle,

$$r = \frac{1}{s}\sqrt{s(s-a)(s-b)(s-c)} \qquad (1)$$

Or,

$$(s-a)\tan\frac{A}{2} = (s-b)\tan\frac{B}{2} = (s-c)\tan\frac{C}{2} \qquad (2)$$

For a right triangle,

$$r = \frac{a+b-c}{2} \qquad (3)$$

For an equilateral triangle,

$$r = \frac{a}{6}\sqrt{3} = 0.288675\,a, \qquad (4)$$

where a signifies one of the equal sides of the triangle.

Making Arbors for Shell Reamers

By Fred S. Harger

In the shop where I am employed we use a large number of shell reamers of high-speed steel for the reaming of holes in the drop-forgings and steel castings that form a large component of the coal mining equipment which constitutes our product. The work is rough and heavy, the material often hard, and the reamers are used on heavy-duty drill presses that give them no alternative but to go through, once they are started; hence care and forethought in designing as well as skilful workmanship in construction is necessary in producing the arbors.

The material of which the arbors are made is tough



ARBOR FOR SHELL REAMERS

machinery steel, and the arbors range in length from short ones that include only the combined length of shell and taper shank up to 36 inches. Each reamer has its own arbor, suited to the work it is to do.

In making the taper seats for the shells we fit them so that the latter may be wrung on by hand up to within $\frac{1}{16}$ in. of the collar, and from thence force them to the shoulder under an arbor press. The taper is slight and must be very carefully fitted.

The driver is let into the collar by milling a seat in the face of the shoulder on each side of the arbor with an end mill. A tool steel key is then fitted to each seat and pressed into place. The key is made of a thickness that will just enter the slot in the end of the shell easily without leaving room for backlash. The illustration will make clear my meaning.

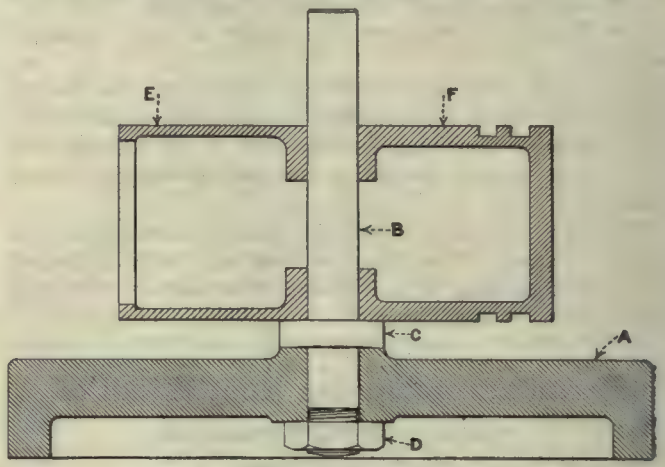
We keep a supply of the reamers in the tool crib, ready to be issued to the men upon demand. We store them upon wooden shelves with strips of wood between each reamer to prevent them from coming in contact with each other, and thus preserve the keenness of edge. Some of the reamers have been resharpened and ground off on the end so many times that they are but about half their original length, yet are still in service. As they are reduced in size by repeated grindings they are used as roughing reamers, to be followed by newer tools of correct size. In this way the effective life of the new reamers is prolonged.

Fixture for Checking Alignment of Wrist-Pin Holes in Pistons

By Douglas P. Muirhead
Glasgow, Scotland

I notice on page 137, Vol. 59, of the *American Machinist*, in one of the articles on "Tool Engineering" by Dowd and Curtis, a method for gaging the alignment of wrist-pin holes. In this method the open end of the piston is used as the locating face, and the alignment of the pin is checked in relation to this face. The method is satisfactory only if the open-end face is exactly parallel to the axis of the wrist pin, which may not always be the case.

In checking wrist-pin alignment, I have always tried to avoid using this face for location if possible, and have found the simple fixture shown in the accompanying illustration would give good results. A cast-iron block *A* carries an upright pin *B*, which is ground to the wrist-pin size and mounted at right angles to the base. This pin is a light push fit in the base and held in position by a nut *D*. The piston to be tested is



FIXTURE FOR CHECKING ALIGNMENT OF WRIST-PIN HOLES

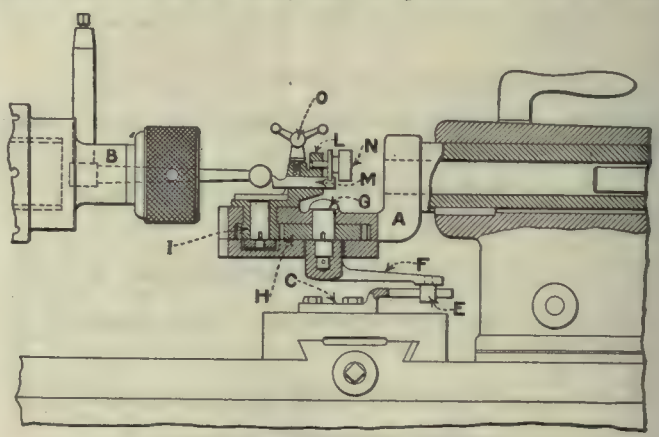
mounted on the pin and rested on the collar *C*, the fixture being placed on a surface plate. Two readings are then taken at *E* and *F* with a clock gage, or dial indicator, and the alignment checked in this way.

The diameter of the pin *B* can be made suitable for any size of wrist-pin hole. In checking pistons which have been ground taper from skirt to crown, suitable allowance must be made for the reduction in diameter. This method of checking was especially developed to check pistons that had knife-edge skirts as other methods did not give satisfaction.

Device for Spherical Turning

By Frank Ramsey

When it is necessary to turn a sphere on the end of a small shaft, a cutting tool shaped to cut the complete profile is generally used. This method has, however, two disadvantages; first, lack of precision, due to the



SPHERICAL TURNING DEVICE

difficulty in keeping the tool sharp and accurate in profile; second, small production, on account of the slow feed required to prevent chatter.

The device shown in the accompanying illustration is designed especially to overcome these difficulties. The member *A* is a pivot piece for the swiveling tool holder

L, and is fitted into the tailstock. The chuck *B* is fastened on the spindle of the lathe and carries the work.

The work having been chucked, the cutting tool, held in the position shown, is brought up to the work and fed to the required depth of cut by turning the tailstock handwheel. The slotted guide bar *C* is fastened to the cross slide of the carriage, the roller *E*, mounted at the end of the arm *F*, being located in the slot of the guide bar.

As the slide is traversed by its screw, it is evident that the arm *F* will be caused to turn about the pivot *G*, carrying with it the gear *H*. This gear meshes with the pinion I, which is fastened to the tool holder *L*, and causes it to rotate about the same center, generating a true accurate sphere on the work.

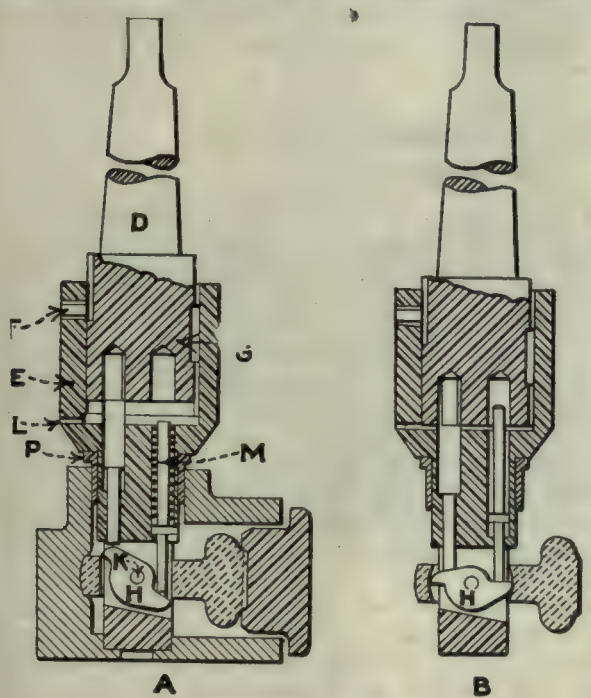
The diameter of the sphere is adjusted by means of the knurled collar screw *N*, which fits a groove in the tool *M* and moves it in or out from the center of rotation as required. The tool is clamped in position by the screw *O* when the proper setting has been made.

A Boring Bar for Spherical Boring

By Alfred Clegg

This device is used to produce a spherical hole approximately 1 in. in diam., in a bronze bearing slightly less than ½ in. thick. In operation the piece to be bored is mounted in a fixture as shown at *A* in the accompanying illustration, after having been drilled to the proper size on another machine.

The shank of the tool *D* is arranged to fit the machine spindle and the pin *L* is screwed into its lower face. The section *E* carries the tool *H* pivoted on the pin *K*, and slides vertically on the shank *D*. The feather key *G* fits a keyway in the shank, and the vertical movement of the tool holder *E* on the shank is fixed by the screw *F* which strikes the lower end of its slot as *D* is raised.



SPHERICAL BORING BAR

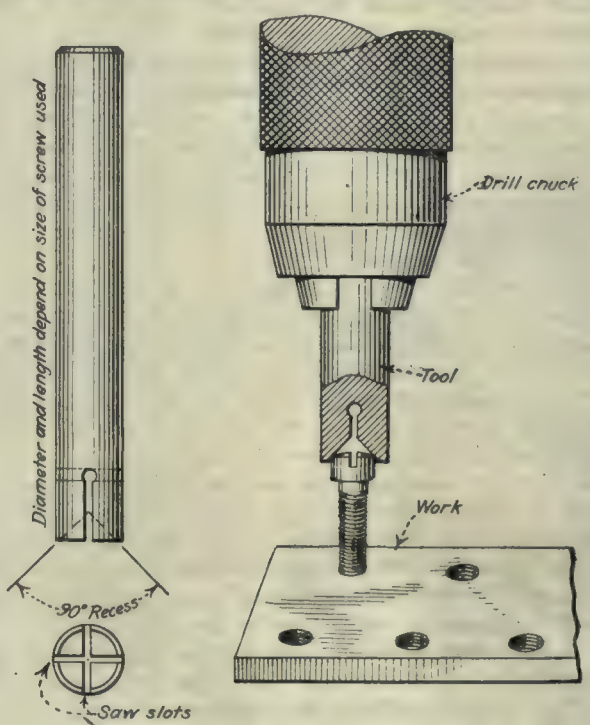
When the device is positioned in the work and fixture as shown at *A*, the rotation of *D* will cause rotation of the tool about the vertical axis and, as *D* is lowered the pin *L* will cause the tool to rotate also about its horizontal axis *K*. This action produces the spherical bore.

The spring-pressed pin *M* simply serves to hold the other end of the tool always in contact with the operating pin *L*. The bushing *P* is hardened and ground for a perfect fit in the fixture. The bore is completed when the cutting tool *H* has reached the position shown at *B* in the illustration.

Method of Inserting and Removing Machine Screws Rapidly

By H. J. Boll

Where castings or other parts having tapped holes in them are to be sprayed or dipped in enamel or japan it is necessary that the tapped holes be perfectly clean after this operation. In some classes of work it is not practical to tap after enameling because of the chances of marring the finish in handling. The holes may be tapped before enameling and then re-tapped to clean them after enameling, but it has been found more economical to put screws in the tapped holes and have them there during the enameling operation.



TOOL FOR RUNNING IN SMALL SCREWS

This is very speedily accomplished by the use of the tool shown herewith. The screws are started in, one turn, by hand. The tool is put in the chuck of a sensitive drill-press and the work brought up under it by hand. The friction between the tool and the screw turns the screw home instantly.

To remove the screws after enameling, simply reverse the direction of rotation of the drill press and proceed as before.

Aside from the above use, this tool may be used for permanently assembling many classes of work where screws are used.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors
December 20, 1923

Mr. Coolidge Breaks His Silence

LIKE A CLEAR brook flowing into a muddy swamp the words of the President's first message to Congress poured forth into the turgid atmosphere of political Washington. Mr. Coolidge's taciturnity has become something of a byword throughout the country but it is now evident that he is entirely capable of expressing himself when the time arrives.

As a courageous example of disregard of political expedience this message is almost in a class by itself. Many of the points covered could easily have been straddled or camouflaged in a glowing burst of rhetoric but Mr. Coolidge chose to vindicate the faith of his admirers by meeting the issue fairly.

The President's whole-hearted support of Secretary Mellon's tax reduction proposal has met with very general approval all over the country and particularly by the men prominent in industrial circles. His stand on the bonus has been almost equally well received although it naturally met with little favor from the members of Congress who will vote for a bonus measure no matter what happens.

We believe Mr. Coolidge's position on the immigration question is generally sound although the problem of actually selecting immigrants before they leave the old countries is exceedingly difficult to solve. No one doubts that selective immigration is the kind this nation ought to have but so far we have heard of no really practical plan for accomplishing it.

The railroad consolidation problem is almost equally difficult. There can be no doubt in anyone's mind, however, that the President is for it. He will probably have his troubles with the radical element in Congress, particularly if the LaFollette bloc gains control of the interstate commerce committee in the Senate.

It is high time to call a halt to the continuation of reductions in the Army and Navy and Mr. Coolidge's stand on national defense is therefore welcome. Certainly Europe has not recovered from the delusion that wars offer good solutions for economic problems and there are rumblings from Mexico. For the present, therefore, America can hardly afford to let her defenses rust away.

Many other subjects of vital importance to American industry are taken up in the message and disposed of with remarkable clarity of vision. We understand that Mr. Coolidge spent months in boiling down his message. Consequently we can hardly hope to do more than mention a few high spots in the short compass of an editorial.

As a model of brevity and clarity of expression we believe that this message will go down into history and rank with our great presidential documents.

Closer Limits For Trade Associations

COLLECTION of trade statistics practically is limited to those which may be requested by a governmental agency in the final consent decree in the case brought by the Department of Justice against the Tile Manufacturers' Credit Association. The proceeding was in the United States Court of the Southern District of Ohio. Before the decree was made final the law department of the National Association of Manufacturers urged the Department of Justice to permit the periodic collection of facts relating to capital employed, power used, wages, taxes paid, fuel consumed, machinery employed, in addition to production, sales shipments, stocks, prices and like pertinent trade information. It was specified that all such information was to be a record of accomplished facts.

It is known that the Department of Justice gave long and careful consideration to the proposal. The significance of the decree is increased greatly by the fact that the collection of trade statistics is not made permissible after the Department's study of the proposal.

The tile decision, if taken as a precedent will have a far-reaching effect on trade association activities. If the government is to collect fundamental statistics, it must have money and authority, meaning higher taxes and more government in business. And the information would reach the user too late to be useful.

The business man is now more than ever dependent upon statistical services. His trade association can function for him quickly and intimately, and it ought not be shackled so long as it keeps within the intent of the law.

Putting New Blood Into the Business

WHAT happens to any enterprise that is headed by men whose reputation is secure and who do not feel the need of expending much energy to keep things moving? Not much in the way of progress and sometimes a rather rapid retrogression.

With young men at the helm whose reputations are yet to be made there is quite a different story. They may make more mistakes because of their lack of experience but at least they get more done by reason of their greater ambition and activity.

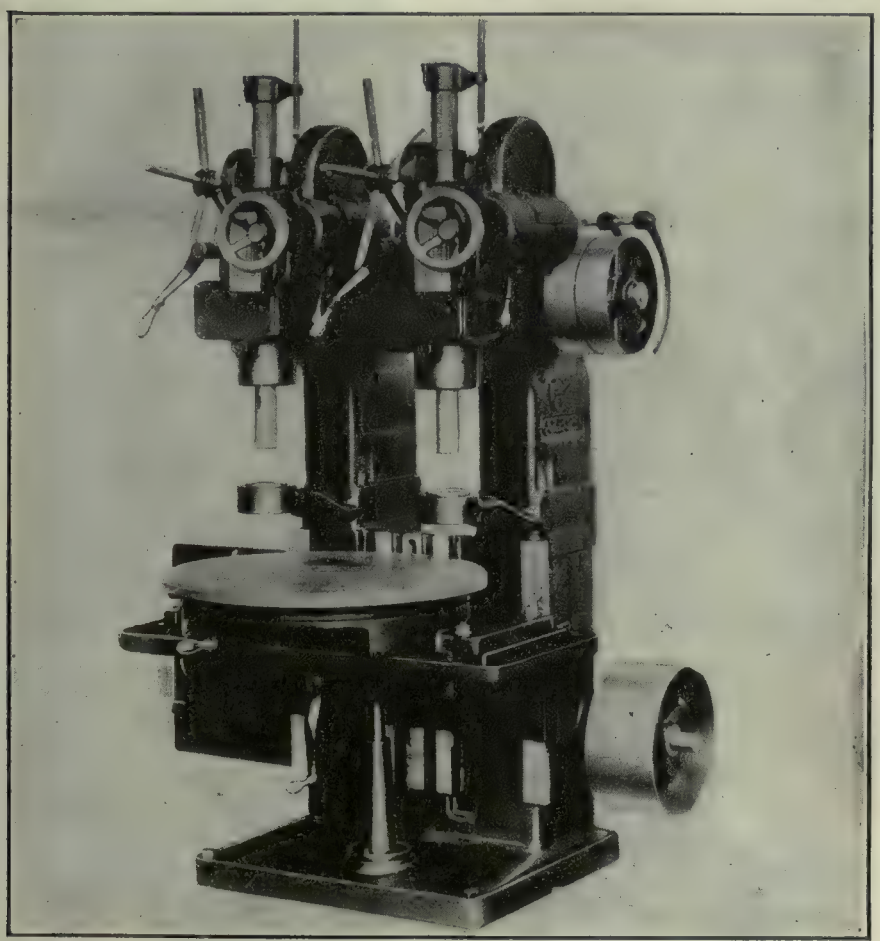
In an address to the local section delegates of the American Society of Mechanical Engineers, past president Harrington pointed to the two types of local sections where the above mentioned conditions exist. He remarked that he had observed that sections whose officers were eminent engineers, ornaments to their profession, rarely did much of anything. On the other hand, those headed by younger, less prominent men forged ahead and made themselves felt in the Society.

Young blood in any enterprise, commercial or professional, has its place. There is little question but that its impetuous course should be guided and occasionally restrained by the wisdom, or perhaps it would be better to say experience of older heads. But give it responsibility and something to do if you want results.

Shop Equipment News

Colburn Two-Spindle No. 2 Drilling Machine

The special two-spindle drilling machine shown in the accompanying illustration has recently been placed on the market by the Colburn Works of the Consolidated Machine Tool Corp. of America, Rochester, N. Y. The machine differs from the regular No. 2 double-spindle machine, manufactured by this company, only in the addition of steady supports and a speial three-station rotating table.



COLBURN TWO-SPINDLE NO. 2 DRILLING MACHINE

Two Colburn No. 2 heads are mounted on a common column which also carries a bracket type of table extending the full length of the machine. To this machine table is clamped the rotating table, the latter having three positions, one for loading, one for drilling and one for reaming. A lever for releasing the indexing latch is located at the left below the table and a lever for clamping the table in position after indexing is also provided.

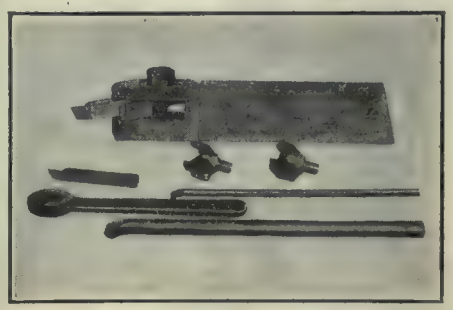
The steady supports are shown attached to the frame above the table in the accompanying illustration. An automatic trip, together with spring-type counter-weight, returns the spindle to the starting position after each operation. On work for which two stations for drilling can be used, a four-station table can be furnished and the table will then be indexed through 180 degrees to bring the work under the drills.

A 5-hp. motor for driving is mounted on a bracket at the rear of the machine and is geared to the jackshaft. The power is then transmitted to each head by a belt. The heads are entirely independent of each other and can be operated at different speeds and feeds.

The machine is designed for production work in machining duplicate parts in quantities, and is at the same time sufficiently flexible to handle a variety of work requiring a wide range of speeds and feeds.

X-L-N-T Tool Holder

A tool holder which possesses unusual adaptability and convenience is now being marketed by Marshall & Meier, 298 Mulberry St., New York, N. Y. The holder is furnished in three styles, the standard shank with capacity for $\frac{5}{16}$- and $\frac{1}{4}$-in. tool bits being shown in the accompanying illustration. A larger size to handle $\frac{7}{16}$- and $\frac{3}{8}$-in. cutters, and the illustrated size with a $\frac{3}{8}$x$\frac{3}{8}$-in. shank for speed lathes are also furnished.



X-L-N-T TOOL HOLDER

The tool bit is held in a slot in a piece which pivots in a hole in the front extension of the shank, and this arrangement allows the cutter to be swung through an arc of about 180 deg. without moving the shank in the tool post. The tool is clamped under the end of a short bar, the other end of which is seated on a shoulder of the shank. The clamp bar is tightened by means of a screw which is threaded into the shank.

The rear edge of the slotted piece is knurled and rests on a knurled section of the shank so that it will not tend to move when clamped in position. Three slotted pieces are furnished with each holder, one for the large and one for the small square tool bits, and one for two sizes of boring bars. High-speed

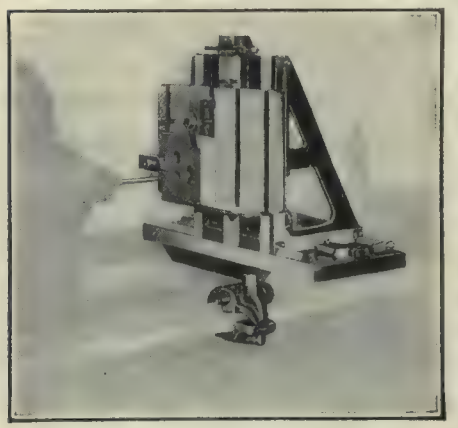
tool bits and a wrench complete the outfit.

The convenience of the holder is evident, as it performs the functions of a straight, right-, or left-hand holder, and will also handle threading and boring tools. It is quickly convertible from one function to another. All parts are made of machine steel and pack-hardened.

Craley Spacing and Boring Attachment

A lathe or milling machine attachment, designed for accurate layout and boring work, has recently been placed on the market by the C. C. Craley Manufacturing Co., Shillington, Pa. The device is shown mounted on a lathe in the accompanying illustration.

The device consists of three major parts; a base to be attached to the



CRALEY SPACING AND BORING ATTACHMENT

tool carriage; an angle plate adapted to slide crosswise of the lathe on the base; and a work-holding plate vertically adjustable on the face of the angle plate. The relative movement of these three parts allows universal adjustment of the work in relation to the boring tool, and suitable clamps are provided to hold the parts in position after the setting has been accomplished.

Accurate positioning of the work is accomplished by means of standard gage blocks in conjunction with accurate wedges which are provided on the apparatus. These wedges are two in number, one being attached to the base and the other to the angle plate. The wedges are hardened, ground and lapped and are graduated to read in thousandths of an inch.

The work plate and the angle plate carry stop pins which can be brought into contact with the wedges, or gage blocks placed in front of the wedges, in order to obtain a given setting. With the stops against the wedges and the wedges set at zero, a point on the work plate is exactly aligned with the spindle, and this point is the intersection of two lines across the faces of a guide and a pair of stop pins on the face of the work plate.

The work having been located against the pins and the guide and clamped, any point on the work may be positioned exactly in relation to the spindle by the use of gage blocks in front of the wedges together with the adjustment of the wedges themselves.

By the use of 15 standard blocks and the wedges any location may be determined from zero to the extreme limits of the attachment in both directions. A complete set of hardened and lapped blocks is furnished with the attachment.

The work plate is provided with a coiled spring on either side. These springs act as a counterbalance when the clamp is loosened for resetting the work.

Dunning Type C Air Compressor Unit

A recent addition to the line of Dunning air compressors manufactured by the Geo. Sachsenmaier Co., 926 N. Third St., Philadelphia, Pa., consists of an automatic tank unit, designated Type C. As shown in the accompanying illustration, the compressor and its driving motor are mounted on the tank, a pressure control switch being provided to stop and start the motor at given tank pressures.

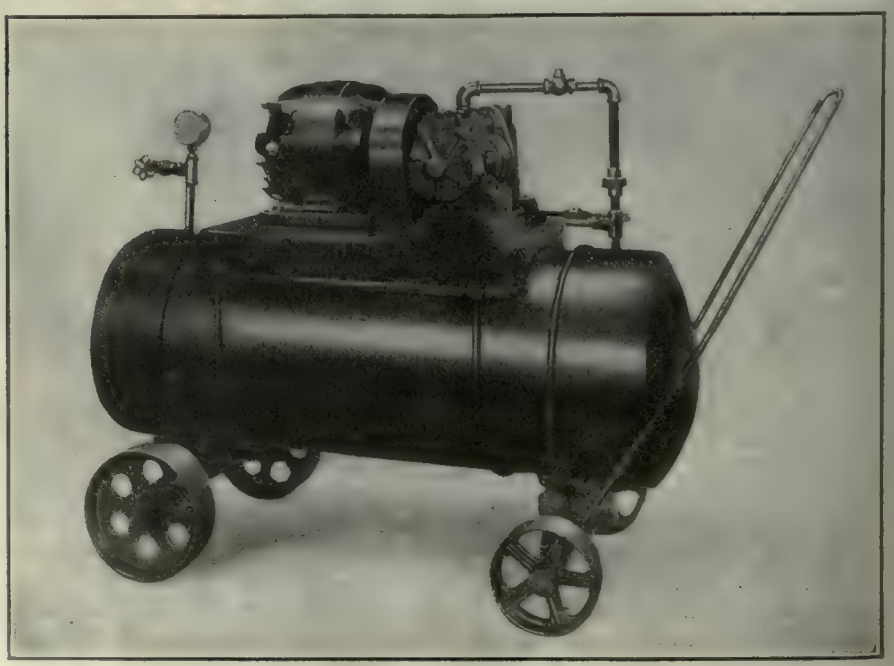
The compressor consists of a one-piece cylinder casting, the base of which forms an oil well, and in which a one-piece piston is disposed horizontally. The piston is operated from a horizontal shaft which passes through the piston at right angles to its axis and oscillates it by means of an eccentric. No connecting rods are required.

Each end of the cylinder bore is closed by a head in which an intake and an outlet valve are fitted. This construction provides a double-acting pump of exceptionally simple design and with comparatively few parts.

The pump runs at slow speed and is fitted with bronze bearings. A force-feed lubricating system is provided, the oil being distributed to the working parts through the hollow eccentric shaft from a plunger pump in the base. The surplus oil returns to the reservoir for the recirculation.

The valves are of ample size for the service required, and each end of the piston is fitted with three rings to insure good compression. The tank is tested at a pressure of 400 lb. per sq.in., and is mounted on wheels. The apparatus is easily portable and can be used wherever electric current is available.

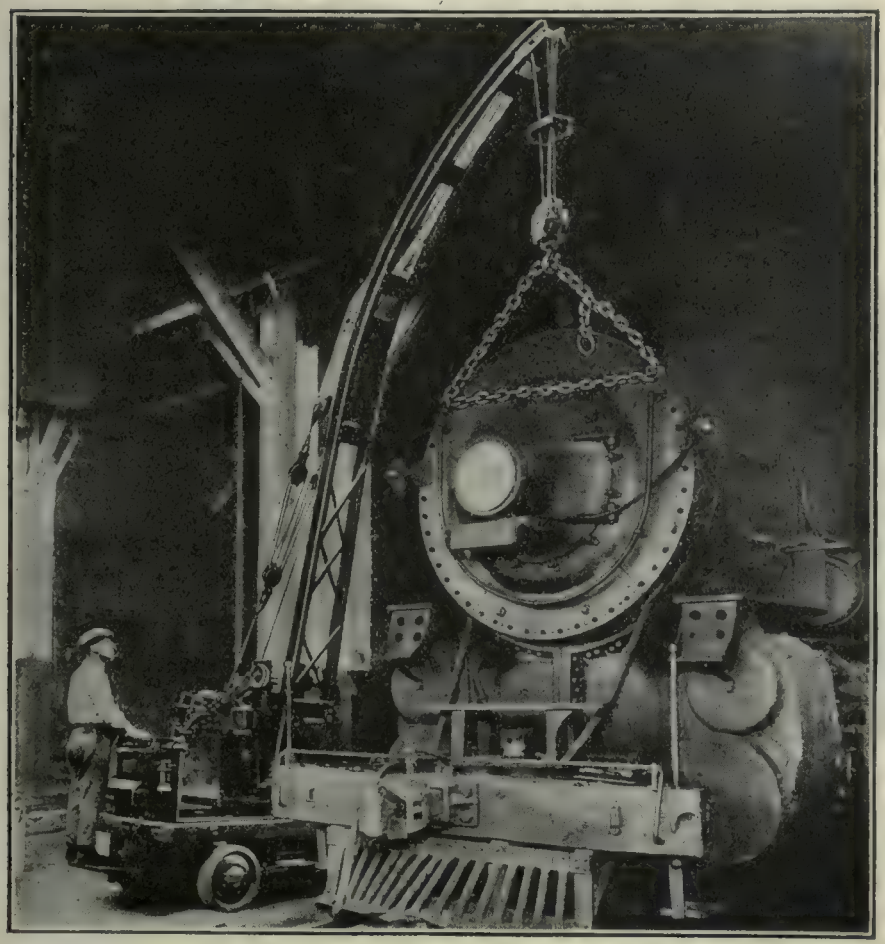
With the addition of this unit, this line of compressors is now available in a variety of sizes, ranging from the small compressor with 2-in. base and 2-in. stroke, weighing only 11 lb., to the large 4x4-in. compressors with a capacity of 30 cu.ft. per minute.



DUNNING TYPE C AIR COMPRESSOR UNIT

Baker Locomotive-Type Crane

The Baker R & L Co., Cleveland, Ohio, is now marketing a locomotive-type electric crane which has a broad field of usefulness and is especially adapted to the needs of railroad shops. It will lift and transport all sorts of heavy parts and packages; with a short boom the loading and unloading of freight cars can be accomplished; and a 19-ft. boom makes it available for work in the locomotive repair shop. The crane shown in the accompanying illustration is engaged in the latter occupation, lifting a boiler front into place.



BAKER LOCOMOTIVE-TYPE CRANE

The regular boom is 12 ft. long, and for operation inside a standard box car, an 8 ft. boom is furnished, the wheelbase being reduced to 60 in. The standard wheelbase is 70 in. and the tread is 44 in. The truck is mounted on four wheels, all of which steer, and two of which are used for driving.

All motions of the machine are electrically driven and the controls are mounted on the dash directly in front of the operator. The driving or travel motor is a Baker series-wound, 24-volt machine, running at 1,150 r.p.m., and a drum type controller provides three speeds forward and reverse. With the rated load of 3,000 lb. the travel speed is 3 mi. per hour.

The driving wheels are operated through a worm drive and a bevel pinion differential. The driving axle is of the full-floating type and is fitted with radial and thrust ball bearings. The steering knuckles and levers are fitted with renewable bushings.

Separate independent motors operate the crane slewing mechanism and the hoist. The hoist mechanism consists of two drums, both driven by the same motor through a pair of magnetic clutches. A solenoid brake prevents rotation except when power is applied and three limit switches are provided to control the operation. The drum-type controllers for these motors and a switch for the magnetic clutches are mounted on the dash.

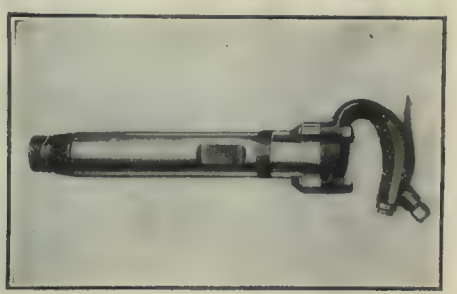
The crane will lift its rated load of 3,000 lb. at a 7-ft. radius and, with the 19-ft. boom, will give a lift of 192 in. at a 95-in. radius. The hoisting speed with the rated load is 7 ft. per min., and with no load, it is increased to 30 ft. per minute.

The driving brake is operated by a pedal and is interlocked with an automatic switch and the controller. The automatic switch is of the Baker quick-break type. The battery compartment is mounted on the crane, moving with it and counterbalancing the load on the hook. The boom is fabricated from structural steel and will be furnished of the length required. The weight of the crane without the battery is 7,000 pounds.

Ingersoll-Rand Riveting Hammer

A recent development in riveting hammers made by the Ingersoll-Rand Co., 11 Broadway, New York, N. Y., is now being marketed. The tool is illustrated herewith and has been thoroughly tested on all classes of work.

The hammer is made in three styles, A, B, and C, which are available in sizes ranging from a 5- to a 9-in. stroke. Each size can be furnished with any one of three types of barrels and with either outside or inside trigger handles. The outside trigger handle is standard and is shown in the illustration.



INGERSOLL-RAND RIVETING HAMMER

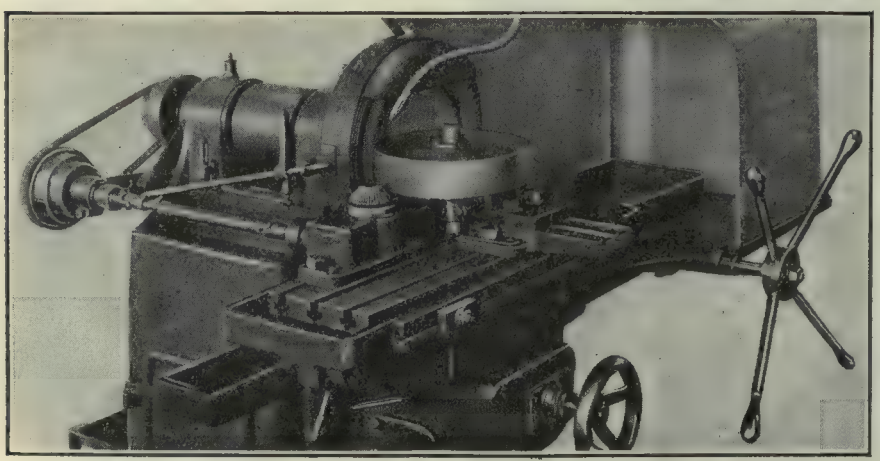
Three alloy steel bolts hold the handle to the barrel and make it possible to take the tool apart anywhere for inspection or cleaning, with a wrench only. The throttle valve is a combination of the piston and poppet types, designed to give the nicety of control and freedom from leakage required. The control is sensitive and the hammer will deliver a heavy blow or a light tap at the will of the operator.

The special alloy steel valve has a liberal bearing surface and has no holes or ports from which checks or cracks may start. It operates in a strong valve box, located in the head of the barrel and made with a solid end for ease of removal and cushioning action on the piston.

The handles are of steel, shaped to fit the hand and with a sandblast finish. The exhaust takes place through the side of the barrel, the opening being fitted with an adjustable deflector. It is stated that this hammer gives comparatively little "kick-back" in proportion to the fast, hard-hitting action and that the air consumption is small.

Graham Pulley Grinding Attachment

The Graham Mfg. Co., 71 Willard Ave., Providence, R. I., has recently placed on the market a machine for grinding the faces of pulleys. The machine is the same in its essential features as the standard Graham face-grinding machine described on page 352, Vol. 55, of the *American Machinist*, with the additional details involved in the pulley supporting and driving mechanism. By removing the latter from the table the machine is quickly convertible for straight face-grinding.



GRAHAM PULLEY GRINDING MACHINE

The pulley grinding attachment is in two parts, both of which are secured to the surface of the table by means of T-head bolts. An adjustable base holds a stationary arbor in a vertical position, upon which arbor the pulley to be ground is placed. This arbor is a free running fit for the bore of the pulley, and to mount the work for grinding requires only that it be set in place on the arbor. No driving dogs or other parts are attached, and no means of locating or supporting it in definite vertical relation to the grinding wheel are needed. Because of this condition the machine handles pulleys upon which no previous facing, or other operation than boring have been performed.

The pulley is driven by a small conical-shaped burr of hardened steel, having a serrated surface upon which the rim of the pulley rests and by which it is supported at the proper height for grinding. The driving burr receives its power through a worm and wormwheel and a universal-jointed shaft and clutch from a three-step cone pulley, which is driven by a belt from a cone on the rear end of the grinding wheel spindle.

The position of the driving burr in relation to the vertical arbor is adjustable for different diameters of pulleys by loosening two clamping bolts, sliding the burr into contact with the work and again tightening the bolts. The burr should be placed as closely as possible to the point of contact between the work and the grinding wheel, as it sustains the downward thrust of grinding. It may be located inside or outside of the pulley rim. Three work speeds, ranging from 50 to 250 ft. per min., are available by means of the cones, the speed used depending principally upon the hardness of the iron.

The driven burr may be stopped and started at any time by means of a conveniently located clutch lever but, unless the work is quite small in diameter and the speed very fast, it is neither necessary nor desirable to do so.

The vertical position of the pulley should be such that the axis of the grinding wheel is in line with the center of the pulley face. Pulleys may be ground flat, concave or with a crown, the surface contour depending on the position of the pulley in relation to the grinding wheel.

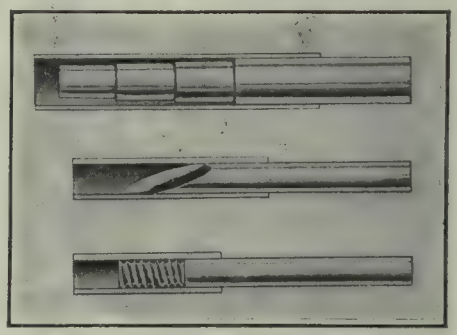
An arbor must be supplied for each size of bore, but these are simple pieces of machine steel and are changed by loosening and tightening two clamping bolts. Pulleys up to 24 in. in diam. by 6 in. face are regularly ground, and the diameter may be increased to 30 in. by removing some of the water guards.

Advantages claimed for the method are that pulleys may be cast with a small allowance for finish, and that a true and smoothly finished surface is obtainable in a fraction of the time that would be required for turning. By supplying a supporting and driving plate, segmental work may be ground as readily as the full circumference.

"Elastoid" Fiber Protectors for Metal Parts

The Elastoid Fiber Co., Waltham, Mass., is now marketing a line of protectors for metal parts, which are adapted for use in the machine shop and other metal working plants.

Many metal parts in process of manufacture present sharp corners, shoulders, edges or threads which may be easily damaged when handled in bulk. To prevent such damage these fiber protectors are furnished in a variety of sizes and shapes. The protectors are to be placed over the parts after machining and to remain with them until they are assembled or shipped.



"ELASTOID" FIBER PROTECTORS

It is stated that the cost of the protectors is so slight that they can be thrown away after use.

Melbourne to Have an Electric Show

An electrical exhibition under the auspices of the Victoria Electrical Federation will be held in Melbourne during September, 1924, Assistant Trade Commissioner, F. G. Pauly informs the Commerce Department. It is planned to cover every phase of the electrical industry, showing actual working models of the various types of apparatus from toys to machinery, transport, lighting and other industrial equipment. Both wireless telegraphy and telephony will have prominent places in the exhibition.

The duration of the affair will be for four weeks, taking in the period during which the Royal Agricultural Show is held.

News Section

Immigration Problem Is Subject of Two Day Conference

In an attempt to develop constructive suggestions looking to the solution of our immigration problem, the National Industrial Conference Board called a meeting at the Hotel Astor, New York City, Dec. 13 and 14. Delegates from a number of social and industrial organizations attended and expressed their views. No action of any kind was taken, but several worthwhile recommendations were made by speakers.

Among them was the proposal to require the steamship company to provide facilities for medical examination, no passport to be viséd unless accompanied by a medical certificate. This suggestion gets around the difficulty of providing for selection of immigrants by American officials abroad which is rightly considered by other countries as an infraction of their sovereignity. Another suggestion was that serially numbered certificates equal in number to the annual immigration quota be issued to prevent the deportation now enforced by exceeding quota restrictions.

Canadian System Favored

The general feeling expressed was that the Canadian system of selecting immigrants, based on the needs of the country as a whole, had many advantages. No particular group should be able to secure immigrants which might fit their requirements, but which could not be absorbed and become of real value and benefit to the whole country. The Canadian system checks immigration at the point of embarkation, where the immigrant receives his passport or other certificate.

The subject of regulation was discussed from many angles. Nearly everyone seemed to believe that the time had arrived when it had become necessary. It was advocated that the cost be made as low as possible and that red tape and chances for annoyance be reduced to a minimum.

One of the greatest evils is believed to be the many ways in which immigrants are fleeced, beginning almost as soon as they land. The exasperating feature of this is that nearly all of it is done by shrewd members of their own nationality, who easily secure the confidence of the victim. Max Kohler of the Baron de Hirsh Fund feared that compulsory registration would open the way to numerous abuses of the immigrants by inspectors. This view was not shared generally and was vigorously opposed by E. D. Henning, Assistant Secretary of Labor.

The attitude of labor was outlined by Hugh Frayne of the American Federation, who defended the contract labor laws and the present restrictions. He advocated, however, that each U. S. consulate should have on its staff members representing the manufacturers, agriculture and labor and that these men handle all calls for labor from different groups in the United States.

It was pointed out by several speakers that most of the criticisms of restrictions and registration came from those who, unconsciously perhaps, were more concerned in relieving their fellow countrymen than in securing the people best suited to the needs of this country.

Fear Sperry Was Drowned in Channel

All indications would point to the probable death of Lawrence B. Sperry, the American flyer, whose airplane was picked up in the English Channel recently. Conclusions are that Sperry had some trouble with his plane and landed safely enough in the Channel but made the mistake of trying to swim a distance of more than three miles in the icy waters.

Lawrence D. Sperry was one of America's best known flyers. He was a rare combination of spectacular flyer and competent pilot and was considered by many to be one of the ablest flyers that the world has yet known. He was the recipient of the French prize some years ago for his exceptional flying at which time he demonstrated his father's gyroscopic stabilizer to the delight of the French judges.

Recently he had been building the Sperry Messengers, a new type airplane for use in the United States army and Navy.

Unemployment Causes Waste

Unemployment during the periodic troughs in the business cycle is responsible for the greatest single waste. Troughs in the business cycle can be done away with if booms are eliminated. Accurate information as to stocks, consumption and distribution of commodities, made available at frequent intervals, will do much toward eliminating booms. These opinions were expressed by Commerce Secretary Hoover, in the course of remarks Dec. 5 at the annual dinner of the Washington Society of Engineers.

In the course of his remarks, that dealt largely with standardization and simplified practice, Secretary Hoover stated that one of the leading economic boards in the country had reached the conclusion that the exhaustive statistical service, represented by the business survey of the Bureau of the Census, and other figures compiled by the Department, had contributed more than any other single factor to the stabilization that has characterized business during the last twelve months. These figures permit the individual business man to interpret his own situation in relation to the country as a whole. Not long ago, Mr. Hoover pointed out, three great American industries practically went through bankruptcy because they had overstocked raw materials.

Ford Cylinders from Furnace "Dust"

Henry Ford has begun the manufacture of cylinder castings from "dust." On the 50,000-ton mountain of "dust" whose peak at the River Rouge plant has been rising higher and higher for three years, the pile has been fed by the Ford blast furnace. From this "dust" he proposes to build 600,000 cylinder castings. It will take a year and a half to use up the mountain.

The Ford company has announced that it has begun the reclamation. It isn't "dust" in the ordinarily accepted term. It is blast furnace dust, a fine sand-like substance which is blown from the furnace in the blast and is utterly worthless in that state. It is valuable, however, because 50 per cent of it is iron ore. The other 50 per cent is coke dust.

Cylinder Production

It is estimated that of the 50,000 tons in the dust mountain at River Rouge, 25,000 tons are iron ore in dust form. The reclamation of the 25,000 tons of iron ore means sufficient ore for more than 600,000 cylinder castings weighing 82 lb. each.

A new sintering plant has been built for the work. It stands close to the two big blast furnaces and joins the giant ore bins from which the furnaces are fed. The furnace dust, caught up in suction conveyors, is carried directly to the sintering plant and there is mixed with cast iron borings gathered from the various Ford manufacturing units.

A gas flame of intense heat is passed over the dust, and the action of the coke under this heat and the suction draft, fuses the mixture into chunks of size and weight for use in the furnace.

Business Editors Meet with Hoover

The members of the National Conference of Business Paper Editors attended a meeting at Washington, D. C., recently at which Secretary of Commerce Herbert Hoover discussed national problems as they apply to the business situation of the country, and plans for the coming six months were discussed. A luncheon was enjoyed by the members attending. Approximately thirty-five business publications were represented.

Improvement in Buffalo Business After Many Quiet Months

Most Buffalo machine tool dealers report conditions for this season of the year highly satisfactory. An occasional pessimistic note is sounded but, on the whole, inquiries are good and indicate now that there will be a good buying movement in this district for at least the first quarter of 1924 and that it will probably extend into part of the second quarter of the year. Many inquiries are reported for industrial equipment to be delivered after the first of January or even later in the Winter and Spring. There is an exceptional demand which has been developing during the last ten days, and is likely to increase, for road building machinery and tools that are commonly used in construction. Part of this is said to be due to the fact that the New York State Highways Department is letting its contracts for state road construction in the Autumn now rather than later. All of this equipment is, of course, being quoted for Spring delivery.

Straggling orders in general lines are being placed at the present time, although no orders of mention have been reported in this district in the last ten days. The fact that the few sales are of a general nature and that the inquiries are also general, and from many different points, is considered by some an omen of good, stable business conditions and an excellent condition for the machine tool business.

Inquiries have been common in pipe and pipe fittings as well as allied lines. The electrical line is very quiet, however, the demand for central station equipment being practically at a standstill. There is a demand for industrial electrical equipment of a wide variety.

One of the interesting developments of the week was the report that the Pierce-Arrow Motor Car Co., after a careful study, is about to make delivery of a new chassis designed for bus transportation. The delivery of the first three will be made to a Virginia concern about Jan. 1. The body building is not done here. The motor is six cylinder and is said to develop 125 hp. It is designed to transport a maximum of forty persons at a maximum speed of sixty miles per hour without difficulty.

Chicago Market Gets Many Inquiries

Sales of machine tools in the Chicago district were light this week. With few exceptions industrial concerns are doing little buying of used or new machinery. Inquiries are far in excess of sales and dealers look for a good volume of business in January.

The National Metal Trades Association's free employment office has more applicants than at any period since March, 1922. Large concerns such as the Goodman Manufacturing Co., the Union Special Machine Co., and the Kellog Switchboard & Supply Co. continue operations with scarcely less than their normal working force, but the small concerns in the Chicago district are operating with a greatly reduced working force.

The Cleveland, Cincinnati, Chicago & St. Louis R.R. has placed an order with the Whiting Corp. for a 120-ton, double trolley electric traveling crane. The Missouri Pacific R.R. is reported to have purchased a 400-ton wheel press and a 48-in. car wheel borer. The Chicago, Indianapolis & Louisville Ry. has issued an inquiry for a 48-in. x 10-ft. tool room lathe. The Richmond, Fredericksburg & Potomac R.R. has purchased a 25-ton, 8-wheel standard gauge, steam operated crane from the Orton & Steinbrenner Co. The New York Central R.R. is reported to be now inquiring for about 100 tools. Recent sales to industrials include four planers, one 52-in. x 48-in. x 12-ft., one 36-in. x 42-in. x 10-ft., and two capable of handling material 12-ft. wide, 12-ft. high and 20-ft. long. Also two heavy duty turret lathes and a 12-spindle cluster drill. A Chicago industrial is making inquiry for machines of various descriptions, amounting to about $25,000.

There were several important developments during the last week in the steel industry. One was the abolishing of "Pittsburg Plus" by the La Salle Steel Co., and the other was the reduction in the price of cold drawn screw steel and shafting by the Fitzsimmons Steel & Wire Co. and the Bliss & McLaughlin, Inc.

Western Canada Has Good Gains

Machine shops and small foundries throughout eastern Canada report a slowing up of business, but conditions are just the opposite in Ontario and the Western provinces where the great activity prevailing in the pulp and paper industry is creating an increasing demand for tools and other supplies. Those plants that depend largely on railroad work are looking anxiously forward now for some announcement as to the 1924 construction plans. It is understood the programs of both the Canadian National Railway and the Canadian Pacific Railway have been prepared, but there is no indication as to when buying will commence. It is quite possible that the contemplated extensions of the Canadian National Railways, involving an expenditure of approximately $14,000,000, which were held up by Parliament last session, will be approved at the coming session. This would establish quite an important market for supplies.

Indicating generally enlarged business in Canada during the past year, construction contracts awarded for the eleven months ended November show an increase of nearly thirteen per cent. The total for the period was 293 million dollars, the largest increase being in new construction of public utilities. Total awards during November are placed at $15,632,000, as compared with $21,453,000 in November, 1922. The outlook for the coming year is for a slightly increased volume of general building.

A substantial increase in the net operating revenue of the Canadian National Railways for the first nine months of the year is shown in a report just to hand. The earnings were $6,857,815 compared with $527,313 for the similar period of 1922. The volume of freight moved in Canada in October was the largest in any month during the past two years. This indicated the full swing of the grain movement, but also must be regarded as showing very substantial improvement in business activity.

Inventory Time in Milwaukee

Business in machine tools has assumed the customary aspect of the period immediately preceding the holidays and the close of the year. Manufacturers as well as dealers at present are engaged in gathering up the loose ends and preparing for the inventory and holiday vacation periods. Buyers of metalworking equipment apparently have satisfied their requirements for the remainder of the year and sales have become of a distinctly scattering nature, with only the most urgent and emergency needs being filled.

Local machine tool makers are approaching the end of the year with a smaller volume of unfilled orders than at this time last year. Sales for the year are expected to compare favorably in volume with the preceding year, however. While a year ago a moderately heavy buying movement was setting in late in the Spring, conditions were reversed this year and there has been a gradual slackening of demend since May and June, although several months just past have measured up well with the corresponding months in 1922.

On the basis of increased inquiry in November, which continued to gain in December, builders and dealers in the local machine tool market express confidence that buying activity in 1924 undoubtedly will represent a substantial advance over the year now ending. There seems to be no question in their minds that the caution which became pronounced at mid-year and was then sharply reflected into sales, has been gradually dissolving and the metalworking trade in general looks forward to a new year with substantial hopes of genuine improvement.

Auto Production Steady

Concern over the future of the automobile business, which furnished the most important demands upon manufacturers of metalworking machinery during the past twelve to eighteen months is passing as the result of the progress made by this industry in the face of seasonal influences that ordinarily have made the last three months of each year the lowest in point of sales. While the expectancy is for a substantial absorption of new tools by the passenger car trade, it is believed by many that the coming year will witness a healthy advance by the manufacturers of motor trucks and motor buses which should have a beneficial influence on tool business. While facilities of these departments of the automobile business have not been overtaxed all through 1923, a very real need for greater production is seen in the immediate foreground because of the stronger degree of security in the

future of motor transport of freight and passengers that has appeared in recent months.

The railroad situation and its bearing upon the demand for metalworking machinery has brightened locally. The expectancy of a strong demand has been sustained despite the disappointing manner in which it has developed for the past year, and it is believed that unless the Congress pounces upon the railroads in an unforeseen manner, the financial ability of the carriers to purchase tools and materials will be enhanced to the obvious advantage of virtually every department of the iron, steel and machinery trades.

Quiet Business Is Detroit's Lot

With the approach of the holidays and the general let-up in Detroit's automotive industry for the latter part of December, the machine tool industry is showing a slight decline. This has not reached the proportions of previous years, however, and leaders in the industry are one in their belief that the lull which is approaching is but the forerunner of an active market after the first of the year.

Four new cars, products of smart craftsmanship, have just made their bow to the automobile public. Presaging some of the refinements that will be forthcoming next year, they indicate the strides accomplished in 1923 and herald advances that may be expected generally in 1924.

Balloon tires, four-wheel brakes, automatic spark control, fewer doors, wider doors, and most interesting of all—better prices, are represented in the quartette of new models which has engaged the public interest for the past few days. Attention has been centered on closed cars, with the result that some striking "all-season" types are available.

Expansion Expected

Following closely on the heels of an increase in capital stock of the Paige-Detroit Motor Car Co. from $4,000,000 to $8,000,000, the board of directors has declared a 50 per cent stock dividend. "Expansion policies, combined with the tremendous success of the Jewett during the year 1923 has made possible this liberal dividend payment." Harry M. Jewett, president, declared. "This increased business has also made possible the completion of a new $1,500,000 plant for the exclusive production of the Jewett. This plant will have a capacity of 500 Jewetts daily. Present plants will be turned over to Paige production. These will have a capacity of 150 cars a day."

The same conditions as are found in the Paige plants prevail in every other large automobile factory in this section. With the 4,000,000 mark in car production for 1923 in sight and prospects bright for next year, an absence of fear features industrial activity.

Body companies of the city, with their employees numbering nearly 40,000, report an ever-increasing demand for closed bodies. The open cars are now becoming largely special jobs, it is said, and considerable rearranging has been necessitated in the body plants because of the extraordinary preponderance of closed types called for.

Building figures for the first eleven months are nearly $120,000,000, and the 1923 total will exceed those of 1922, the highest previous year, by more than $30,000,000.

Employment in the city continues to hold its own, a remarkable occurrence for this time of the year.

New York Preparing for New Year

Sales of single tools and a few orders from the railroads that are closing on lists of long standing are the only outstanding features in an otherwise featureless machine tool market in the New York City district. December, never an active month, is living up to tradition, and dealers report that while it is on a par and in some cases better than last December, the month will be below both October and November in the total number of sales.

But next year—that, according to dealers, is another story. Preparations for unusual activity during the first quarter are being made and sales campaigns are being whipped into shape for the expected business during February and March. Inquiries have been very plentiful and advices from most industrials state that after inventory and after appropriations for the year have been made buying will commence.

One dealer expressed the belief that the first two quarters of 1924 would be equally as good as the first two quarters of this year and that the politicians would see to it that the last two quarters would be periods of prosperity as well.

Buying from the automobile shops is expected over the entire year, railroad buying is practically assured, Japan will probably be in the market by the middle of February, and the expansions of general industrials at this time presages equipment buying in March and April.

Dealers in used machinery are of the opinion that business for them, too, will be better and more even during the coming year than in 1923. Business has not been bad with them this year, but it has been unusually spotty and erratic.

Exporting is better than has been the rule for this season of the year and promises to keep above the standards set in other years. Severe weather will mean poor shipping, but it is to be expected and, therefore, is provided for by the exporters.

News of Washington Activities

By Paul Wooton

The budget which just has been submitted to Congress provides $130,000 to enable the Bureau of Standards to co-operate with Government departments, engineers and manufacturers in the establishment of standards, methods of testing and inspection of instruments, equipment, tools, and electrical and mechanical devices used in the industries and by the Government. This includes the practical specification for quality and performance of such devices and the formulation of methods of inspection, laboratory and service tests. This will permit of some expansion of this work. The amount appropriated for the current fiscal year was $100,000.

For technical investigations in co-operation with industries, upon fundamental problems involved in industrial development, with a view to assisting in the permanent establishment of new American industries, the budget carries $180,000. This is $30,000 more than was made available for use during the current fiscal year.

The Brown Plan

Prospects favor the success of the Brown plan for the reorganization of the administrative departments of the Federal Government insofar as concerns the setting up of a Division of Public Works in the Interior Department, and as it pertains to the Department of Commerce.

The main objection to the Division of Public Works comes from the Corps of Engineers of the Army. The plan will include, however, provisions to insure the assignment of engineer officers to river and harbor projects and other public construction.

The major changes in the Department of Commerce have been agreed upon unanimously. The President has authority in law to move the technical bureaus in that Department. The Attorney General now is considering if existing law does not authorize the transfer of all technical bureaus affected by the Brown plan by executive order. It is admitted, however, that legislation will be required to bring about the creation of the public works division of the Interior Department.

So far as the remainder of the proposed reorganization is concerned, there seems little chance of putting it through. Once that heads of departments become wedded to the bureaus under their charge, it is very difficult to reach agreements as to transfers. The remainder of the reorganization plan, it is believed, must await some new administration. If it can be accomplished within the first three months of an administration's course, before it has settled in its tracks, reorganization can proceed smoothly.

Coolidge on Coal

Insofar as it deals with coal, the President's message is ambiguous. It gives the impression that he is not in favor of regulation except during extreme emergency, but there appears to be great difference of opinion as to the significance of what he said. It indicates that he is doubtful whether the Federal Government has any power to fix prices, wages or profits, or take similar action in peace times. He does make the clear-cut statement that he does not believe in Government ownership. This statement could have been little more than a gesture since hardly anyone believes in it and certainly there had been no doubt as to Mr. Coolidge's position concerning the matter.

Programs of Auto Production

With an annual automobile show scheduled for January, leading motor car companies are working out their production schedules for the new year. Some have already fixed their programs for 1924. For companies which have announced their plans, an increase in output is predicted, compared with that reported for 1923. In some instances the increase will be accompanied by a readjustment of the financial structures of the companies.

The Jordon Motor Car Co. of Cleveland, according to reports in the New York financial district, is expected shortly to call a meeting of stockholders to approve an increase in the company's capitalization, and to authorize retirement of the outstanding preferred stock.

The Chandler Motor Car Co. announces that its production program for 1924 calls for 22,500 to 25,000 cars, of which 10,000 are expected to be turned out during the first quarter. The higher production for the first quarter, according to officials, is for the purpose of meeting the heavy demand expected in the Spring. This year, it is pointed out, the company produced 16,600 cars in the eleven months and the total for the twelve months is expected to aggregate 17,500 cars.

The production program of the Hupp Motor Car Co. calls for an output of 50,000 cars next year, of which 75 per cent are expected to be closed cars. Officials declare they were forced to turn down orders for 7,500 cars last Spring because of inability to make deliveries.

The Packard Motor Car Co. announces that its plants are operating on a schedule which calls for a monthly production of 600 single eights and 1,300 sixes. This is capacity operation for the company's factories in Detroit. A greater percentage of closed bodies is being produced than at any time in the company's annals.

Patent Law Amendment Introduced

The following bill was recently introduced in the House of Representatives by Congressman Lampert:

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that whenever a mistake in a patent or trade-mark registration, incurred through the fault of the Patent Office, is clearly disclosed by the records or files of the office, a certificate, stating the fact and nature of such mistake, signed by the Commissioner of Patents and sealed with the seal of the Patent Office, may be issued, without charge, and recorded in the records of patents or trade-marks, and a printed copy thereof attached to each printed copy of the patent or trade-mark registration, and such certificate shall thereafter be considered as part of the original, and every patent or trade-mark registration, together with such certificate, shall have the same effect and operation in law on the trial of all actions for cause thereafter arising as if the same had been originally issued in such corrected form. All such certificates heretofore issued in accordance with the rules of the Patent Office and the patent or trade-mark registrations to which they are attached shall have the same force and effect as if such certificates had been specifically authorized by statute.

Lawsuit Eliminator

"Sec. 2. That section 892 of the Revised Statutes be, and the same is hereby, amended to read as follows:

" 'Sec. 892. Written or printed copies of any records, books, papers, or drawings to the Patent Office, of letters patent, of prints, authenticated by the seal of the Patent Office and certified by the commissioner thereof, or in his name attested by a chief of division duly designated by the commissioner, shall be evidence; and any person making application therefor and paying the fee required by law shall have certified copies thereof.' "

"Sec. 3. That section 11 of the Trade-Mark Act of Feb. 20, 1905 (Thirty-third Statutes at Large, page 724), be, and the same is, hereby amended to read as follows:

" 'Sec. 11. That certificates of registration of trade-marks shall be issued in the name of the United States of America, under the seal of the Patent Office, and shall either be signed by the Commissioner of Patents or have his name printed thereon and attested by an Assistant Commissioner of Patents or by one of the law examiners duly designated by the Commissioner of Patents, and a record thereof, together with printed copies of the drawing and statement of the applicant, shall be kept in books for the purpose. The certificate shall state the date on which the application for registration was received in the Patent Office. Certificates of registration of the trade-marks may be issued to the assignee of the applicant, but the assignment must first be entered of record in the Patent Office.' "

Farrell Urges Export Development

America's opportunity in the industrial world now lies in hitherto undeveloped markets, in the opinion of industrial experts who addressed the third foreign trade conference of the Cleveland Chamber of Commerce recently.

James A. Farrell, president of the United States Steel Corp. and of the National Foreign Trade Council, was the principal speaker. Japan was the chief topic discussed.

Flying Boat Makes New Record

A new record for weight-carrying in flying boats, equipped with one Liberty motor, was made off Raritan Bay, in the new Aeromarine all-metal-hull flying boat, according to an announcement by Paul G. Zimmermann, chief engineer of the Aeroplane Plane & Motor Co.

The flying boat took off after a 65-second run, in a 15-mile wind, carrying 3,445 lb. useful load. This represents 47.2 per cent of the gross weight of the machine.

Hoover Reports on 1923 Activities

Legislation for the revision of the navigation laws, for control of traffic in the air and for stabilization of radio service were among the recommendations made by Secretary Hoover in the annual report of the Commerce Department. The rapid growth of aircraft and radio transmission alike, he said, had created a need for administration development, while the navigation laws, long under scrutiny, required adjustment to the increased commercial expansion.

Within the department itself Mr. Hoover recommended that Congress follow the general reorganization plan prepared under the Harding Administration and make three administrative groupings to deal, respectively, with industry, trade and navigation. He likewise urged Congressional affirmation for the acts by which President Harding created Alaskan fisheries reserves and suggested relief from Federal taxation for Americans resident abroad and engaged in furthering American commerce.

Department's Special Work

Much of the report dealt with the special enterprise, in which the Commerce Department has engaged during the year, designed to standardize commodity and material specifications, to collect facts about world agricultural production and to determine the character of organizations abroad by which it has been charged that American consumers have been threatened with unduly high prices.

"Through the huge export balances of the last few years we have shifted from a debtor to a creditor nation," said Mr. Hoover, "and the theory is now more or less generally accepted that our hitherto normal excess of exports over imports must ultimately shift to an excess of imports, as we have large balances to receive in payment of interest. The gradual reduction of the monthly export excess in 1922, culminating in the Spring of 1923 in four consecutive months in which imports were larger than exports, does not necessarily mean that this time has arrived."

In reviewing business conditions, Mr. Hoover declared activity had increased from month to month during the fiscal year.

New Ford Power Plant Is Nearing Completion

Construction of the first of eight new 62,500-hp. turbo-generators to be installed in the Ford Motor Co. power house at River Rouge, Mich., is 85 per cent completed. The test run is scheduled for January. The second unit is 15 per cent under way.

With all units now planned in place, the Rouge power plant will be capable of producing one-half million hp., taking its place among the greatesst plants of its kind in the world. This enormous power production, according to present plans, will be used entirely for Ford industries and the electrification of the Detroit, Toledo and Ironton R.R. that is owned by Mr. Ford.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
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SOME students of hygiene maintain that an equable climate is depressing to those who live in it. They assert that frequent changes in temperature and humidity stimulate the human organism and that without them men become inert. This is another way of saying that "variety is the spice of life," physically as well as mentally.

Perhaps the same thing is true of business life, for the story of last week's markets is one of normal stability and activity that fails to inspire enthusiasm because it has become monotonous. Cotton is about the only commodity whose price has changed much, but the cotton market would not be normal if it was stable and people are no longer excited by its vagaries. The Government crop estimate putting the crop at 10,081,000 bales was published on Wednesday. It does not prove anything, but it has reawakened the fear of an acute shortage at the end of the season and has enabled the bulls to reform their ranks and rekindle the ardor of their followers.

But the lack of excitement in the dry goods market is noteworthy and cotton goods are not yet selling at the parity of 35 cents for the raw material. The known facts indicate higher prices, but it remains to be seen whether their influence is spent because they are known.

The stock market is in much the same condition. It is firm but it has ceased to advance aggressively. Here again the bullish significance of the known facts is admitted. Railroad earnings are good and many industrial corporations are declaring increased dividends in order to distribute their increased earnings. The only exceptions are the Chicago & Northwestern R.R., which reduced its semi-annual dividend and the "Omaha," which passed its semi-annual dividend altogether. These are both called Vanderbilt properties and the action of their directors caused no little surprise. It is explicable only upon the theory that the payments withheld were required for improvements and maintenance, as the gross revenue of both roads exceeds last year's. It is, however, undeniable that the market for all railway securities is held in check by the fear of adverse legislation by Congress when the railroad bill comes up for consideration.

The bond market is firm and Government securities in particular have worked upward on the buying of "Liberties" attributed to the Federal Reserve banks, who are supposed to be investing their unemployed funds in the open market.

The staples other than cotton have changed but little in price. Sugar is slightly higher upon the downward revision of the large crop estimates previously current. Iron and steel are quieter as is natural in view of the large business booked a month ago. The non-ferrous metals show but little change. The jobbing trade is quiet as usual at the Christmas season, but the department stores report a holiday business that is already well ahead of last year.

Existing conditions and the immediate outlook are, in fact, as nearly normal as could be expected. There is no unemployment and in so far as the economic situation is concerned America's Christmas ought to be a happy one.

> "Existing conditions and the immediate outlook are, in fact, as nearly normal as could be expected. There is no unemployment and in so far as the economic situation is concerned, America's Christmas ought to be a happy one. The November statement of our foreign trade confirms this view. Merchandise valued at 404 millions was exported, while our imports were worth but 292 millions."

The November statement of our foreign trade confirms this view. Merchandise valued at 404 millions was exported, while our imports were worth but 292 millions. The balance of 112 millions in our favor was in a measure offset by November gold imports worth $39,000,000. The probabilities are that the December imports of gold will be even larger and it is quite possible that our net imports of gold during the calendar year will reach $300,000,000, to which must be added the domestic production of gold amounting to approximately $50,000,000.

The effect of this gold upon the commodity markets and business in general continues to be the unknown quantity in the price equation.

There seems to be but little likelihood that we will export any substantial portion of the gold we have accumulated in the near future and the Federal Reserve banks are trying to camouflage it by putting gold certificates in circulation. By this method they may for a time succeed in stifling its inflationary influence, but it is to be doubted whether they can do this much longer and everyone who has even a rudimentary knowledge of economics must admit that when the point of "gold saturation" is reached prices will rise by leaps and bounds. A sub-conscious appreciation of this probability is probably responsible for the steadiness of the markets, while doubt as to its imminence is the only reason for their hesitancy.

The weekly statement of the Federal Reserve System should therefore be closely watched. For last week it shows a decrease of $2,500,000 in the gold held and a reduction of 1.1 per cent in the reserve ratio, which now stands at 75.3. These changes are both due to the holiday demand for currency which seems to have been met chiefly by paying out gold that is likely to come back during January, when it may be practicable to get a better idea of a situation that is without precedent.

The problem is still further complicated by conditions abroad. It is said that much of the floating capital of Europe that is usually kept in London is being transferred to New York in the fear that the success of the labor party in England may give it control of the British government and open the way to an imposition of the "capital tax levy." These transfers will compel London to send more gold here and still further postpone the resumption of specie payment in Great Britain.

As to Germany and France, there is little reason to hope that they can even stabilize their present currency and the exchange value of the franc is slowly declining as the financial condition of the French government becomes understood.

The revolution in Mexico is another discouraging development. That it has come so soon after our recognition of the Obregon government is perhaps fortunate for us as there has not been time enough to put much American capital in Mexico, but it is a great disappointment to those who had hoped that an era of tranquility and prosperity was at last assured for the Mexican people.

The immediate effect in this country has been a decline in all Mexican securities, but its consequences otherwise have not been important and they have caused hardly more than a ripple in the tranquil sea of American prosperity and opulence.

Steel Ingot Production Shows Increase

Production of steel ingots in November aggregated 3,113,804 tons, according to the returns of companies reporting to the American Iron and Steel Institute and producing 95 per cent of the country's output. The companies actually reporting produced 2,969,012 tons. October production totaled 3,547,966 tons, of which the companies reporting produced 3,382,986 tons. In November, 1922, the respective totals were 3,430,309 and 2,889,297 tons.

Germany's Continual Wage Arguments

"Pre-war wages for pre-war efficiency" is the battle cry of the employer—What labor wants and what it will probably get—Will prices take a corresponding drop?

BY OUR BERLIN CORRESPONDENT

WHILE the chaos into which the collapse of the passive resistance has plunged Germany is still deepening, indications are not absent that a new process of crystallization has already commenced. To speak of chaos is hardly an exaggeration. The Ruhr problem in a most critical stage, business at a low-water mark and the void created by the shipwrecked currency, are factors that can hardly be surpassed. They have taken from the country's economic leaders at last some firm resolutions and are commencing to create in the whole population an intense longing for healthier conditions even at the sacrifice of time-honored tradtions.

The ground is being broken for reconstruction on a new basis. The German people are beginning to realize the economic disaster that would result from the detachment of the Ruhr and Rhineland. They seem to reconcile themselves to this possibility as something inevitable. Rhine and Ruhr are now being considered an open wound, which an invisible agency will not let heal. If the rest of Germany is to recover, amputation is regarded in many minds as the last resort.

The belief has established itself as an indisputable truth that, without the good-will of the occupying powers, business on the Rhine and Ruhr cannot revive, no matter what exertion and sacrifices are made, and that the good-will cannot be obtained as long as the two provinces remain members of the German State. This line of thought appears now to shape the course of events. It coincides also with the line of least resistance, which commends itself to a country in such a weak state as Germany. The resistance against the separatist movement is wavering visibly and it would not be surprising to see the alienation of the two provinces. Curiously enough the theory is gaining ground that each of the two parts would separately recover more quickly than in unison.

Solving the Labor Problem

The attitude toward the labor problem is becoming bolder every day. Up to a short time ago, the extermination of the revolutionary labor achievements could scarcely be discussed in public. All that public discussion would tolerate was deliberations on the ways and means to make the rigid eight-hour work day "more elastic" without trespassing on the new rights of the labor classes. In the first stages of the delicate process of readjusting wages on a gold mark basis, the war cry was raised: "Pre-war wages for pre-war efficiency only." Wages were then stated to run considerably ahead of pre-war wages. Firm hands have now taken hold of this important problem, regaining control quickly and to an amazing extent. Backed by the hue and cry for a thorough reform and by dire need, the restraint of the employer's party has broken bounds. The latter is now obviously determined to do complete work. Pre-war wages for pre-war efficiency is being demanded. By pre-war efficiency is meant the restoration of pre-war labor conditions. The present situation is extremely favorable for such retrograde evolution. The labor element has now realized that its revolutionary achievements has not been the blessing it was led to expect. It has had time to pierce through the glittering veil of the ever-increasing figures of its earnings to their concrete value which has not advanced, but steadily dropped behind.

How Labor Feels About It

Labor's resistance now rests chiefly on the allegiance to its dogmas. Even in this respect a change has prepared itself as the levelling process has secretly alienated the best part of the labor element from those dogmas. This part is longing for the old-time differentiation of wages and a fair reward for efficiency and diligence. Besides, the keen edged weapon of the labor classes—the strike—has become quite blunt. The unions' coffers are empty and many manufacturers would rather welcome a strike. The weakness of the labor position was amply evidenced by the fixation of the first gold wages. The employers' organization had repeatedly announced that 75 per cent of pre-war wages constituted the utmost limit to which industry could go. The trade unions were aiming much higher. They claimed the double of pre-war wages, expecting that the usual compromise, which to achieve is the function of the arbitration boards, would land them at a level of about 150 per cent.

The employers are firm, knowing that the first gold wages would establish a standard of rates of a lasting nature and they realized the momentous issue at stake for the shaping of the immediate future. In the contests following, the greater strength is on their side. A number of strikes, under circumstances unheard of since the labor party came into power, have confirmed this fact. The result was that employers have, step by step, retreated from their 75 per cent limit. The first gold wages of the miners have just been adjusted at an average of 4.20 gold mark for the Ruhr and about 2.50 gold mark for the German interior. The strong differentiation made in favor of the Ruhr miners is purely temporary and explained by the exceptional conditions in the district. For a 7½ hour shift, 2.50 gold mark or about 30 pfennigs may be regarded as the standard awarded to that class of workmen. The average in 1913 for a 10 hour shift was 4.00 gold mark or 40 pfennigs. The new rates correspond approximately with 75 per cent of pre-war rates. In subsequent adjustments, a much lower ratio was proposed by the employers. The State administration, the largest employer, is actually engaged in negotiations with the workmen's organization on a basis of from 20 to 27 pfennigs per hour, corresponding with barely 50 per cent of pre-war wages. This is being done at a time when the gold mark has hardly a third of its pre-war purchasing power. The workmen are being consoled by the theory that an increase of the production will again raise the purchasing power of the currency.

The first blood drawn in the contest has brought an easy victory to the employers. Encouraged by this fact, they have now put all their "guns" in position. As would be expected, the Ruhr industrialists have opened the attack. After serving their whole working force with a notice of dismissal, they have forwarded to the unions new stipulations under which they declare to be prepared to take them on again. These new stipulations are in fact old ones drawn up on the lines of pre-war conditions, especially regarding the work-day and piece work payment. The outcome of the struggle now waged around these stipulations is still undecided, but it is a significant fact that they have not been repudiated by the unions and have actually been taken into discussion. The Ruhr industrialists have let it become known that they intend to run only two shifts per day in the future, and that their working forces will be reduced 30 per cent. If they succeed, an example is set for the rest of industry.

The Other Question—Prices

But if there seems to be a solution of the labor question, the price situation is still in a serious state. From the basic products upward, prices have surpassed their corresponding pre-war level. The low wage rates now enforced are resting upon a very fragile foundation. If the price level cannot be screwed down accordingly, the firm ground now almost within reach will be lost. Much is hoped in this respect from the automatic levelling action of a stable currency. Whether the latter alone will be capable to reduce the hot-house growth of prices to a proper size, may be doubted.

Quite unnoticed in the general trouble is an executive order that has been issued supplying the government with a formidable weapon to cut down such exuberances of the inflation period. This order is drawn up along the lines of the United States Anti-Trust bill, but is more far-reaching, and allows swifter action. It enables the government to annul every sort of agreement, verbal or written, tending to unduly raise prices and maintain them at a level detrimental to the public interests. In place of slow legal machinery, a special court is established to deal speedily and thoroughly with all cases brought to its notice.

Personals

JAMES L. GOUGH has been appointed sales manager of the Stoker-Rumely-Wachs Co., Chicago, Ill.

H. P. DUVAL has been appointed representative in the Missouri district for H. D. Conkey & Co., Chicago, Ill. His headquarters will be located at 301 American Bank Bldg., Kansas City, Mo.

CLINTON G. ARMSTRONG, formerly consulting metallurgist for the Chicago Flexible Shaft Co., and research metallurgist of the Western Electric Co., has joined the Calorizing Co., Pittsburgh. He will serve in capacity of sales engineer and will be connected with the Chicago office of the Calorizing Co.

HOLLIS T. WALDO has resigned his position with the Goulds Manufacturing Co., and has opened an office in Haverhill, Mass., as an hydraulic engineer.

LOUIS R. KRUGER has resigned as general superintendent and mechanical engineer of the Cruver-Peters Co., Chicago, Ill., and has accepted a position as mechanical engineer and adviser to Mrs. Chas. Stein of California. His new address is 805 Bush St., San Francisco, Calif.

S. A. GILLIARD has been appointed sales agent for H. D. Conkey & Co., Chicago, Ill., in the Buffalo, N. Y., district. His headquarters will be at 405 Liberty Building.

J. HUBERT DOUGHERTY, who for seven years has been manager at Toronto for the General Supply Co. of Canada, Ltd., has been transferred to the management of that company's office in Montreal. W. H. QUA, who has been with the company for the past four years, succeeds Mr. Dougherty in charge of the Toronto office.

WILLIAM W. COCHRAN, automobile body expert, who recently returned from an inspection of European motor car factories and body plants, has been appointed superintendent of the Wills-Sainte Claire trim shop at Marysville, Mich.

H. C. KEYSOR has been made works engineer at the Pittsburgh plant of the American Steel Foundries Co. Mr. Keysor for the past four years has been employed at the Alliance, Ohio, plant of the same company, acting as special investigator, assistant foundry foreman and inspector.

Obituary

JULIUS C. BIRGE, vice-president of the Ames Shovel & Tool Co., St. Louis, Mo., died recently in that city.

WILLIAM H. COOLEY, treasurer of the New York Car Wheel Co., Buffalo, N. Y., died recently at his home in that city.

ANTONIO C. PESSANO, chairman of the board of directors of the Great Lakes Engineering Works, Detroit, Mich., died recently in New York City.

GEORGE DUDLEY LOOMIS, aged 77 years, is dead at his home in Tiffin, Ohio. He was president of the Loomis Machine Co. and was also identified with many other metal working plants in that locality.

STEPHEN C. MASON, president of the National Association of Manufacturers from 1918 to 1921, died recently at his home in Pittsburgh, Pa., as a result of dilation of the heart. He was 62 years of age. He was secretary and director of the McConway & Torley Co. since 1896 and was widely known in railroad circles.

EDWARD L. THOMAS, president of the Thomas Grate Bar Co., died at his home in Birmingham, Ala., recently after an illness of several weeks. Mr. Thomas was formerly of Valdosta, Ga., going to Birmingham some years ago at which time he established the above company. He was the inventor of the patent grate bar which this company manufactured.

RALPH E. GILMAN, special engineer in charge of turbo-generator engineering of the Westinghouse Electric & Manufacturing Co., died in the Methodist Hospital, Los Angeles, Dec. 5.

Discuss Standards for Page Sizes

A special committee on size of publications for standards of the American Engineering Standards Committee met on Dec. 13, under the chairmanship of Henry M. Hobart, consulting engineer of the General Electric Co., at the Engineering Societies building to discuss standard sizes for publications dealing with standards as published by engineering societies. While the work of this committee does not deal directly with the sizes of sheets as made by the paper mills, it is largely dependent on the sizes if waste in trimming is to be avoided. This committee ties up the sizes of sheets with the work done at the Bureau of Standards looking toward the simplification of paper sizes. The Bureau found that, although there were 333 sizes made, 90 per cent of the publications printed could be handled by 4 sizes of sheets.

The standards recently adopted by the Germans were shown and, while these are not far from the sizes which will probably be adopted in this country, they are enough different to give a sheet of different proportions than we are accustomed to see, and one that would not file easily in our standard filing cabinets. This is to be regretted because the German standards have also been adopted by Austria, Switzerland and Holland and are also being seriously considered by the Belgians.

This question of size has long been studied in this country and there is a strong tendency toward the adoption of 7⅜x10⅝ in. as the standard size for engineering codes, data, etc. There is a tolerance of ⅛ in. for variation in trimming. Folding this once gives 5⅛x7⅜ in. for pocket literature, and this size is also being used in many cases. These sizes are cut from the standard 32x44-in. sheets with the usual trimming.

While no direct recommendations were made, it was the sense of the meeting that the size of 7⅜x10⅝ in. was best for the publication of engineering data and standards, except for pocket use.

Business Items

With a capitalization of $200,000, the H. J. Logan Co., Toronto, Canada, has been incorporated to manufacture and deal in machinery, by Robert Wherry, William Zimmerman and W. H. Osborne.

The correct address of the Chicago office of the Van Dorn Iron Works Co., Cleveland, Ohio, is 167 Monroe St.

The Steel Products Corp., Sheboygan, Wis., recently incorporated with $100,000 capital, has perfected its organization by the election of the following named officers: President, A. G. Stuedeman; vice-president, Robert C. Ebenreiter; secretary and treasurer, Fred Zschetzsche.

The Marathon Battery Co. of Wausau, Wis., has been incorporated with a capital stock of $150,000 for the purpose of engaging in the manufacture of storage batteries, dry batteries, electrical devices and appliances, equipment and general electrical merchandise. The incorporators are W. H. Thom and Edgar J. McEachron of Wausau, and E. A. Fuller of Madison, Wis.

The plant and equipment of the Hercules Steel Casting Co. of Milwaukee is being offered for sale by E. L. Cullen, receiver, 871 Robinson Ave., Milwaukee. Bids are now being received and will close Jan. 21, 1924, at 5 p.m. The corporation was placed in charge of a receiver by the state courts several months ago. The equipment includes a 10-ton tilting electric furnace and all appurtenances, including electric cranes, core ovens, iron and wood flasks, welding torches, etc. The capacity is 300 tons a month, with a payroll of 100 men. There is a pattern and carpenter shop, pattern storage vault and a warehouse building.

The General Machinery Co., Spokane, Wash., has been appointed representative for the Eastern district of the state of Washington for the Chicago Pneumatic Tool Co., New York City.

J. E. Rhoads & Sons, leather belting manufacturers, have opened a store in Atlanta, Ga. The main office for the concern is in Philadelphia.

The Brock Engineering Corp. has received incorporation papers from the Secretary of State of Missouri. The company will manufacture and deal in steam boilers. The capital is to be $100,000. The incorporators are: Edward J. Brock, A. J. Brock, V. D. Sears and C. B. Brockett. Offices have been opened in the Arcade Building, St. Louis, Mo.

The Western Tool & Wrench Co., of San Francisco, has been incorporated with a capital stock of $50,000. The directors are: A. W. and Herman Peterson and John Henry.

The Wausau Motor Parts Co. of Wausau, Wis., a new $50,000 corporation, has been organized to take over the entire business and interests of the Menominee Piston Ring Co., of Menominee, Mich. The plant and equipment is being transferred to Wausau and installed in a leased building. Additional purchases of machinery are contemplated, as in addition to piston rings the Wausau concern intends to manu-

facture pistons and other motor and engine replacement parts. Later general automobile accessories will be manufactured as well.

The C. W. Rood Engineering Co., Wisconsin Rapids, Wis., is engaging in the manufacture of machinery as a development of its general engineering practice, and has taken over the Johnson & Sons Machine Co. of the same city. A new shop is being set up in one of the large factory buildings of the F. McKinnon Co., manufacturer of wagons and automobile bodies. The machinery acquired from the Johnson company will be materially supplemented. The Rood company will specialize in the construction of hoisting and excavating machinery, continuing also the Johnson company's policy of building custom machinery.

The Prime Mfg. Co., 653 Clinton St., Milwaukee, manufacturer of brass castings, hardware specialties, automobile trunks, etc., has engaged Frank D. Chase, Inc., engineer, Chicago, to make plans for its proposed new brass foundry, to be 60x120 ft., fireproof, and cost about $65,000 with full equipment.

The Northwestern Fence & Wire Co., Milwaukee, has been incorporated under the laws of Wisconsin for the purpose of manufacturing and dealing in all kinds of wire goods. The capital stock is $50,000 and the incorporators are Daniel V. Holcomb, John Selbo and William Clark. The company has established offices at 290 Third St.

The organization of a new company to succeed the Anderson Foundry & Machine Co., a subsidiary of the R. L. Dollings Co., Anderson, Ind., has been agreed upon by committees representing stockholders and creditors of the company. The joint committee by resolution appointed a subcommittee, consisting of Bert McBride, of Indianapolis, receiver for the R. L. Dollings Co. in Indiana; William O. Barnard, Newcastle; Emerson McGriff, Portland; William S. Diven and Charles K. Pagot, of Anderson, to handle the reorganization affairs.

Trade Catalogs

Power Piping Systems. The Pittsburgh Valve, Foundry & Construction Co., Pittsburgh, Pa. A particularly interesting booklet on power piping systems has been issued by this company. It contains forty 8½x11-in. pages exceptionally well illustrated and the various parts of the Atwood power piping system concisely but clearly described. Standard specifications for power piping are given and there are tables of dimensions to be found as well.

Electric Controlling Apparatus. The Cutler-Hammer Manufacturing Co., Milwaukee, Wis. The catalog containing bulletins with prices and dimensions of electric controlling apparatus has been issued by this company for November.

Automatic Machines. The Cleveland Automatic Machine Co., Cleveland, Ohio. Production Bulletin No. 4 is the title of this booklet in which the various machines and parts for machines are illustrated and described.

Flexible Couplings. Smith & Serrell, Central Ave. at Halsey St., Newark, N. J. The Franeke flexible coupling for direct-connected machines are described and sectional, charted and "close-up" photographs are to be found in the booklet as well as charts and tables of sizes and dimensions.

Small Tools and Gages. Catalog No. 11. The Pratt & Whitney Co., Hartford, Conn. All of the small tools produced by this company are listed in this 494 page catalog. Tables, charts and prices are also to be found.

Pamphlets Received

The Annual Report of the Director of the Bureau of Foreign and Domestic Commerce. Department of Commerce, Washington, D. C. The report this year, 1922-1923, differs from the preceding similar reports in several important particulars. It records an unprecedented demand for the services and assistance from the bureau, nearly a million requests having been received in the course of the year. A notable advancement has been made in the quality of the Bureau's statistical services during the year. Contacts between the Bureau and those whom it serves in business have been made more direct and helpful, it is pointed out in the report, and other features that have made the department of greater value are listed and described.

Emergency Braking on Electric Cars. D. D. Ewing. Bulletin of Purdue University, Lafayette, Ind. This is bulletin No. 13 of the Engineering Experiment Station of the University containing 163 pages devoted to observations on the subject, summaries of test data, illustrations showing various experiments and many charts showing the results of emergency braking where tests have been carried out.

Annual Report of the Director of the Census. Government Printing Office, Washington, D. C. This report covers the fiscal year ending June 30, 1923, and is made to the Secretary of Commerce. General and special censuses, including industrial statistics, and the work of collecting these data, is clearly but briefly told.

What's Ahead for American Business? P. F. McDonald & Co., Boston, Mass. Expressions of opinion as to the trend of business are contained in this booklet. Such men as Charles M. Schwab, E. M. Herr, Elbert H. Gary, Roger W. Babson, George M. Verity, H. B. Thayer, Charles L. Allen, Howard Coonley, and others are quoted.

Readjustment of Relative Freight Rate Schedules. United States Chamber of Commerce, Washington, D. C. This is the report of Special Committee No 3 and the case of the present rates and the need for readjustment are reported.

An Employee's View. H. E. Core, general chairman, Brotherhood of Locomotive Firemen and Enginemen, Pennsylvania R.R., Philadelphia, Pa. How the plan of employee representation on the Pennsylvania R.R. is actually working, is reported in this booklet which contains the speech that Mr. Core recently delivered at the New York Railroad Club. He describes the amicable settlement of industrial disputes by the methods in effect on this railroad as "amazing."

Engineering Education and American Industry. National Industrial Conference Board, 10 East 39th St., New York City. This is special report No. 25, in which the subject of engineering education is told in detail. The booklet is divided into three parts: "The Need for Trained Leadership in Industry"; "The Educational Problem"; and "The Responsibility of Industry." Other headings are: "The New Problems of Industry"; "The Present Requirements of Industry"; "Future Requirements"; "The Kind of Talent Necessary"; "The Engineering School"; "Tendencies of Engineering Graduates"; "Developments in Engineering Courses"; "Suggestions for Industrialists"; "Training in Fundamentals"; and "Selection and Classification of Students."

The De Bothezat Barograph, Type "A." Published by the Chief of the Air Service, Washington, D. C. W. F. Gerhardt has prepared this paper which is one of the series of Air Service Information Circulars. He is of the engineering division of McCook Field, Dayton, Ohio. The general features of the mode of operating the Barograph are outlined. Half-tone illustrations, charts and tables of interest to readers are to be found in the booklet.

Shall the United States Enter the International Labor Organization? Magnus W. Alexander, M. W. Alexander, 10 East 39th St., New York City. This is a reprint from the *New York Times* of Feb. 25, 1923, in which Mr. Alexander who is managing director of the National Industrial Conference Board sets forth both sides of this interesting question.

Anti-Friction Bearings in the Steel Mills. A. M. McCutcheon, Chief Engineer, the Reliance Electric & Engineering Co., Cleveland, Ohio. This paper was presented before the Association of Iron and Steel Electric Engineers and is an exhaustive survey of the subject.

Power and Its Application from the Seventeenth Dynasty to the Twentieth Century. The Morse Chain Co., Ithaca, N. Y. This is an address delivered by F. L. Morse at the twenty-sixth annual convention of the American Mining Congress held in Milwaukee, Wis., during September. The pamphlet is profusely illustrated with reproductions of etchings and drawings of the ancients showing the various crude methods of power and the improvements that have been made up to the present day of belts, shafting and chain drives.

Final Report of the Federal Fuel Distributor to the President of the United States. Government Printing Office, Washington, D. C. The work of F. R. Wadleigh, Federal Fuel Distributor, and how it has been carried out, is told in this government pamphlet. There are many tables showing coal production, distribution and other data of general interest.

Visibility of Radiant Energy. K. S. Gibson and E. P. T. Tyndall. Published by the Department of Commerce, Bureau of Standards, Washington, D. C. This is a scientific paper of the Bureau of Standards, No. 475, and contains valuable data, charts, tables and text pertaining to the subject.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Machinery. Landskrona, Sweden. Agency. Reference No. 8432.

Machines and supplies for various industries. Harbin, China. Purchase. Reference No. 8470.

Pumps and pump and pipe fittings. Habana, Cuba. Agency. Reference No. 8418.

Tools in general and interchangeable wrench sets. Nantes, France. Reference No. 8421.

Tools and precision apparatus. Bucharest, Rumania, Purchase and agency. Reference No. 8409.

Forthcoming Meetings

American Society for Steel Treating. Winter sectional meeting. Hotel Seneca, Rochester, N. Y., Jan. 31 and Feb. 1, W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

Society of Automotive Engineers. Annual meeting, Jan. 22 to 25, at the General Motors Building, Detroit, Mich. Coker F. Clarkson, 29 W. 39th St., secretary.

American Gear Manufacturers Association. Spring Meeting. April 28, 29 and 30, 1924. Lafayette Hotel, Buffalo, N. Y.

Society of Industrial Engineers. Eleventh annual convention. Buffalo, N. Y. April 30, May 1 and 2. Headquarters, 608 S. Dearborn St., Chicago, George C. Dent, executive secretary.

Southern Supply & Machinery Dealers Association, National Supply & Machinery Dealers Association, and American Supply & Machinery Manufacturers Association. Triple convention, May 19, 20 and 21, 1924, Hotel Cleveland, Cleveland, Ohio. F. D. Mitchell, secretary-treasurer, 1819 Broadway, New York City.

Foreign Trade Council. Eleventh annual convention at Boston, June 4, 5 and 6. O. K. Davis, India House, Hanover Square, New York City, secretary.

The General Committee of Dividion V, Mechanical of the American Railway Association. Convention and exhibits. Atlantic City, June 11-18, 1924.

Railway Supply Manufacturers Association. Exhibit. Atlantic City, June 11-18, 1924.

The Lyons Fair. Lyons, France. March 3 to 17, 1924. Information furnished by Emile Garden, 50 Church St., New York City.

New and Enlarged Shops

Machine Tools Wanted

Conn., Bridgeport—A. L. Clark Co., 1710 Main St.—equipment for $150,000 proposed machine shop and service station.

Conn., Middletown—School Bd. E. B. Sellew, Supt.—wood and metal lathes, machine shop equipment, etc., for trade school.

Ill., Chicago—Union Pacific R.R., 58 East Washington St., G. C. Smith, 15th and Dodge Sts., Omaha, Neb., Purch. Agt.—about seventeen machine tools, including engine lathes, drill and bushing presses, grinder, drills and boring mills.

Ill., Peru—W. H. Maze Co.—18 in. shaper and belting for machine shop.

Ill., Rockford—Automotive Corp., 315 South Church St.—drill press and chain hoist for garage.

Kan., Frontenac—Fuertsch Garage—hand tools and drill press.

Kan., Girard—Central Garage, 202 South Ozark Ave., E. S. Couder & Son, Purch. Agts.—drill press and 14 in. x 6 ft. lathe.

Kan., Girard — County Garage, C. M. Cooper, Purch. Agt.—drill press; 18 in. x 12 ft. lathe; regrinding and reboring machine; line shaft; motor burning in machine.

Kan., Girard—W. J. Farrell, 220 South Ozark Ave. (electric and automobile service)—drill press.

Kan., Girard—North Side Garage, North Side Sq., D. R. Jones, Purch. Agt.—drill press and post drill.

Kan., Girard — W. Shivner, 205 North Cherokee St.—12 in. x 8 ft. lathe.

Kan., Girard—Snow's Machine Shop, 109 North Ozark Ave., S. R. Snow, Purch. Agt.—stamp machine.

Kan., Pittsburg — Deckard Steel & Iron Co., 4th and Smelter Sts., C. L. Deckard, Purch. Agt.—milling machine, standard dies.

Kan., Pittsburg—Pittsburg Boiler & Machine Wks., A. Sikesetter, Purch. Agt.—hand tools, planers, air tools, shapers and tools for heavy machine work.

Mich., River Rouge—Whitehead & Kales, 58 Haltiner St., H. C. Vance, Purch. Agt.—high speed drill, one heavy type plain production and one hand milling machine.

Minn., St. Paul—Siems-Stembel Co., 2600 Como Ave., G. Zak, Purch. Agt.—punches, shears, air compressors, drills, hydraulic press, etc., for car building and repair shops.

Mo., Pierce City—Stuckey Auto Co., D. E. Stuckey, Purch. Agt.—drill press and lathe (used).

N. J., Newark—Bd. Educ., R. D. Argue, Secy.—receiving bids until Dec. 27 for sheet metal shop machinery, pumps and valve reseating outfit, etc.

N. Y., Baldwinsville—Penn Spring Wks., Lock St.—machinery and equipment, including automatic machine tools, for addition to factory for the manufacture of automobile springs and bumpers.

N. Y., Binghamton—J. Shulman, 22 Collier St.—garage repair shop tools and equipment.

N. Y., Buffalo—F. C. Brindler, 228 Ideal St.—equipment for garage repair shop.

N. Y., Buffalo—Buffalo Genl. Electric Co., River Rd.—complete machine shop machinery and equipment to replace fire loss.

N. Y., Buffalo—Federal Addressing Machine Corp., 11 Goodell St.—No. 1 milling machine and 16 in. x 8 ft. lathe, quick change gears.

N. Y., Buffalo—P. E. Green, 230 North St.—equipment for garage repair shop.

N. Y., Buffalo—E. Lowry, 175 North St.—equipment for garage repair shop.

N. Y., LaFargeville—E. Schell—acetylene welding outfit, drill press and tools for garage repair shop.

N. Y., Utica—Dairyman's League, Wurz Ave.—tools, vise and equipment for automobile repair shop.

N. Y., Utica—R. Metzger, Lafayette St.—machinery, tools and equipment for automobile repair and paint shop.

N. Y., Watertown—Northrop Motor Co., 123 Benedict St., S. B. Northrop, Purch. Agt.—tools and equipment for expansion program.

O., Cincinnati—J. Steptoe Co., 2951 Colerain Ave.—bevel gear cutter andgear hobbing machine for gears up to 24 in. diameter (used).

O., Columbus—F. Girard Co., 196 East Gay St.—two electric drills, press, grinder, etc., for new service station.

O., Youngstown—H. Steinfurth, Wirt St.—machinery, tools and equipment for repair and machine shop.

Pa., Allentown—P. Bower, 632 North 8th St.—tools and equipment for garage repair shop.

Pa., Allentown — Quick Service Garage, Rear 131 North 7th St., C. H. Kemmerer, Purch. Agt.—lathe, tools and equipment for repair shop.

R. I., Pawtucket—New England Machine & Electric Co., 31 Bayley St.—large and small machine tools for proposed $25,000 shop.

Wis., Appleton—Kurz Motor Car Co., 1107 College Ave.—automobile repair machinery, chain hoist and small tools.

Wis., Lakemills — Overland Garage Co., c/o O. W. Farmer, Mgr.—automobile repair machinery, small tools, gasoline tanks and pumps for proposed $40,000 garage.

Wis., Madison—L. F. Schollkopf, 210 East Washington Ave.—drill press, chain hoist and small tools for repair shop.

Wis., Milwaukee—Amer. Plier & Tool Corp., c/o O. L. O'Boyle, 221 Grand Ave.—machine tools, including grinder and drill.

Wis., Mondovi—Hardy Motor Co., W. J. Hardy, Mgr.—automobile repair machinery, small tools, gasoline tanks and pumps for proposed garage and repair shop.

Wis., Oconto—E. W. McAllister (machinist)—boring machine and drill press.

Wis., Oshkosh—Oshkosh Mfg. Co., 412 South Main St.—punch and shear, capacity ½ x 2 in. mild steel.

Wis., Ripon — Advertisers Mfg. Co. — special metal working machinery for the manufacture of metal advertising signs, etc.

Wis., Sheboygan—Jenkins Machine Co., South 8th St.—special machinery for the manufacture of woodworking tools and machinery.

Wis., Sheboygan — Steel Products Corp., 426 Grant St., F. Zschetzche—special machinery, including shears, hacksaws, drills, grinders and presses, for foundry for the manufacture of automobile bumpers.

Ont., Cornwall—L. Brunet, Montreal Rd.—bench lathe for automobile repairs.

Ont., Moose Creek—T. Dewar—lathe for garage.

Ont., Wakefield — Joyce Bros. — press, tools, etc., for automobile repair shop.

Ont., Wiarton—W. McCrabb—tools and machinery for proposed $40,000 garage and repair shop, to replace that which was destroyed by fire.

Ont., Woodstock—Bickle Fire Engine Co.—metal working machinery, tools, etc., to enlarge plant.

Que., Montreal—J. G. Berthiaume, 2878 St. Lawrence Blvd.—automobile repair machinery.

Que., Montreal—E. Brunelle, 341 Alwin St.—tools and equipment for garage.

Que., Montreal—J. A. Dufresne, 692 Albert St.—equipment for automobile repair shop.

Que., Montreal—A. Dussault, 367 Jeanne d'Arc St.—equipment for garage repair shop.

Que., Montreal—J. Escata, 792 Berri St.—tools and equipment for automobile repairs.

Que., Montreal — Hamelin & Frere, 1821 Notre Dame St.—repair tools and equipment for garage.

Que., Montreal—J. T. Repair Shop, 654 Drolet St., A. Jones, Purch. Agt.—tools and general equipment for automobile repair shop.

Que., Montreal — A. Laurin, 2320 Blvd. Gouin, W.—small lathe for automobile repair shop.

Que., Montreal — J. Leclerc, 1481 St. Dominique St.—repair tools, press, etc., for garage.

Que., Montreal—L. Poitras, 2535 Clarke St.—equipment, tools and emery wheel for garage.

Que., Montreal—L. Rottella, 1666 Papineau Ave.—garage and repair equipment.

Que., Montreal—H. Signori, 631 Dorchester St., E.—machinery and equipment for garage.

Que., Montreal—F. Stephens, 11 Duluth Ave., E.—tools and equipment for garage.

Machinery Wanted

Calif., Oakland—R. C. Durant, 10910 East 14th St. and A. G. Waddell, 346 Hanover St.—machinery and equipment for proposed plant for the manufacture of transmissions for Star motor cars at Los Angeles.

Conn., Hartford—Standard Mattress Co., 711 North St.—steel conveyors for proposed $40,000 factory.

D. C., Wash.—Bureau of Yards & Docks, Navy Dept. — laundry equipment for Brooklyn.

Ill., Forest Park (Oak Hill P. O.)—H. Huxhold—one large air compressor.

Ia., Bayard—Bulletin—10 x 15 in. or 12 x 18 in. job printing press.

Kan., Girard—Electric Shoe Shop, South Side Sq., L. H. Harmon, Purch. Agt.—nailing machine.

Kan., Girard—Girard Garage, 212 South Ozark Ave., R. Morris, Purch. Agt.—electric drill for automobile repairs.

Kan., Kansas City—Pouton Bros., Wyandotte St., between 10th and 11th Aves.—Miehle perfecting press.

Kan., Pittsburg—When Shoe Shop, 422 North Bway., F. P. Wadlow, Purch. Agt.—shoe nailing mahine.

Kan., Wichita—T. F. Roy, 113 North Osage St. (cabinet maker)—one 6 in. and one 8 in. jointer, also pony planer.

Me., Rockland—School Com.—wood and metal working machinery for manual training department of new high school.

Md., Glenelg — G. H. Paul — linotype, cylinder press, one 8 x 12 in. and one 12 x 18 in. job printing press, automatic feeders, folder, multicolor printing press, card press, stitcher, miter, paper cutter, Ludlow machine, monotype machine, saw and metal cutter.

Mass., East Boston (Boston P. O.)—Boston Sand & Gravel Co., 300 Condor St.—electric coal hoist and tower with thru boom, to handle 1½ yd. bucket; possibly electric traveling crane, 60 ft. boom (used preferred).

Mass., Unionville—Ray Cotton Mills—several picking machines.

Mich., Detroit—Detroit House of Correction, 1441 Alfred St., E. Dennison, Supt.—cooling room, washing room and bottling equipment, also refrigerating system, sterilizing plant, etc., for milk house for farm at Plymouth.

Mich., Highland Park (Detroit P. O.)—Ford Motor Co.—mechanical equipment, including conveyors and material handling equipment, for proposed assembly plant at Jacksonville, Fla.

Miss., Belzoni—The city, F. M. Pepper, Clk.—receiving bids Jan. 10 for coal conveying machinery, etc.

Mo., Granby—Weekly News Herald, G. W. Dugan, Purch. Agt.—newspaper cylinder press and paper cutter (used preferred).

Mo., Kansas City—Acme Filling Sta., 2733 McGee St.—air compressor and tank.

Mo., Kansas City—Unity Publishing Co., 9th St.—Miehle perfecting press.

Mo., Pierce City—W. B. Jones Publishing Co.—paper cutter, Miller job press and feeder (used)

Mo., St. Charles—St. Charles Sand Co.—10 ton truck scale.

Mo., Seneca—W. R. Dutton—newspaper press, belting, hangers, pulleys and shafting.

N. Y., Albany—Williams Press, Inc., Market Sq., D. L. Williams, Pres.—one sheet feed rotary press similar to Cottrell make.

N. Y., Boonville—A. C. Capron—complete machinery and equipment for proposed feed mill and cold storage plant, to replace that which was destroyed by fire.

N. Y., Buffalo—Buffalo Fdry. & Machine Co., 1543 Fillmore Ave.—equipment.

N. Y., Buffalo—E. Herrmann, 267 Elm St.—laundry equipment.

N. Y., Buffalo—J. Ricotta, 463 Front Ave.—equipment for concrete block factory.

N. Y., Buffalo—S. White, 382 Sycamore St.—equipment for concrete block factory.

N. Y., Buffalo — J. P. Ziemiacki, 116 Howell St.—equipment for concrete block factory.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Improvement in demand for basic pig iron. Reserve iron stocks getting low; price advance anticipated. Little importing being done owing to comparatively low price of American iron. Steel prices continue firm. Bars not under $2.40 per 100 lb. at mill. Shapes unchanged at $2.50 base. Firmness in nuts, bolts, rivets, etc., at Pittsburgh mills. Consumers' stocks low owing to inventory. Better demand expected at beginning of new year.

Advances—Copper demand improved; price of electrolytic up ¼c. per lb. in week. Lead market strong; advanced ⅛c. per lb. Tin prices tending upward.

Declines—Zinc market easier; quotations about 15c. per 100 lb. below those of a week ago. Antimony quiet; no change in price. Furnace coke down about 50c. and foundry, 25c. per ton in week.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.05
Northern Basic	24.00
Southern Ohio No. 2	24.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	28.00
BIRMINGHAM	
No. 2 Foundry	22.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.25
Virginia No. 2	28.17
Basic	24.00
Grey Forge	24.00
CHICAGO	
No. 2 Foundry local	24.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	27.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.77
Basic	25.77
Bessemer	26.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.75
Cleveland	4.75
Cincinnati	5.00@7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh	New York	Cleveland	Chicago
No. 10	2.90@3.00	4.34	3.75	4.00
No. 12	3.00@3.10	4.39	3.80	4.05
No. 14	3.10@3.20	4.44	3.85	4.10
No. 16	3.30@3.40	4.54	3.95	4.20
Black				
Nos. 17 and 21	3.70	4.30@4.55	4.45	4.70
Nos. 22 and 24	3.75	4.35@4.60	4.50	4.70
Nos. 25 and 26	3.80	4.40@4.65	4.55	4.75
No. 28	3.85	4.50@4.75	4.65	4.85
Galvanized				
Nos. 10 and 11	3.85@4.00	4.50@4.80	4.70	4.85
Nos. 12 and 14	3.95@4.10	4.60@4.90	4.80	4.95
Nos. 17 and 21	4.25@4.40	4.90@5.20	5.10	5.24
Nos. 22 and 24	4.40@4.55	5.05@5.35	5.25	5.40
No. 26	4.55@4.70	5.20@5.45	5.50	5.55
No. 28	4.85@5.00	5.50@5.75	5.80	5.85

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4%; class A, plus 23%. Cast iron, standard sizes, 34% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0,17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.20
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.70
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	8.35
Floor plates	5.80	5.66	5.80
Cold drawn shafting or screw	4.40	3.90	4.30
Cold drawn flats, squares	4.90	4.40	4.80
Structural shapes (base)	3.64	3.46	3.30
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.10@3.15 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			13.87½
Tin, 5-ton lots, New York			48.87½
Lead (up to carlots), St. Louis	7.40	New York	8.12½
Zinc (up to carlots), St. Louis	6.25	New York	6.60

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.20	27.00	28.50
Antimony (Chinese), ton spot	9.75	10.50	10.25
Copper sheets, base	21.00	21.00@21.25	23.00
Copper wire, base	16.25	19.00	16.25
Copper bars, base	20.00	22.50	19.50
Copper tubing, base	23.50	27.25	23.00
Brass sheets, base	17.75	22.00	18.75
Brass tubing, base	22.00	27.00	20.50
Brass rods, base	15.50	18.00	15.75
Brass wire, base	18.25	22.00	....
Zinc sheets (casks)	10.25	10.45	....
Solder (½ and ½), (case lots)	33.75	31.75	30.00
Babbitt metal (83% tin)	52.00	59.50	48@52
Babbitt metal (35% tin)	25.00	18.50	22@25
Nickel (ingot and shot)	29.00	....	....
Nickel (electrolytic)	32.00	....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00

Shop Materials and Supplies

METALS—Continued

Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.75	11.00	11.50
Copper, heavy, and wire	10.75	10.50	10.75
Copper, light, and bottoms	9.50	8.75	9.75
Lead, heavy	5.75	5.25	6.00
Lead, tea	4.75	4.00	5.00
Brass, heavy, yellow	7.00		7.25
Brass, heavy, red	8.75	9.25	9.00
Brass, light	6.25	5.00	6.25
No. 1 yellow brass turnings	7.00	5.75	6.75
Zinc	3.75	2.75	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$25.10	$22.85	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.40	18.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	13.00	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.11@0.14	$0.15	$0.14
Cotton waste, colored, per lb.	.09@.14	.12	.10½
Wiping cloths, 13¼x13¼, per lb	9.00	36.00 per M	.16
Wiping cloths, 13¼x20½, per lb.		52.00 per M	.16
Sal soda, per 100 lb.	2.40	2.25	2.65
Roll sulphur, per 100 lb.	3.60	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.95	1.00	.94
Lard cutting oil, 25% lard, per gal.	.55	.50	.67½
Lard oil, pure, per gal, 2 to 5 bbl. lots	.76	.73	.71
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.297	.35	.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30–10%	30–10%	30–10%
Heavy grade	20–5–2½	30%	20–5–2½%
Rubber and duck:			
First grade	50–10–5%	50–10%	40–10%
Second grade	60–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton		4.00@4.40
Coke, prompt foundry, Connellsville	per net ton		5.25@6.50
White lead, dry or in oil	100 lb. kegs	New York, 14.00	
Red lead, dry	100 lb. kegs	New York, 14.00	
Red lead, in oil	100 lb. kegs	New York, 15.50	

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0354	$0.0354	$0.0304
Cold finished shafting	per lb.	0.044	0.0465	0.039
Brass rods	per lb	0.155	0.1475	0.17
Solder (½ and ½)	per lb.	0.3375	0.31	0.275
Cotton waste	per lb.	.11@.14	.10@.13	.09@.11½
Washers, cast iron (½ in.)	per 100 lb.	6.50	6.50	6.00
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.02
Lard cutting oil	per gal.	0.55	0.55	0.50
Machine oil	per gal.	0.297	0.297	0.33
Belting, leather, medium	off list	30–10%	30–10%	30–10%
Machine bolts up to 1x30 in.	off list	45%	40–10%	40%

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	45%	60%	50–5%
1⅛ and 1¼x3 in. up to 12 in	15%	50–5%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	30%	$3.50 net	
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	35%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	
Hex. head and hex. nut bolts	List net		65–5%
Lag screws, coach screws	45%		60–5%
Square and hex. head cap screws	60%	70%	70–10%
Carriage bolts, up to 1 in.x30 in.	35%	50%	50–5%
Bolt ends, with hot pressed nuts	45%		55%
Tap bolts, hex. head, list plus	35%		
Semi-finished nuts, 9/16 and smaller	65%		
Semi-finished nuts, ⅝ and larger	60%	70%	80%
Case-hardened nuts	50%		
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$4.00
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	4.00
Washers, round plate, per 100 lb. Off list	1.50	4.00	4.00
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.50	3.50
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.50	3.50
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.50	3.50
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.50	3.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	50%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.00	$3.60	$3.75
Cone heads, ditto (net)	5.20	3.80	3.85
1⅛ to 2-in. long, all diameters, *EXTRA* per 100 lb.	0.25		0.15
⅝ in. diameter *EXTRA*	0.35		0.15
½ in. diameter *EXTRA*	0.75		0.50
1 in. long, and shorter *EXTRA*	0.75		0.50
Longer than 5 in. *EXTRA*	0.50		0.25
Less than 200 lb. *EXTRA*	0.50		0.50
Countersunk heads *EXTRA*	0.45		$3.70 base

N. Y., Madrid—W. Griffith—machinery and equipment for plant for the manufacture of condensed milk, etc., at Massena.

N. Y., New Hartford—Utica Coca Cola Bottling Co., E. C. Baker, Purch. Agt.—bottling machinery and equipment.

N. Y., New York—Cuba Cane Sugar Corp., 112 Wall St.—equipment, including crystalizers, etc., for proposed $200,000 raw sugar mill at Velasco, Cuba.

N. Y., Penn Yan—B. H. Rogers—machinery and equipment for proposed shop for the manufacture of building materials.

N. Y., Rensselaer—W. Barnet & Son, Inc.—rag picker, condenser and garnet machine for cotton goods.

N. Y., Utica—Deutsche Zeitung, 18 Elizabeth St., R. Metzler, Purch. Agt.—presses and equipment for proposed $10,000 newspaper plant.

O., Greenville—City Bakery—complete equipment for proposed bakery.

O., Paulding—Foreman Blacksmith Shop, C. Foreman, Purch. Agt.—tools and equipment to replace fire loss.

O., Toledo—H. H. Nelson, 153 Utah St.—equipment, including hoisting machinery, for new automobile paint shop.

Okla., Drumright—L. S. Allard—duplex press, one No. 8 and one No. 14 linotype machine.

Ore., Portland — Oregon Amer. Lumber Co., 1017 Yeon Bldg., C. W. McGregor, Mgr.—machinery for proposed saw and planing mill at Vernonia.

Pa., Allentown—Amer. Beauty Silk Co., Meadow and Allen Sts.—machinery, looms and special equipment for proposed addition to plant for the manufacture of artificial silk.

Pa., Bloomsburg—Garrahan Canning Co.—complete machinery and equipment for proposed plant.

Pa., Erie—Natl. Organ Supply Co., 17th St. (manufacturer of organ parts)—machinery and equipment, including hangers, belting, etc., for proposed factory addition.

Pa., Hallstead — E. Tiffany, Main and Franklin Sts.—machinery, tools and equipment for proposed plant for the manufacture of tree trimmers and specialties.

Pa., Pittsburgh—Amer. Sheet & Tin Plate Co., Frick Bldg., M. T. Dennis, Purch. Agt.—15 or 30 ton electric crane.

R. I., East Greenwich—Greenwich Mills—several looms for addition to woolen mills.

Tex., Clarendon—J. C. Estalick—job printing press, paper cutter, belting, hangers and pulleys.

Tex., San Antonio—L. Harrington Co., Houston Bldg.—machinery and equipment, including crusher, washer, screens, etc., for proposed crushing plant at Salado.

Tex., Sherman—J. Beerman, Box 736—newspaper press and complete equipment.

Tex., Slaton—Job Printer, Box 142—job printing press, belting, pulleys and hangers (used).

Wis., Cambridge—Webster Candy Co., A. E. Melster, Purch. Agt.—candy making machinery, including dippers, pulling machine, kettles, etc.

Wis., Kenosha—C. L. Holderness, 913 Charles St.—rock crushing machine.

Wis., La Crosse—La Crosse Rubber Mills Co., Indian Hill—special rubber working machinery, etc., for proposed addition to factory.

Wis., Madison—Bd. Educ., F. W. Jackson, 22 West Dayton St., Business Mgr.—small mortiser for manual training department of Central High School.

Wis., Madison—Mead & Seastone, Journal Bldg.—electric hoists for penstocks of hydro-electric plant at Caldron Falls.

Wis., Madison—L. J. Schultz, 1326 West Washington Ave.—8 in. sticker.

Wis., Madison — State Bd. of Control, Capitol Bldg., E. Kading, Pres.—refrigeration equipment, dish washing machinery, etc., for refectory at Union Grove.

Wis., Madison—M. B. Witt, 2215 Hollister Ave.—gasoline storage tanks and pumps for proposed filling station on Monroe St.

Wis., Marshfield—Loisell Bros. (garage)—chain hoist and air compressor, electric or gasoline engine power.

Wis., Milwaukee—F. R. B. Mfg. Co., 1296 Forest Home Ave., A. E. Fenrig, Purch. Agt.—woodworking machinery, including sticker.

Wis., Milwaukee—J. M. Tice, 570 Prospect Ave. (woodworking)—one portable saw rig.

Wis., Milwaukee—M. Weinreis, 246 Oregon St.—one caterpillar crane.

Wis., Milwaukee — H. Wiesner, 1433 Prairie St.—air service equipment, emery wheel and stand.

Wis., Milwaukee—Yunker-Hansen Sales Co., 6516 Greenfield Ave.—gasoline storage tanks and pumps for proposed $40,000 garage.

Wis., Richland Center—A. V. Robinson—one large air compressor and one belt conveyor.

Wis., Sheboygan—Evergreen City Broom Co., c/o G. Paykel, 628 North 8th St.—broom making and wire working machines.

Wis., Spooner—J. R. Allen—rock crushing machinery and screening plant for gravel pit.

Wis., Wausau—Wausau Memorial Hospital, c/o G. B. Heineman, 201 1st St.—dish washing machinery, sterilizers, etc., for new hospital.

Wis., Wauwatosa—G. Siewert, Route 2—cement block making machinery, including power tampers.

Wis., West Bend — Atlantic & Pacific Products Co., c/o H. M. Clark, Mgr. — sterilizing equipment and special machinery for new condensery.

N. S., Yarmouth—Yarmouth Cold Storage Co., Ltd., A. W. Eakins, c/o Parker-Eakins Co., Ltd., Purch. Agt.—complete equipment for new $75,000 cold storage plant.

Ont., Chapleau—Austin & Nicholson—sawmill equipment.

Ont., Clinton—M. G. Ransford—pans and general salt handling equipment for plant at Exeter.

Ont., Niagara Falls—Fagen & Co., Northcott Bldg., Queen St.—machinery for new plant for the manufacture of auto wire.

Ont., St. Catherines—Coniagas Mines Ltd., J. J. Mackau, Secy., M. Reid, Cobalt, Genl. Mgr.—mining machinery.

Ont., Spanish Station—Graham & Wilkinson—sawmill equipment.

Ont., Toronto—Consolidated West Dome Lake Mines, Ltd., C. H. Manaton, 420 Bank of Hamilton Bldg., Purch. Agt.—mining machinery, supplies and equipment for South Porcupine.

Ont., Welland—Welland Steel Casting Co.—special equipment.

Que., Calumet—W. Filoon—machinery for the manufacture of ensilage carrier.

Que., Dixie—R. T. Donaldson—equipment for the manufacture of automobile radiator shutters.

Que., Montreal — H. E. Bourassa, 700 Demontigny St., E.—machinery and equipment for tire repair shop.

Que., Montreal—Canadian Auto Radiator Co., Ltd., 1218 St. Denis St.—welding outfit.

Que., Montreal — J. Desrosiers, 269 Christopher Columbus St.—moulders and saws for sash and door factory.

Que., Montreal—Imprimerie Maisoneuve, 478 Lasalle Ave.—equipment for job printing plant.

Que., Montreal — A. Montpetit, 3084 St. Hubert St.—vise and other equipment for automobile repair shop.

Que., Montreal—N. Pariseau, 2666 27th Ave. (doors, etc.)—surfacer or planer.

Que., Montreal—N. Perron, 221 Christopher Columbus St.—forge, vise, etc., for blacksmith shop.

Que., Montreal—A. Roger, 2660 Fullum St.—planer, etc., for sash and door factory.

Metal Working Shops

Calif., Lankershim—The State Highway Comn., Forum Bldg., Sacramento, is having plans prepared for the construction of an 85 x 150 ft. repair shop, here. R. M. Morton, State Highway Engr.

Conn., Bridgeport — Fletcher-Thompson, Inc., Engrs., 542 Fairfield Ave., receiving bids until Dec. 21 for the construction of a 1 and 2 story, 100 x 298 ft. service station, machine shop and showrooms for the A. L. Clark Co., 1710 Main St., Buick agents. Estimated cost $150,000. Noted May 24.

Fla., Jacksonville—A. Kahn, Archt., 1000 Marquette Bldg., Detroit, will receive bids until Dec. 22 for the construction of a 1 story, 200 x 560 ft. assembly plant on 8th St., here, for the Ford Motor Co., Highland Park (Detroit P. O.) Noted Oct. 25.

Ind., Fort Wayne—The Wayne Oil Tank & Pump Co., Anthony Hotel, awarded the contract for the construction of a 1 story, 80 x 220 ft. addition to its factory for the manufacture of gasoline pumps, etc. Estimated cost $50,000. Noted Dec. 6.

Ind., Michigan City—The Michigan City Lumber & Coal Co. is having plans prepared for the construction of a plant, including garage, on Washington and 2nd Sts. Estimated cost $40,000. Nicol, Scholer & Hoffman, Ross Bldg., Lafayette, Archts.

Ia., Dubuque—The Belsky Motor Co., c/o E. B. Belsky, 6th and Iowa Sts., will receive new bids for the construction of a 2 story, 50 x 125 ft. garage on 8th and Iowa Sts. Estimated cost $50,000. Koenigsberg & Weifeld, 155 Clark St., Chicago, Archts. Former bids rejected.

Neb., Omaha—The Nebraska Power Co., 15th and Farnam Sts., is having preliminary plans prepared for the construction of a 1 story, 114 x 254 ft. machine shop and garage. Estimated cost $150,000. F. S. Scott, 216 Kennedy Bldg., Archt.

N. Y., New York — H. Cahn, c/o J. DeHart, Engr. and Archt., 1041 Fox St., will build a 2 story, 100 x 175 ft. garage on East 69th St. and Ave. A. Estimated cost $200,000.

O., Cleveland—The Acetylene Stove Mfg. Co., 1265 West 2nd St., has had plans prepared for the construction of a 1 story, 60 x 160 ft. factory on East 59th St. and Park Ave. Estimated cost $50,000. W. R. Hopkins, Pres. W. J. Wefel, 3327 Yorkshire Rd., Cleveland Heights, Archt.

O., Cleveland—L. Blanshield, 3322 East 119th St. (automobile radiator repairs) has had plans prepared for the construction of a 1 and 2 story, 43 x 149 ft. garage at 12100 Kinsman Rd. Estimated cost $50,000. L. Skolnik, 6th St. Clair Bldg., Cleveland, Archt.

O., Cleveland—J. Spielman, Ulmer Bldg., has had plans prepared for the construction of a 1 and 2 story, 43 x 129 x 141 ft. garage on East 121st St. and Kinsman Rd. Estimated cost $50,000. Private plans.

O., Steubenville — F. Scott, Studebaker agent, awarded the contract for the construction of a 2 story automobile sales and service building. Estimated cost $150,000. Noted Oct. 25.

Pa., Perkasie — H. Geisel, Sellersville, plans to build a plant for the manufacture of cutlery, here. Estimated cost $25,000.

Pa., Phila.—J. P. Edlert awarded the contract for the construction of a 1 story, 69 x 216 ft. garage on 57th St. and Haddington Ave. Estimated cost $23,000.

Pa., Phila.—The Frankford Grocery Co., Penn and Unity Sts., is having plans prepared for the construction of a 4 story, 64 x 89 ft. warehouse and a 1 story, 45 x 100 ft. garage. Estimated cost $130,000. W. H. Dyer, Land Title Bldg., Phila., Archt.

Pa., Phila.—Packard, Inc., 319 North Broad St., is having plans prepared for the construction of a sales and service station on Broad and Allegheny Sts. P. S. Tyre, 1511 Arch St., archt.

Tenn., Memphis—The Ford Motor Co., Highland Park (Detroit P. O.), is having plans prepared and is receiving bids for steel for the construction of an assembly plant and machine shop on Riverside Blvd., here. Estimated cost $1,000,000. A Kahn, Marquette Bldg., Detroit, Archt. Noted Oct. 4.

Tex., Dallas—The Texas & Pacific R.R., Texas & Pacific Bldg., has had plans prepared for the construction of roundhouse, shops, etc., at Belt Junction. Estimated cost $1,000,000. E. F. Mitchell, Ch. Engr.

Tex., Houston — The Southwestern Bell Telephone Co., Capitol Ave., awarded the contract for the construction of an 8 story shop, etc. Estimated cost $100,000.

Tex., Houston—The White Co., Leeland and La Branch Sts., awarded the contract for the construction of a 1 story, 100 x 100 ft. garage. Estimated cost $40,000. P. E. Seamans, Mgr.

Wash., Seattle — The Ford Motor Co., Highland Park (Detroit P. O.), Mich., is having plans prepared for the construction of a 1 story, 50 x 311 ft. car delivery building on Roy St., here. A. Kahn, 1000 Marquette Bldg., Detroit, Archt.

Wis., Kenosha—The Amer. Brass Co., 570 Elizabeth St., awarded the contract for the construction of a 2 story, 220 x 540 ft. copper wire mill. Estimated cost $300,000. Noted Nov. 1.

Wis., Madison—The Fox Motor Car Co., 107 East Doty St., is having plans prepared for the construction of a 2 story, 72 x 165 ft. garage and repair shop. Estimated cost $50,000. N. W. Fox, Pres. P. M. Homer, Pioneer Block, Archt. Noted Nov. 22.

Wis., Madison—A. J. McCann, 204 Mersey St., is receiving bids for the construction of a 1 story, 60 x 100 ft. garage and repair shop. Estimated cost $50,000. Private plans. Noted Dec. 6.

Wis., Milwaukee—The Curtis Auto Co., 148 8th St., awarded the contract for the construction of a 3 story, 100 x 126 ft. garage on Bway. Estimated cost $200,000.

Wis., Milwaukee—The Main Express Co., 116 Oneida St., awarded the contract for the construction of a 1 story, 60 x 100 ft. garage on Market St. Estimated cost $40,000.

Vol. 59, No. 26 New York, December 27, 1923 25 cents a copy

American Machinist

KENNETH H. CONDIT and FRED H. COLVIN, *Editors*
L. C. MORROW, *Managing Editor* A. L. DE LEEUW, *Consulting Editor*
Associate Editors: ETHAN VIALL, S. ASHTON HAND, F. E. BARDROF, HOWARD CAMPBELL, ELLSWORTH SHELDON
Cincinnati MASON BRITTON, *Manager* *Chicago* *New England*

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And now for 1924

THE general plans for the contents of the "American Machinist" during 1924 provide for full quotas of articles dealing with the automotive and railroad-shop divisions of the industry and with management, engineering and manufacturing subjects.

As a part of the automotive group there is being prepared a series showing the practice in the best European plant.

Definite plans are laid for publishing constructive articles on railroad practice and equipment, continuing the campaign for modern equipment in railroad shops. There is ready a splendid array of practical engineering data including more of De Leeuw's articles "Modern Methods of Machine Tool Design" and a new series on estimating.

The design of gears is an important part of the machinery industry and will be fully covered.

While the preceding paragraphs constitute a promise they are only an indicator of the contents of the two 1924 volumes. The true-blue "American Machinist" will, as always, serve the industry from cover to cover.

McGRAW-HILL COMPANY, INC.
Tenth Ave. at 36th St., NEW YORK

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Electrical Retailing (*Published in Chicago*)
American Machinist—European Edition
(*Published in London*)

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Number of copies of this issue printed, 19,153

Giving You A Record of Progress

LEADING FEATURES

of the

January 17th American Machinist

Review of New Equipment which has been described in the *American Machinist* in the preceding half-year; over 225 descriptions, with illustrations and specifications, of new machine tools, small tools, material-handling equipment, supplies, etc., grouped for the greatest convenience in reference.

Developments and Tendencies in Machine Tools.

Authoritative Views on General Industrial Conditions, showing trend of the Vital Economic Factors, of Prices of Materials, etc.

Programs of the Automotive, Electrical, and Railroad Industries.

Articles on Progress during 1923 in Gear Design and Production, in Steel Treating, in Welding, in Research, and in Standardization.

Employment and Immigration Situation analyzed and tendencies portrayed.

A Big Editorial Section of timely business and equipment news, *plus*—

An Advertising Section that gives the most extensive range of equipment from which to fill your needs.

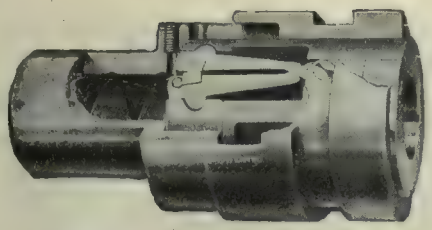
Equipment Review Number

American Machinist

THE JOHNSON FRICTION CLUTCH

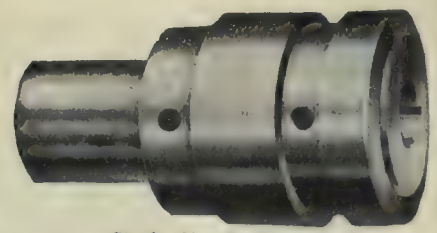
IS THE RELIABLE AND EFFICIENT

LINE-SHAFT CLUTCH



Single Clutch Showing Working Parts

Small, Compact, Powerful and Durable A Quality Product



Single Clutch—Exterior

Be Right, Thru 1924, by Using a Johnson Clutch

Drive your machinery direct from the line-shaft with a

Johnson Single Clutch

and do away with extra equipment when countershafts are used.

A saving in expense and upkeep worth considering.



Single Clutch With Steel Split Pulley Mounted on Hub

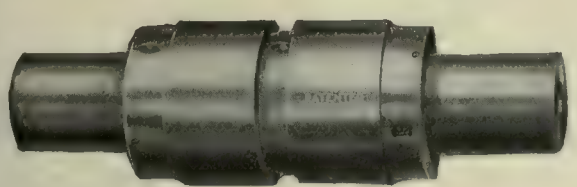
All machinery cannot be driven from line-shaft on account of the difference in speed and reverse motion desired.

The Johnson Double Clutch

is designed to take care of these conditions.

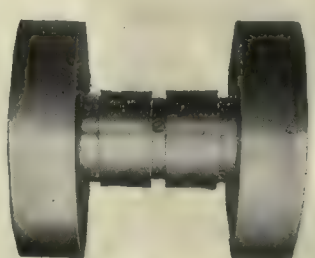
Requires but little more space than a single clutch.

Our engineers will be glad to work out your clutch problems for you. Send for clutch information blank.



Double Clutch—Exterior

Write for Blue Catalog



Double Clutch With Pulleys on Hubs

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONN

Here's a good

Perhaps you are looking for a lathe. If so, you want one that you can depend upon; one that will *last*!

A lathe that will *last* is the one that you should get. Such a machine represents an investment. It pays dividends in the form of continuous service long after other lathes of the same age have been discarded. It is the main reason today why the Lodge & Shipley Lathe stands out so conspicuously among the Master Machine Tools of Industry.

You have read what we say. Now read what somebody else recently wrote us:

> **"We have in our establishment a 14 in.x6 quick change Lodge & Shipley Lathe. The number of this lathe is 3032 and as far as our records show we have been operating this lathe continuously for about 17 years.**
>
> **With the exception of taking a shim out, the main bearings in the headstock were not touched in this period. Quite recently, however, through an accident the cone pulley was broken and we were compelled to make a new cone for the lathe.**
>
> **We gave the lathe a general overhauling and at the present time, in our estimation, it is good for ten years' more work."**

What do you think of that? After using it continuously for 17 years they are confident, that after a general overhauling the lathe will be good for ten years more.

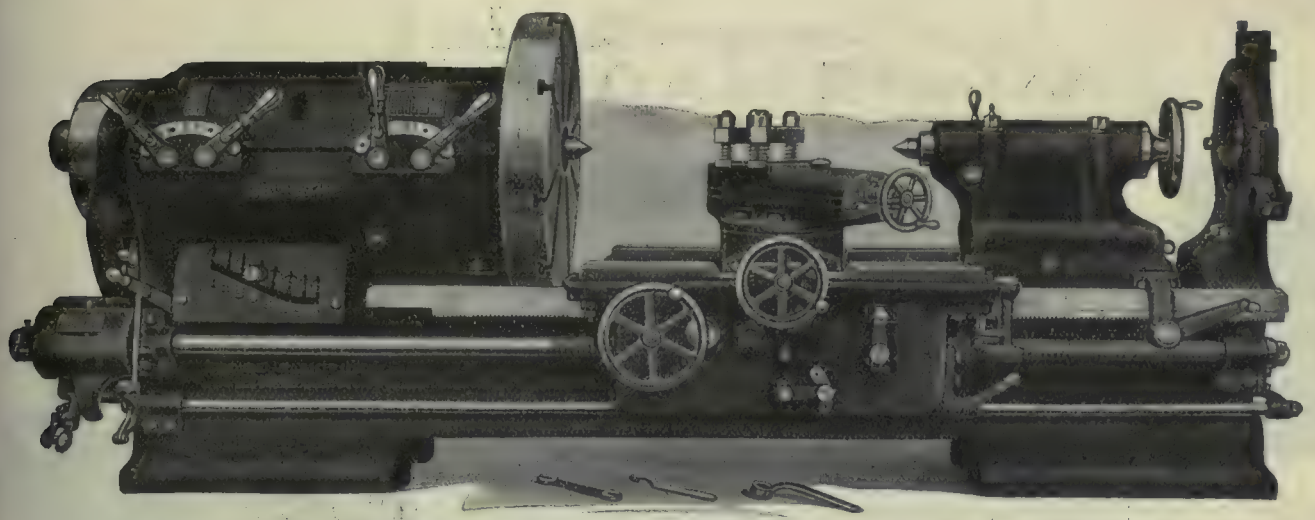
That's the kind of a lathe you want! If this customer had purchased a cheap lathe he undoubtedly would have replaced it three times by now *and yet, on top of all this he expects, and, no doubt, will get, ten years' additional service from the lathe he now has!*

Does it pay to buy a *good* lathe? We will let you answer that question yourself.

The Lodge & Shipley

Cincinnat

reason!



36 in. Selective Head Lodge & Shipley Lathe
Made in sizes 12 in. to 48 in.

The Lodge & Shipley Lathe

is in a class by itself. Quite frequently we get letters telling us that Lodge & Shipley Lathes after 20 and 25 years' use have been overhauled and then turn out work as accurate as when they were new.

There is no secret about this. If you put value into a thing you get value out of it. This lathe can turn out accurate work over an unusually long period of time. IT LASTS! That is the reason for its popularity.

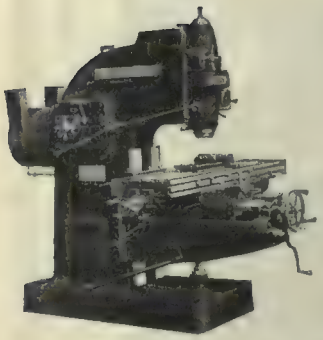
For the man who buys machinery as an investment, this lathe answers requirements to the letter. Let us show you why. It's all in the construction. Write for general loose-leaf catalogue. It goes into details. No obligation.

SEND FOR CATALOGUE TODAY.

Machine Tool Co.

Ohio

OUR WELCOME



Cincinnati No. 4 Vertical High Power Miller. One of 38 Types and Sizes of our Millers

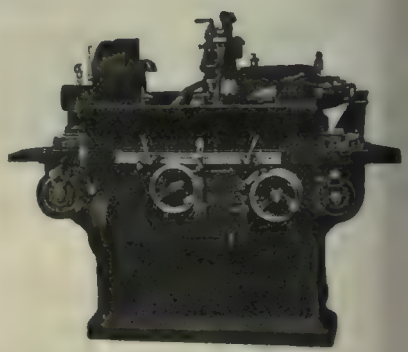
Upon Coming to Cincinnati You Will See In Our Plant

Modern Buildings
Machine Shop equipped for refinements in manufacturing.
Large Engineering and Design Dept.
Machine equipped Foundry with thoroughly tooled Pattern Shop.
Physical and Chemical Laboratories.
Tool Room with modern layout.
Centralized Tool Stores.
Precision Tools and Gauges.
Demonstration Room.
Complete line of our products in a running exhibit.
Operators' Instruction Sheets.

An Employees' Service Department
with
Modern Employment Methods

Careful Medical and Surgical Attendance for employees.
Sanitary and Safety Provisions.
Self-Service Dining Hall.
Co-operative Students of the University of Cincinnati at Work.

Cincinnati Grinder Company's line of Cylindrical Grinders; in the process of manufacture and in demonstration.



12 in. x 24 in. Plain Cincinnati Cylindrical Grinder



THE CINCINNATI MILLING MACHINE COMPANY

THE CINCINNATI GRINDER COMPANY

CINCINNATI GRINDERS

TO YOU IN 1924

Entering Our 40th Year

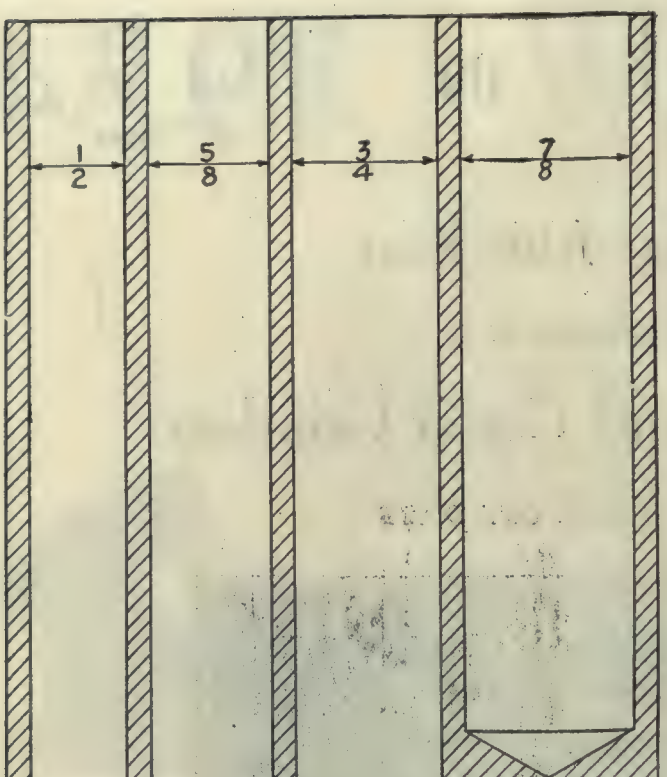
in the manufacture of

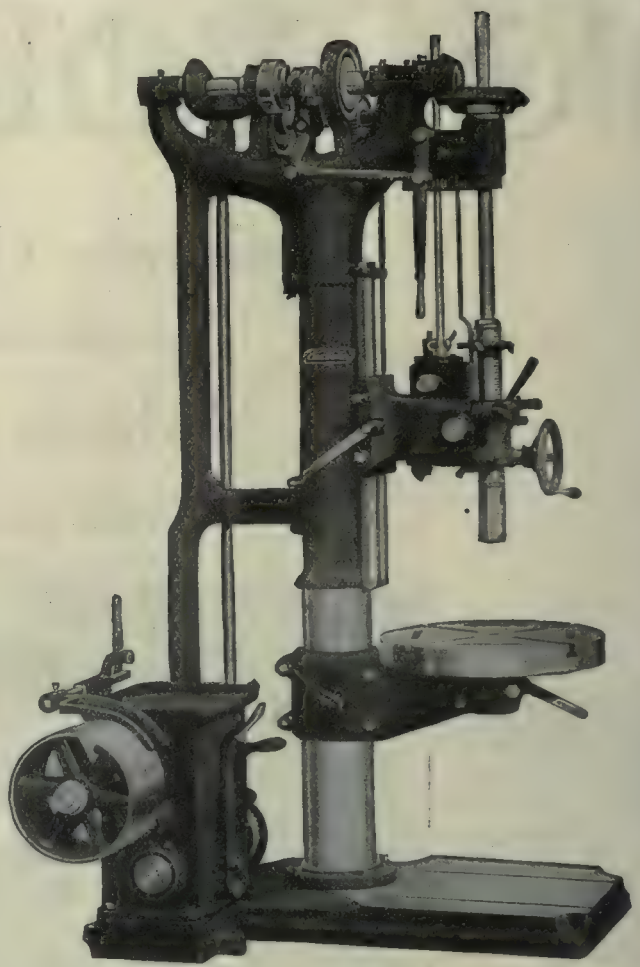
Milling Machines and Cutter Grinders

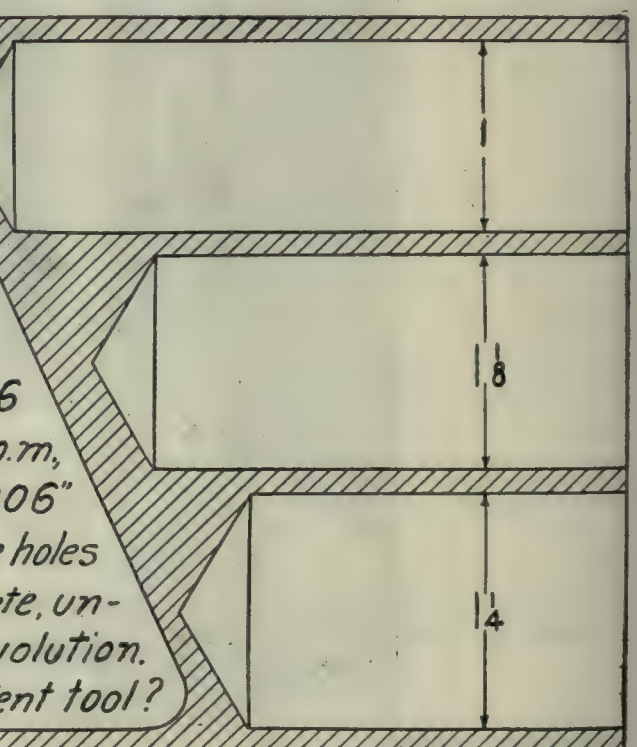
We invite you to visit our plant



CINCINNATI MILLERS







THINK OF IT

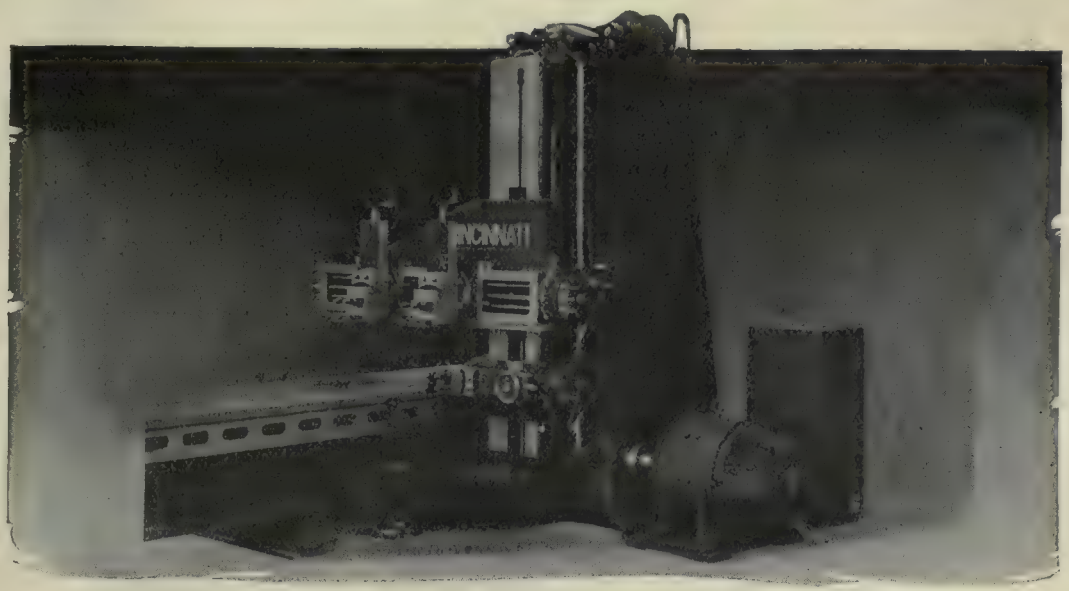
24 INCH DRILL PENETRATION PER MINUTE

This machine is provided with 16 speeds, ranging from 38 to 534 r.p.m., and with 6 feeds, ranging from .006" to .039" per revolution. Each of the holes depicted was drilled in one minute, under a feed of .013 inches per revolution. Can anyone name a more efficient tool?

The Cincinnati Bickford Tool Co.

Oakley, Cincinnati, Ohio, U. S. A.

SKF



Ball Bearings on Planers

Maintain Accuracy and Reduce Maintenance

UNLESS the bearings on vital parts of planers are capable of carrying heavy thrust loads without appreciable friction, wear takes place with the result that accurate work is impossible.

On this 60"x60"x16' open side planer Hess-Bright ball bearings on the down-feed screws and rail heads, on elevating screws for the knee and rail and on the rapid power traverse shaft and power traverse mechanism, insure maintained accuracy of product and smooth and efficient operation. And since quality ball bearings will last for the normal life of a machine and require no take-ups, a little lubricant applied during an off period is all the attention required.

Made of chrome alloy steel hardened uniformly throughout and held to close tolerances during manufacture Hess-Bright deep-groove ball bearings and thrust ball bearings have that endurance and maintained precision that is so important on machine tools of all kinds.

THE HESS-BRIGHT MANUFACTURING COMPANY

Supervised by SKF INDUSTRIES, INC., 165 Broadway, New York City

1078



Cross Section of Single-Row Bearing

Cross Section of Double-Row Bearing

BALL BEARINGS

The Highest Expression of the Bearing Principle

Machines for

THE Jones & Lamson Machine Company have announced certain improvements in the design of the *Hartness Flat Turret Lathe*. These improvements result in a more powerful and rigid machine, covering a wider range of work, but without loss of convenience or ease of handling.

So far as the details of these changes are concerned, they are not in any way radical or spectacular. The workman will feel as much at home with the new machine as with the old "J & L."

Briefly stated, the recent improvements permit us to offer a wider variety of Turret Lathes than ever before, covering a wider range of work; but at the same time this variety of machines has been standardized to the point where each is a simple variation of one carefully considered design.

The machines of this series will be designated as being of our *"Steel Head" Model.*

The "Steel Head" Model

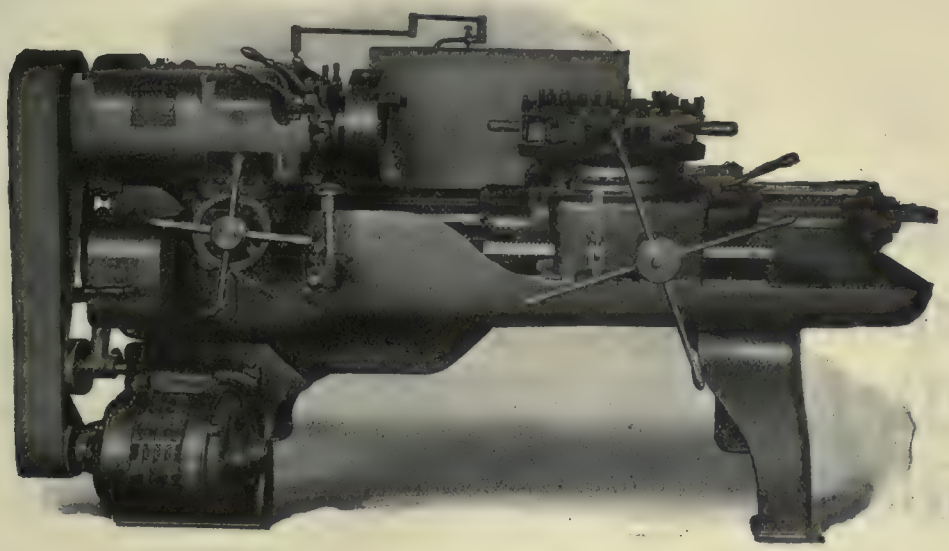
is made in seven styles and sizes covering ninety per cent of the average shop work.

2¼x24 in. Hartness Flat Turret Lathe for Bar Work.
3x36 in. Hartness Flat Turret Lathe for Bar Work.
12 in. Hartness Flat Turret Lathe for Chucking Work.
15 in. Hartness Flat Turret Lathe for Chucking Work.
17 in. Hartness Flat Turret Lathe for Chucking Work.
Double Spindle Hartness Flat Turret Lathe.
Double Spindle Production Lathe.

In general the machines of this model provide a much more powerful drive to the spindle than ever before attained, and an increase in strength of feed as well.

Particular attention has been given to durability by the use of hardened steel gears, multiple disc clutches and ball bearings on all driving shafts.

Chucking Work



15-inch Capacity

Hartness Flat Turret Lathe

with Chucking Outfit

"Steel Head" Model

This is the same machine as the 3x36 in. bar machine, the only difference being in the equipment.

This machine and its equipment offer the most approved means for performing chucking operations on 90% of the work to be found in the ordinary machine shop. The power of the drive, the rigidity of the cross sliding head and flat turret, the accuracy of the stops, the lightness and convenience of manipulation—all combine to give that conjunction of output and accuracy which is the ultimate aim of the progressive shop man.

The increased power and durability of the headstock mechanism will be appreciated.

Send for the set of Bulletins covering the "steel head" line.
You will surely find the machine you have been looking for.

Jones & Lamson Machine Co.
SPRINGFIELD, VT., U. S. A.

"Out with the old, a

Triple-Purpose Radial Drills

The quotation has not lost its real meaning in the slight changes we have made in it in order to apply it to our case.

Foreman Goodfellow, of the Davidson Pump Co., Brooklyn, N.Y. caused us to make the alteration when he expressed his opinion of *American Triple-Purpose Radials.*

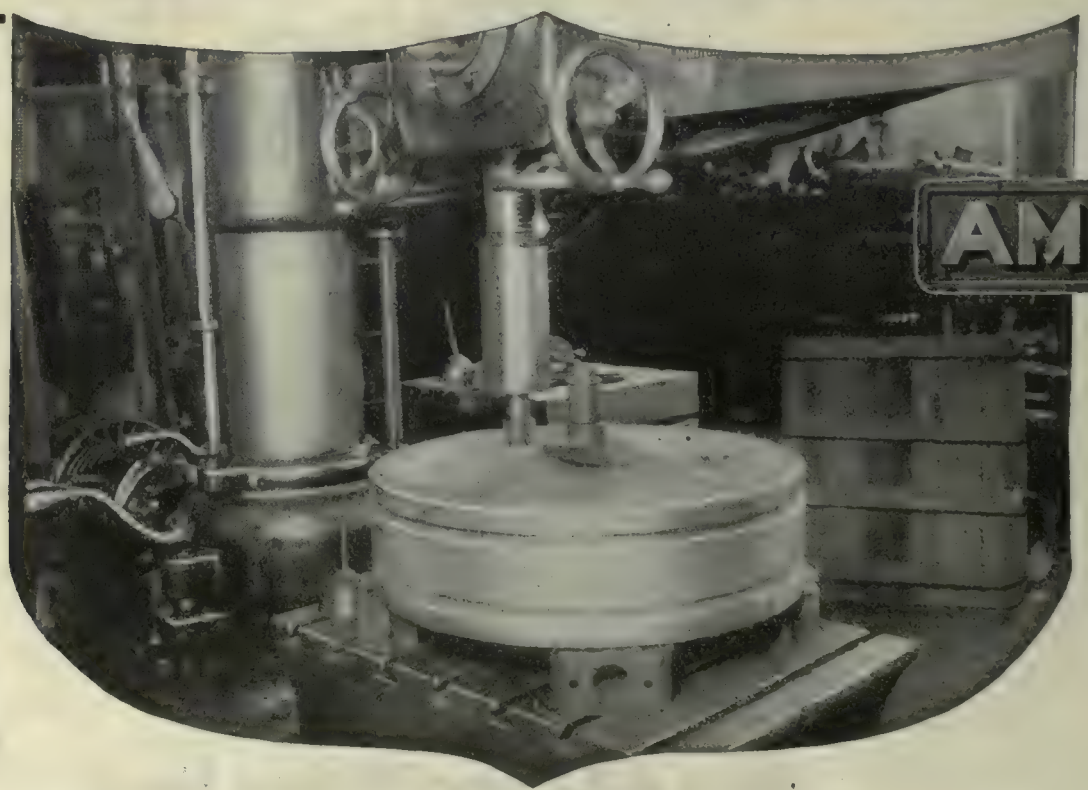
He said:
"We have discarded our old radials to make room for *Americans* because one *American replaces two ordinary radials.*"

There are sound reasons for his statement.

Engine manufacture is particularly dependent upon the precision, adaptability and economy of the machines used in drilling. It is, therefore, not hard to understand the predominance of *American Triple-Purpose Radial Drills.*

In practically all the great machinery industries—automotive,

"Do it on ar



The American Tool Works Co

nd in with the new"

railroad shops, pumps, textile machinery, printing machinery, electrical equipment, etc.—you will find that the leaders "do it on an *American*."

One time-proven factor for this supremacy is the internal gear drive for boring and tapping. The smooth, steady action of the spindle is due to the high gear ratio and ample proportions of gears and shafts. Chatter and vibration are practically eliminated.

The *American Triple-Purpose Radial* shown in this space is tapping 2-inch plug holes in cast-iron Steam Pistons. Nothing unusual about this job excepting the speed and precision with which the *American* goes about it.

It will pay you to consider the application of *American Radials* to your work. If interested, our Engineers will furnish convincing facts.

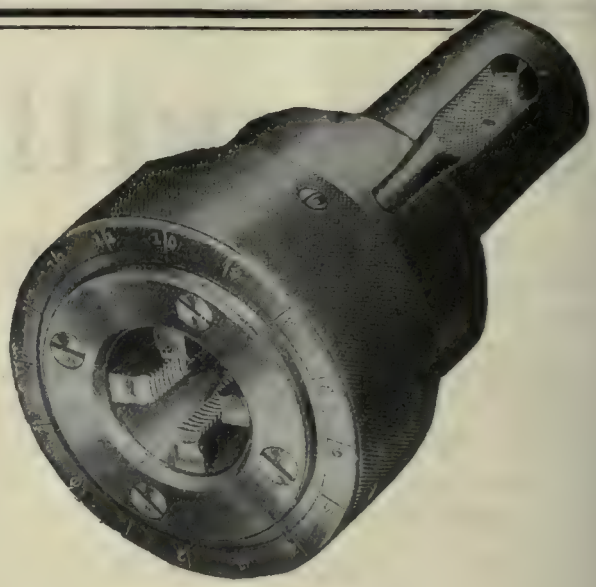
Lathes
Planers
Shapers
Radials

American"



npany, Cincinnati, Ohio, U.S.A.

—for the *same* reason you buy safety razors and Eversharp pencils—



Save the holder—use the refill

Why not install in your shop, the economy of time and convenience you practice in your daily life?

Safety razors and mechanical pencils—when they get dull or break—in goes a new blade or whole lead—and you go whistling on your way.

Think of the hundreds of half-used solid tools—tongs twisted, teeth broken, etc.—that lie in your tool cribs. Dollars in the discard that should be dollars in the bank account.

Murchey Threading Tools—55 sizes of Self-Opening Dies and 46 sizes of Collapsible Taps afford a complete standardized Threading Service to a progressive shop.



The *economy* of mild steel bodies with High Speed Steel blades that last five times as long as solid tools, is overshadowed by the fact that they will stand twice the speed.

Tools, chasers or catalog upon receipt of a postal.

Murchey Machine & Tool Co.

953 Porter Street, Detroit, Mich., U. S. A.

Cleveland Office, 6523 Euclid Avenue; Pittsburgh Representatives, Laughlin & Barney, Union Trust Bldg.; Chicago Representatives, R. E. Ellis Engineering Co., 621 Washington Blvd.; Los Angeles Representatives, Smith-Booth-Usher Co., 228 Central Ave.; San Francisco, Smith-Booth-Usher Co., 50-60 Fremont St.; Coats Machine Tool Company, 14 Palmer Street, Westminster, London, S. W., England; Fenwick Freres & Company, 8 Rue de Rocroy, Paris.

MURCHEY

Collapsible Taps and Self-Opening Die-Heads

It is discouraging to see in many up-to-date shops, old worn out internal grinding machines trying to pound out a modern day's work.

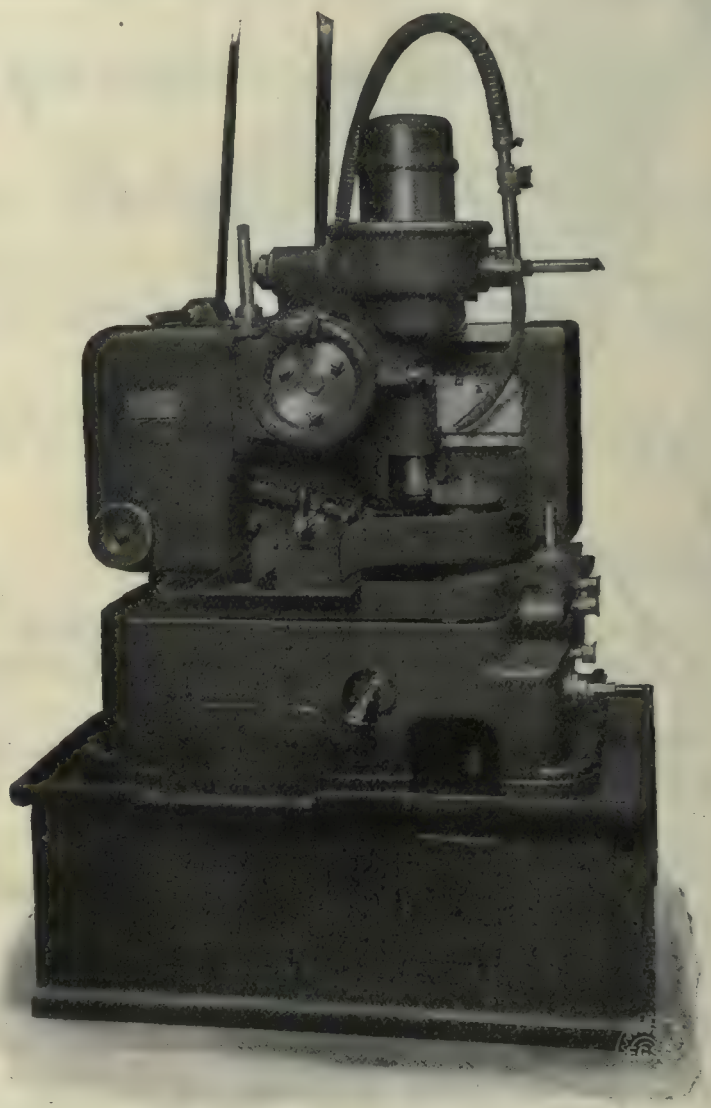
At one time they were good enough — but so were horses.

To-day when it comes to production — The Heald Hydraulic Internal Grinder is to the manufacturer what the air-plane is to the mail service

The Heald Machine Co.
Worcester Mass.

GEAR SHAPERS AND GEAR SHAPER CUTTERS

It Pays to Investigate First



Because of the satisfaction derived from seeing what you are getting, and the further possibility of weighing values.

Because investigation is your best assurance of obtaining satisfactory results.

You may not be in immediate need of a new gear cutting machine, and if that is the case, now is your best time to investigate the possibilities of the new High-speed Gear Shaper—a hurried decision is generally unprofitable.

Before you purchase gear cutting equipment, ask users of the Gear Shaper what they think of it—they are our best advertisement.

Start your investigation by sending for a copy of our booklet "A New Development in Gear Cutting."

A copy is yours for the asking

THE FELLOWS GEAR SHAPER COMPANY

Makers of Gear Cutting Machinery and Cutters for the Past Quarter of a Century

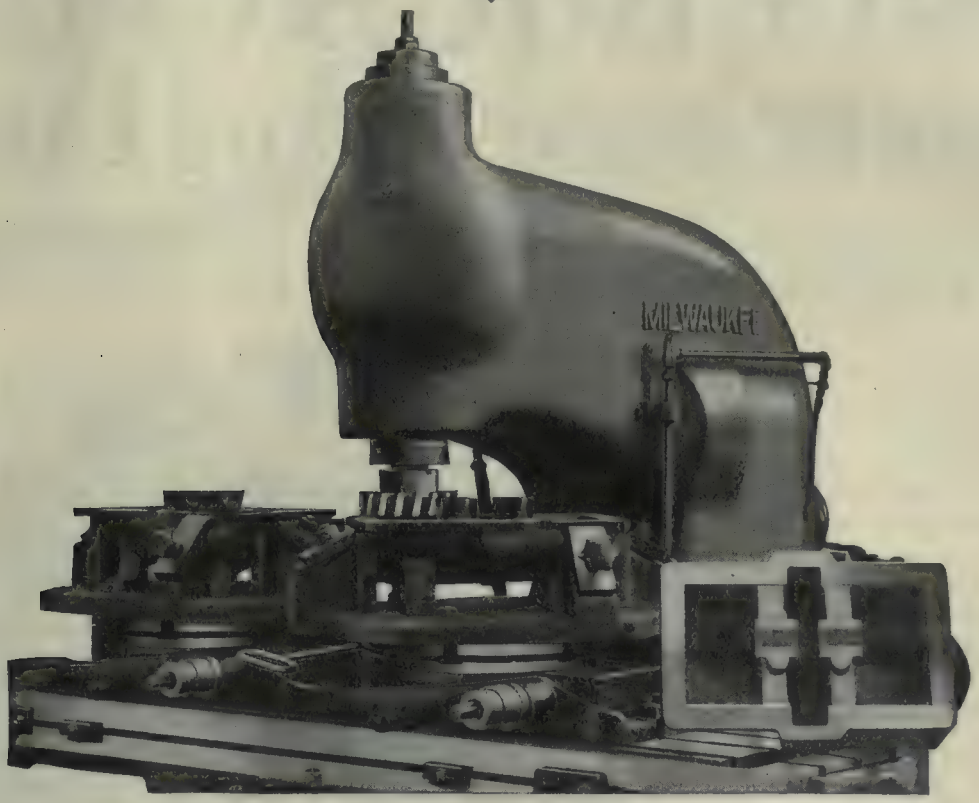
Springfield, Vermont, U. S. A.

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Pacific Coast Representatives: Harron, Rickard & McCone, San Francisco and Los Angeles, California; Nevada; Arizona.

THREAD GENERATORS AND THREAD GENERATING CUTTERS

If it can be milled — *– mill it faster!*



Double Up!

THE quickest way to increase production is to double up the work. That is what PRODUCTION SERVICE did on this job—using two rotary tables instead of one.

Here was a case where it was impossible to use a large face mill and make one pass across the top of the casting. The raised bearing in the center prevented this.

We overcame that obstacle by using a rotary table and milling *around* it. Then, "doubled up" by adding a second rotary table. This permits the operator to load one casting while the other is being milled.

We will "double up" YOUR job if you will give us the opportunity.

KEARNEY & TRECKER CORPORATION
MILWAUKEE, WIS.

Please send PRODUCTION SERVICE Data Sheets and Illustrated Booklet to:

NAME .....

FIRM NAME .....

FIRM ADDRESS .....

27

INGERSOLL

Type "B" Face Milling Cutters

Designed Especially for the Milling of Steel Forgings and Steel and Iron Castings in which Heavy Cuts are Necessary

The type "B" is the heaviest of the Ingersoll Cutters and is designed for milling steel forgings, steel castings, or large iron castings where heavy cuts are necessary or the amount of stock to be removed is irregular. It is a general service cutter especially well suited to work such as is ordinarily found in jobbing shops. It is capable of removing stock to the depth of ½ of an inch at one pass of the table.

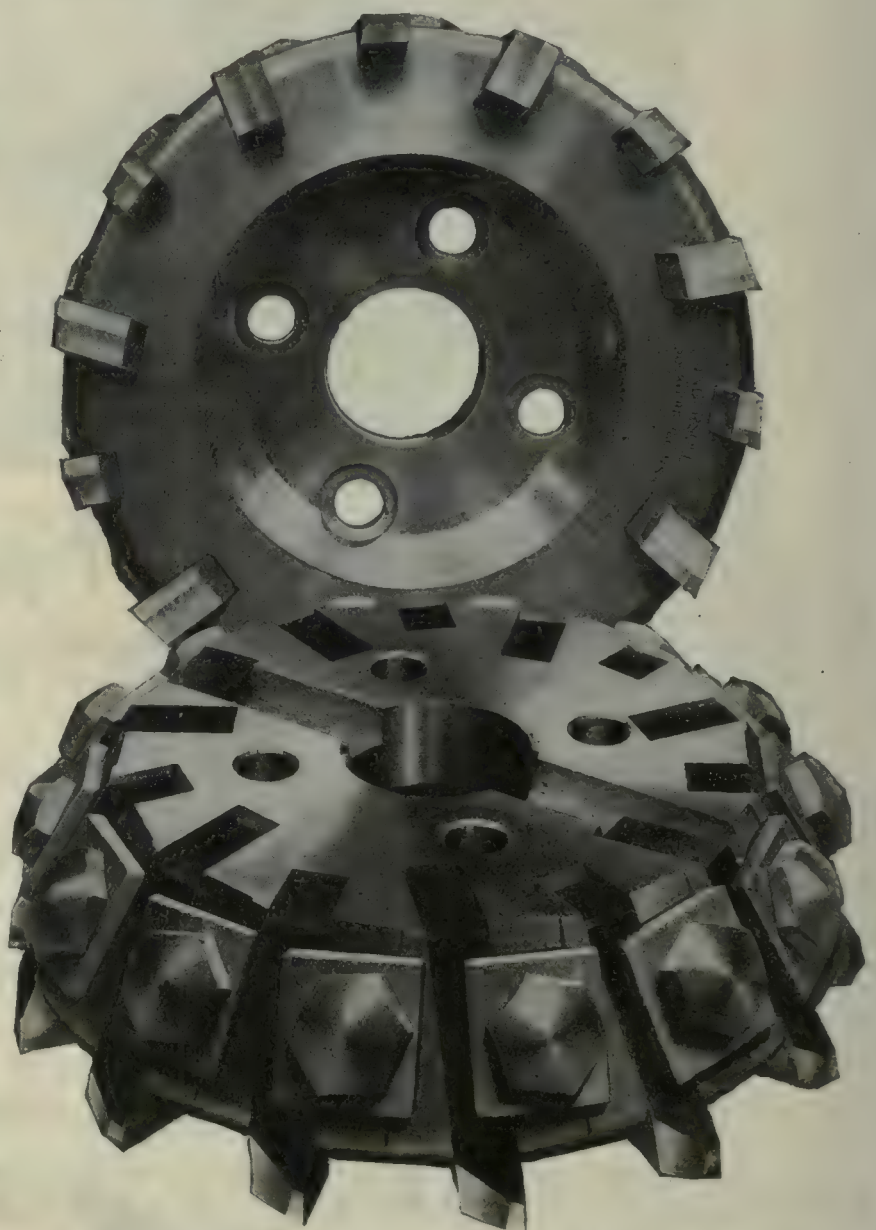
The housing is a steel forging of especially heavy section, carbonized and hardened. Each tooth is held independently in its slot by means of a clamp and heavy machine screw. They are of alternate widths, being ¾ inch by 1¼ inches, and ¾ inch square. This design and construction gives the Ingersoll Type "B" Cutters a capacity for heavy milling work which places it in a class entirely by itself.

The Type "B" Cutter is driven by a standard radial key 1 inch wide by ½ inch deep.

We recommend the type "R" or "S" Cutters for the lighter work where the cut is broken up into narrow sections.

Any of the following bulletins will be mailed to you upon request:

No. 39—"Ingersoll Continuous Milling Machines".
No. 40—"Ingersoll Installations of Milling Equipment".
No. 41—"Ingersoll Drum Type Continuous Milling Machines".
No. 42—"Ingersoll Railroad Rod Milling Equipment".
No. 43—"Ingersoll Face Milling Cutter Grinders".
No. 44—"Ingersoll Inserted Tooth Milling Cutters".



Ingersoll Type "B" Face Milling Cutters

The Ingersoll Milling Machine Co.

Milling Machines and Their Equipment

Detroit: David Whitney Bldg. ROCKFORD, ILL. 50 Church St., New York

New Departure Ball Bearings

Rigidity in Any Bearing Mounting Implies Unchanging Support

EXTREME rigidity is an essential in all gear mountings. The reason for this is best stated by an authority who says: "A correct position once attained should never be altered. Gears do not require adjustment to compensate for wear."

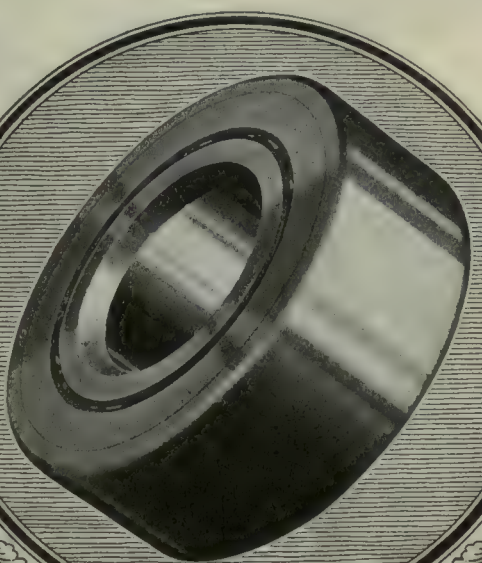
It follows "as night the day" that in order to maintain this correct gear adjustment rigidly and permanently, you *must* use a bearing which does not wear and let down on that adjustment.

If you support your mounting with a type bearing that, because of mechanical principle, wears sufficiently to require adjustment at intervals, the position of the gears it supports is constantly being let down, taken up, let down, taken up—thereby giving anything but a rigid mounting.

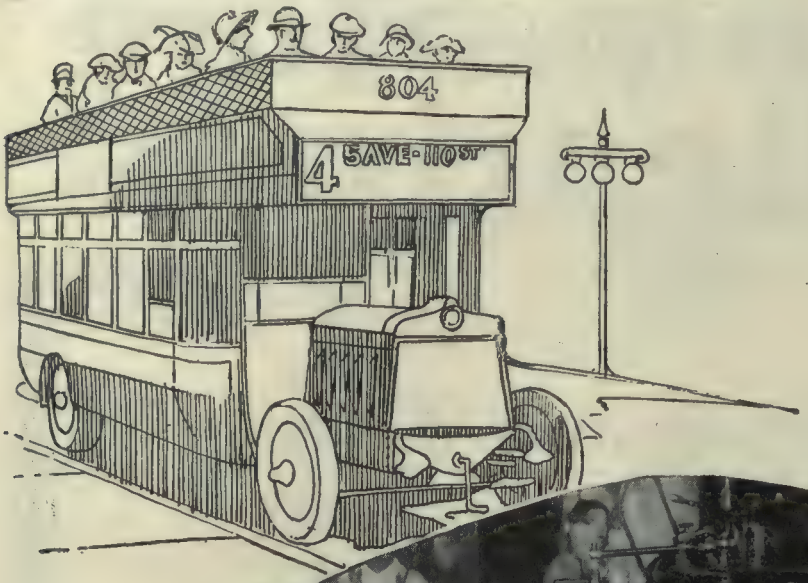
For gear mountings as well as other positions, New Departure ball bearings are ideal, because they locate the parts they support permanently. No adjustment is necessary or possible. They outlast the mechanism itself.

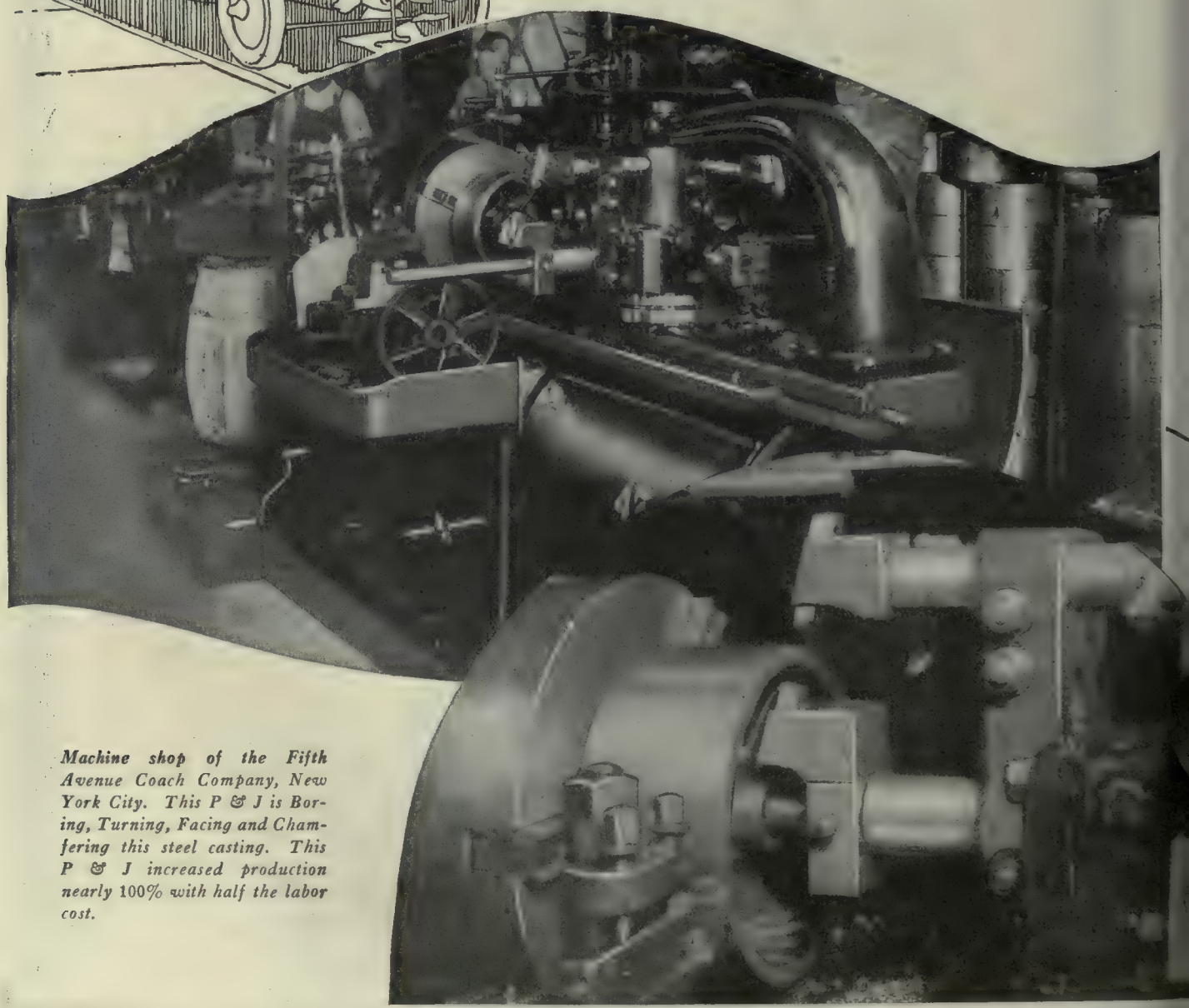
THE NEW DEPARTURE MANUFACTURING COMPANY

Detroit *Bristol, Conn.* Chicago



945





Machine shop of the Fifth Avenue Coach Company, New York City. This P & J is Boring, Turning, Facing and Chamfering this steel casting. This P & J increased production nearly 100% with half the labor cost.

POTTER & JOHNS

The Fifth Avenue Coach Company finds that—"it pays to replace" — with P & J Automatics

One P & J replaces two Turret Lathes with nearly a 100% increase in output

"Keep 'em running" is the watchword at the shops of the Fifth Avenue Coach Co.—*and they do.*

Back of their big fleet of double-decked sight-seeing buses is an unusually efficient Machine Shop, a corner of which shows a new Potter & Johnston Automatic. This machine was installed two months ago, for the purpose of machining these duplex brake drums, tough steel castings.
Results—

—replaced two modern Turret Lathes.
—occupies one-half former floor space.
—halved the labor cost.
—INCREASED PRODUCTION NEARLY 100%

Small wonder they are enthusiastic about P & J accomplishments. But they are likewise deserving of much credit for the spirit of progressiveness that inspired them to analyze all their machining methods, in the light of progress made in modern Machine Tool development.

Far-seeing Management, everywhere, is convinced that "it pays to replace" and to do it AUTOMATICALLY where possible. Naturally they turn to Potter & Johnston.

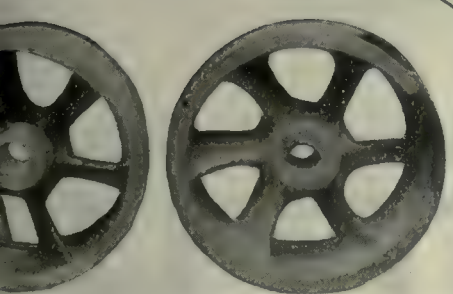
Our Engineering department will gladly give you an estimate from your prints or layouts—there's not the slightest obligation—you'll understand better what real P & J economy means.

Potter & Johnston, Pawtucket, R. I.

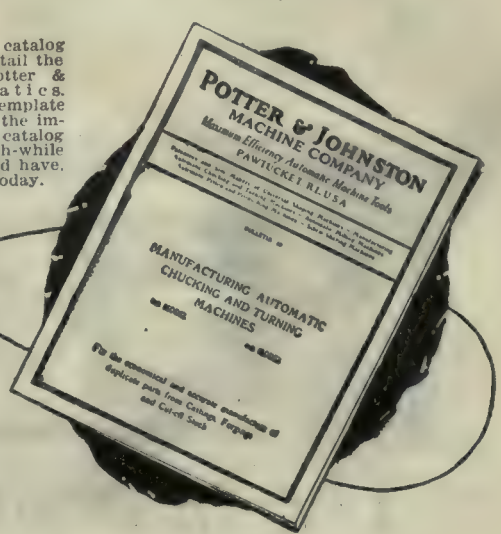
DOMESTIC OFFICES: New York Office: Hudson Terminal Bldg., 50 Church St., Walter H. Foster, Manager. Detroit Office: The Potter & Johnston Agency Co., 535 Bates St. Chicago Office: 3057 Eastwood Ave., Leslie J. Orr, Manager. Pacific Coast Office: Wesley Terrace Hotel, Los Angeles, Cal., Charles H. Shaw, Manager.

CANADIAN REPRESENTATIVES: Arthur Jackson, 177 Roxboro St. E., Toronto, Can.

FOREIGN REPRESENTATIVES: L. J. Colomb, 68 Avenue de la Grande Armee, Paris, France. Representative for France, Belgium, Switzerland, Spain and Portugal. Charles Churchill & Co., Ltd., London, Birmingham, Manchester and Newcastle-on-Tyne, England and Glasgow, Scotland. Ercole Vaghi, Corso Porta Nuova, 34 Milan, Italy. Rylander & Asplund, Stockholm, Sweden. Yamatake Company, No. 1 Yurakucho, Ichome, Kojimachiku, Tokyo, Japan.

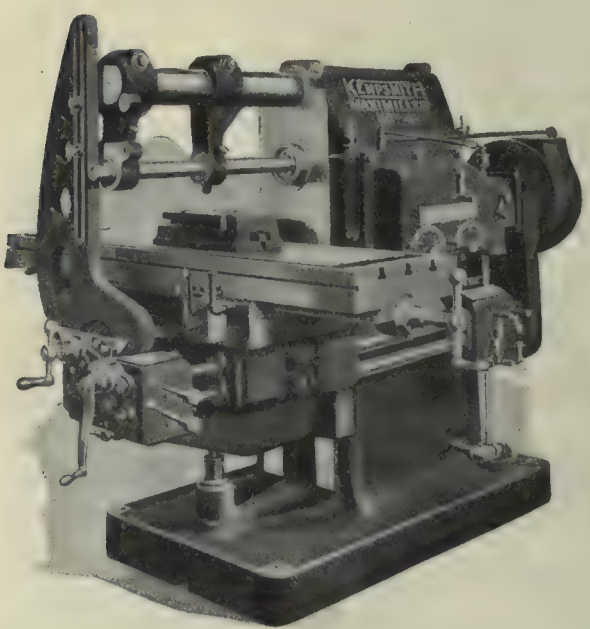


Let us mail you this catalog which illustrates in detail the recent models of Potter & Johnston Automatics. Whether you contemplate purchasing or not, in the immediate future, this catalog brings timely, worth-while information you should have. Request your copy today.



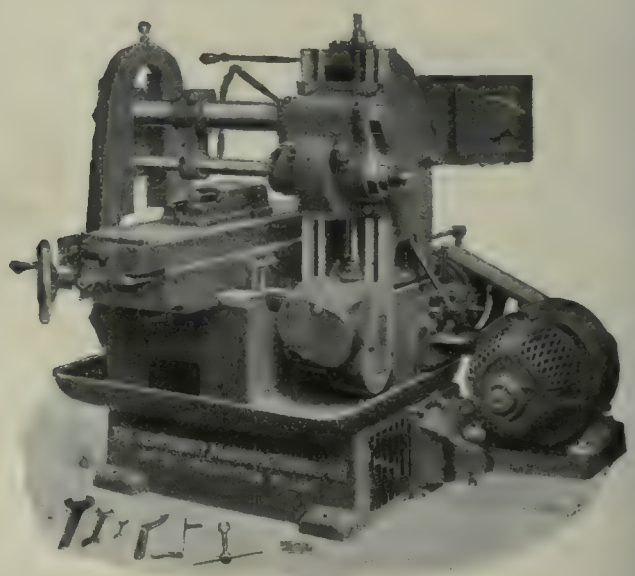
ON Automatics

FOR genuine ability to turn out the work for which it is intended, for power to take repeated heavy cuts, and rigidity to withstand vibration, Kempsmith milling machines, both types, are universally favorably known. The manual control of a Kempsmith machine is well thought out and conveniently arranged. The man of average intelligence will quickly learn and obtain superior results from the machine.



The No. 4 Maximiller, a machine of greater power, greater productive value and greater economy of labor.

The No. 33 Production Miller, a machine built to produce a high volume of duplicate parts.



KEMPSMITH

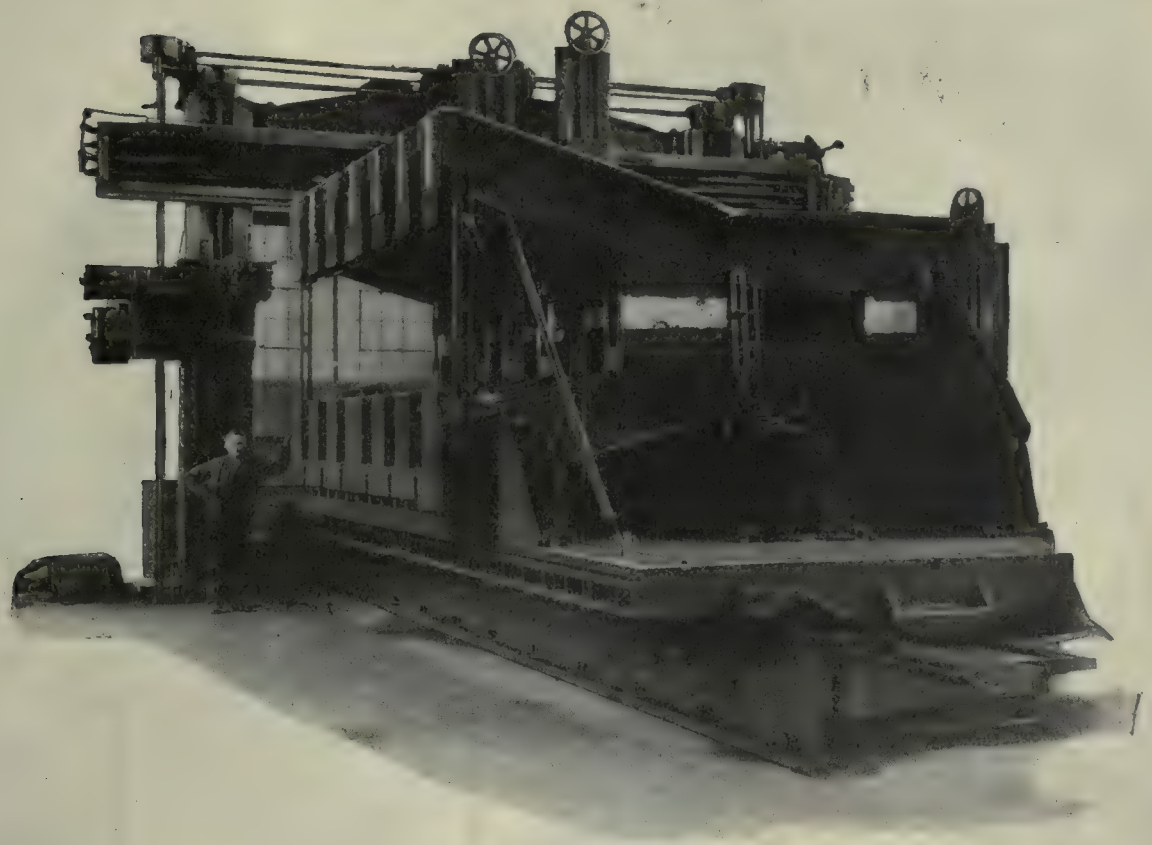
THE KEMPSMITH MFG. CO
MILWAUKEE U.S.A.

The Maximum in Milling Machines

CONSOLIDATED MACHINE TOOLS

BETTS

Heavy Duty Planers



The illustration shows a large Betts Heavy Duty Planer at the plant of McIntosh Seymour Corporation, planing Diesel Engine housings. This machine takes 15 feet between upright, 10 feet under the tool and has a 36-foot planing length.

When buying your next planer investigate the records of these machines in actual service—they will give satisfactory service continuously for years and without costly repairs.

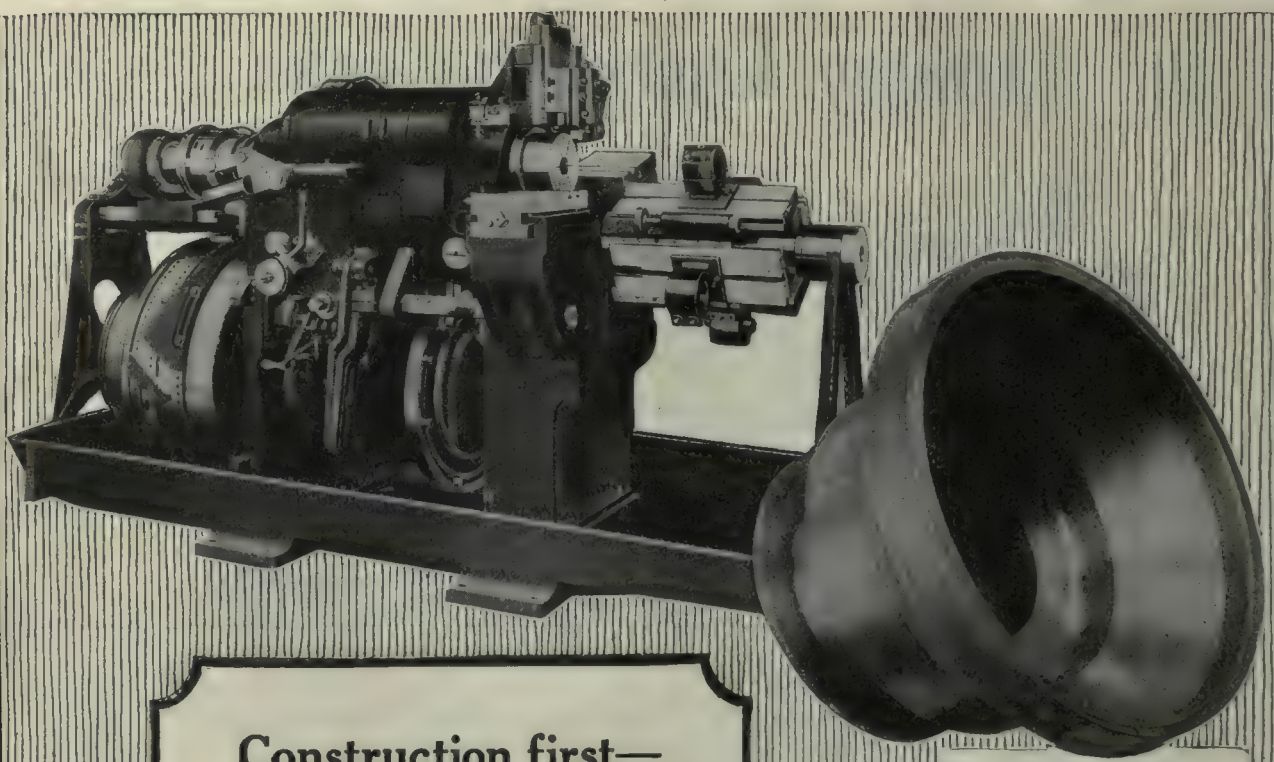
Write us for prices on any of these tools

BETTS	COLBURN	HILLES & JONES	MODERN	NEWTON
Engine Lathes	Drill Presses	Punches and Shears	Plain Grinders	Cold Saws
Boring Mills	Special Drills	Bending Rolls	Universal Grinders	Crank Planers
Planers	H. D. Boring Mills	Plate Planers	Magic Chucks	Milling Machines
Slotters	Standard Boring Mills	Flanging Clamps	S. O. Die Heads	Rod Borers
Axle Lathes, Etc.	Rod Boring Machines, Etc.	Straightening Rolls, Etc.	Threading Machines, Etc.	Cylinder Borers, Etc.

CONSOLIDATED MACHINE TOOL CORPORATION OF AMERICA

402 BLOSSOM ROAD **ROCHESTER, N. Y.**

Model L Gridley Single Spindle

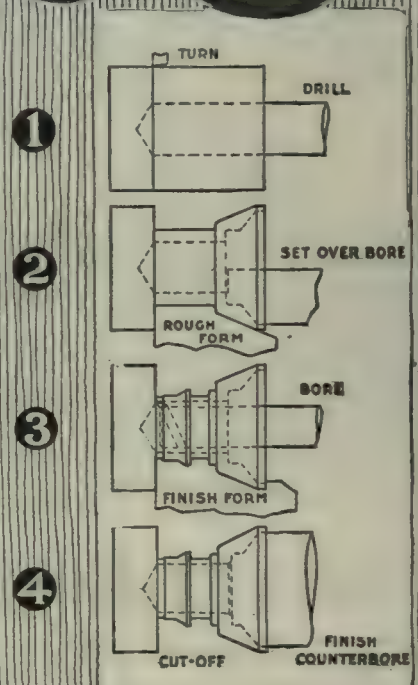


Construction first—your costs depend on it.

The kind of tool support you see in the 5¼ in. Model L Gridley turret lathe above is responsible for the heavy forming, boring and counterboring operations shown on the diagram of this steel job.

And the standardization of tools for both roughing and fine finishing enables you to change from one job to another on the shorter runs without excessive expense of equipment or time.

After all it's the quantity per hour that measures the cort per piece. It costs you nothing to find out how many you can get on Gridleys. Capacities 2¼ in. to 5¼ in.



The National Acme Company

Windsor, Vt. Cleveland, O.

New York, Boston, Buffalo, Chicago, Detroit, Los Angeles

The Purpose of a Good Cutter

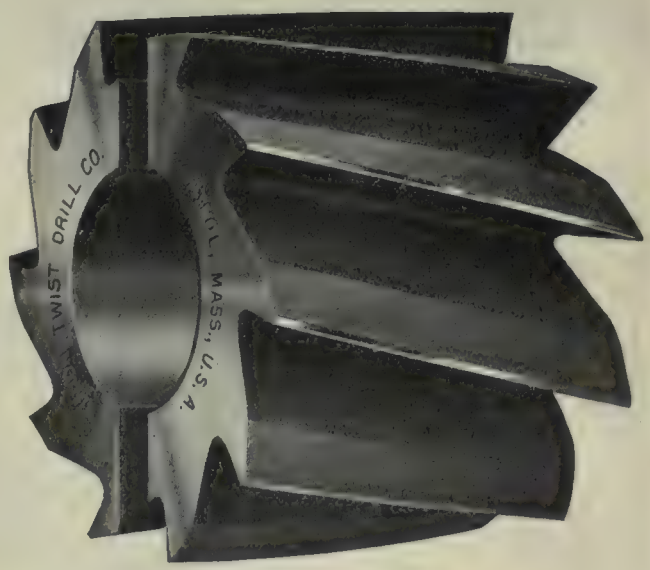
Union High Power Cutters were developed to keep on the job—not to furnish a position for a tool grinder.

The cutting teeth are designed for maximum strength and the care used in material selection and final heat treating assure an unusual service life.

Union Cutters cost less in the end, as is being daily proven by production charts.

Let us give you reasons for using

UNION
High Power Cutters



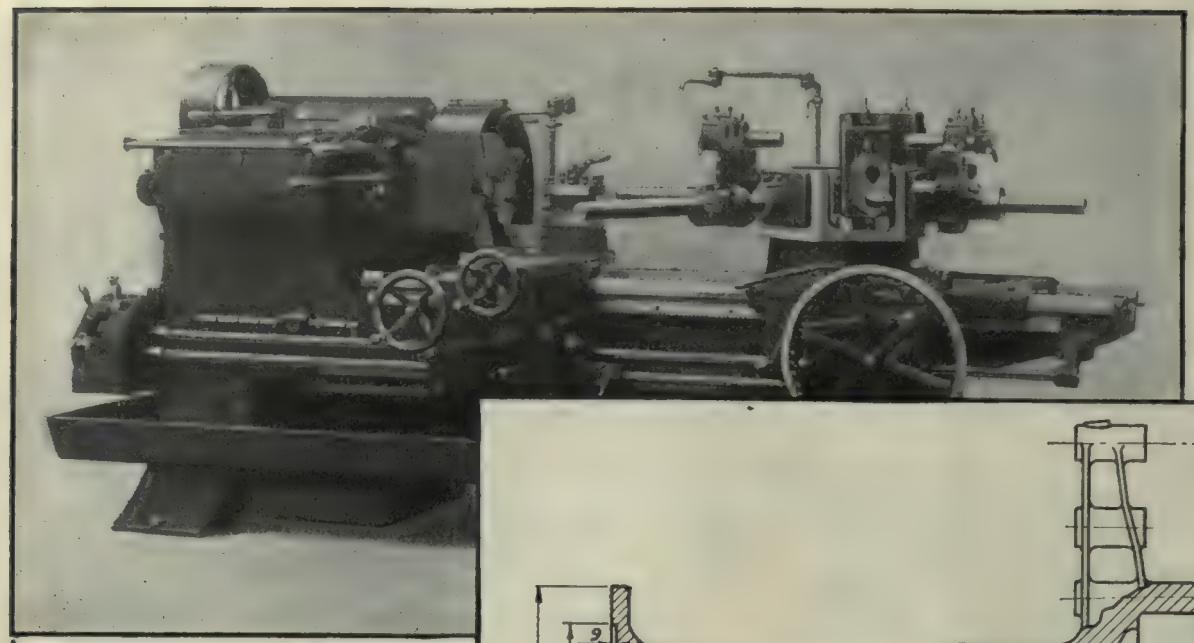


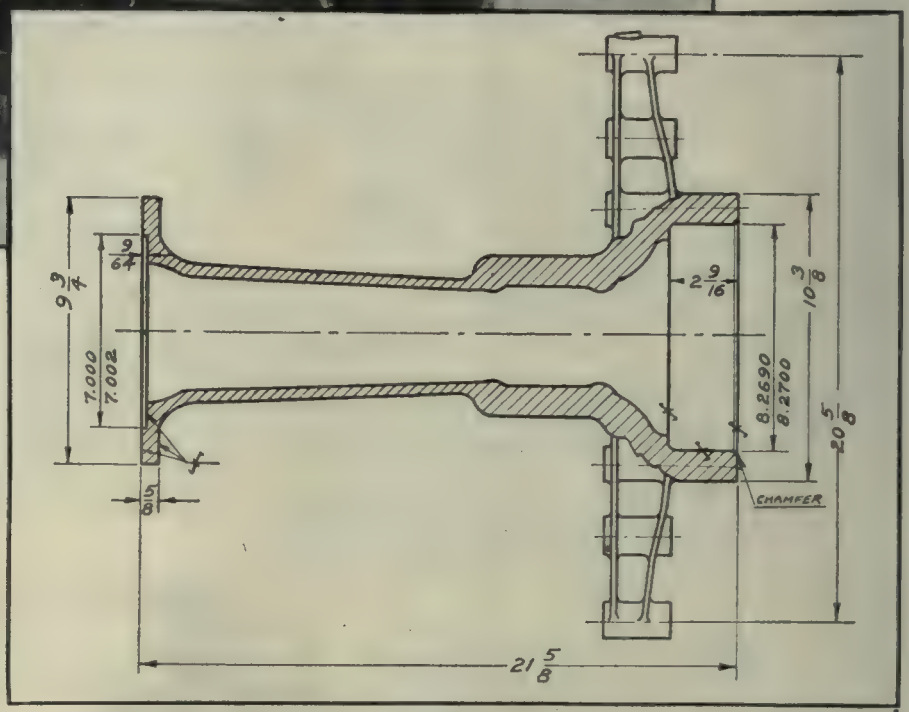
UNION TWIST DRILL CO.

Drill, Reamer and Cutter Makers

ATHOL MASS. USA

DOMESTIC AGENTS: Buffalo, Root, Neal & Co.; Cincinnati, V. N. Devou Supply Co.; Cleveland, White Tool & Supply Co.; Detroit, The Boyer-Campbell Co.; Evansville, Evansville Supply Co.; Grand Rapids, McMullen Machinery Co.; Houston, Brazelton, Wessendorff & Nelms; Indianapolis, Vonnegut Machinery Co.; Minneapolis, F. E. Satterlee Co.; Milwaukee, The Phillip Gross Hardware; New Haven, The Page, Steele & Flagg Co.; New Orleans, Oliver H. Van Horn, Inc. (Cutters); Passaic, New Jersey Engineering & Supply Co.; Philadelphia, E. M. Hanson & Co.; Pittsburgh, Somers, Fitler & Todd Co.; Rochester, Homer Strong; San Francisco, Fred Ward & Son; Springfield, W. J. Foss Company; St. Louis, St. Louis Machinists Supply Co.; Syracuse, Syracuse Supply Co.; Toledo, National Supply Co.; Trenton, N. J., Warren Balderston & Co.; Worcester, Brierly-Lombard Co.; Wayne Hardware Co., Fort Wayne, Ind. **FOREIGN AGENTS:** Australia, Bevan & Edwards, Ltd., Melbourne; Australia, Engineering Supply Co. of Australia, Ltd., Brisbane; Belgium, Charles L. Demoor, Brussels; China, Anderson, Meyer, Shanghai; Denmark, V. Lowener, Copenhagen; England, Markt & Co., London; France, Societe Aux Forges de Vulcain, Paris; Greece, A. M. Papasideris & Co.; Italy, Chas. Civita, Milano; Norway, V. Lowener, Christiania; Spain, Hijo de Miguel Mateu, Barcelona; Sweden, V. Lowener, Stockholm.





Big Saving in an Up-to-Date Motor Truck Plant

Both ends completed in one chucking

A rear axle tube for a Motor Truck required 28 minutes to finish. Because additional equipment was necessary to finish a new and larger tube, the manufacturer investigated other methods than what he was using.

He found that Warner & Swasey 3-A Turret Lathe could do the work on this larger tube in **10½ minutes.** A big saving over the **28 minute** method.

The Warner & Swasey Company

CLEVELAND, OHIO, U. S. A.

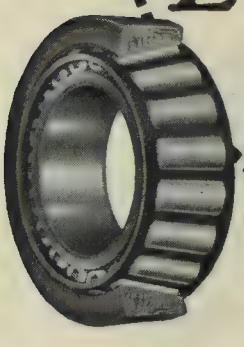
NEW YORK: Singer Building
CHICAGO: 618-622 Washington Boulevard
MILWAUKEE: 1143 Wells Building
BOSTON: Oliver Building
BUFFALO: Iroquois Building
DETROIT: 5928 Second Boulevard
DAYTON: 518 Mutual Home Building



May all the threads you cut in 1924 be clean and true

S.W. CARD MFG. CO.
DIVISION OF UNION TWIST DRILL CO.
MANSFIELD, MASSACHUSETTS. U.S.A.

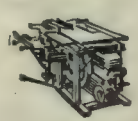
We'll Fight Friction for you *Everywhere*






Textile Machinery

Elevators

Woodworking Machinery

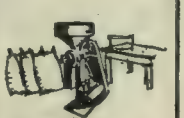
Rail Cars


Railway Signal Devices


Mine Cars


Clay Machinery


Pumping Machinery


Coffee Grinders

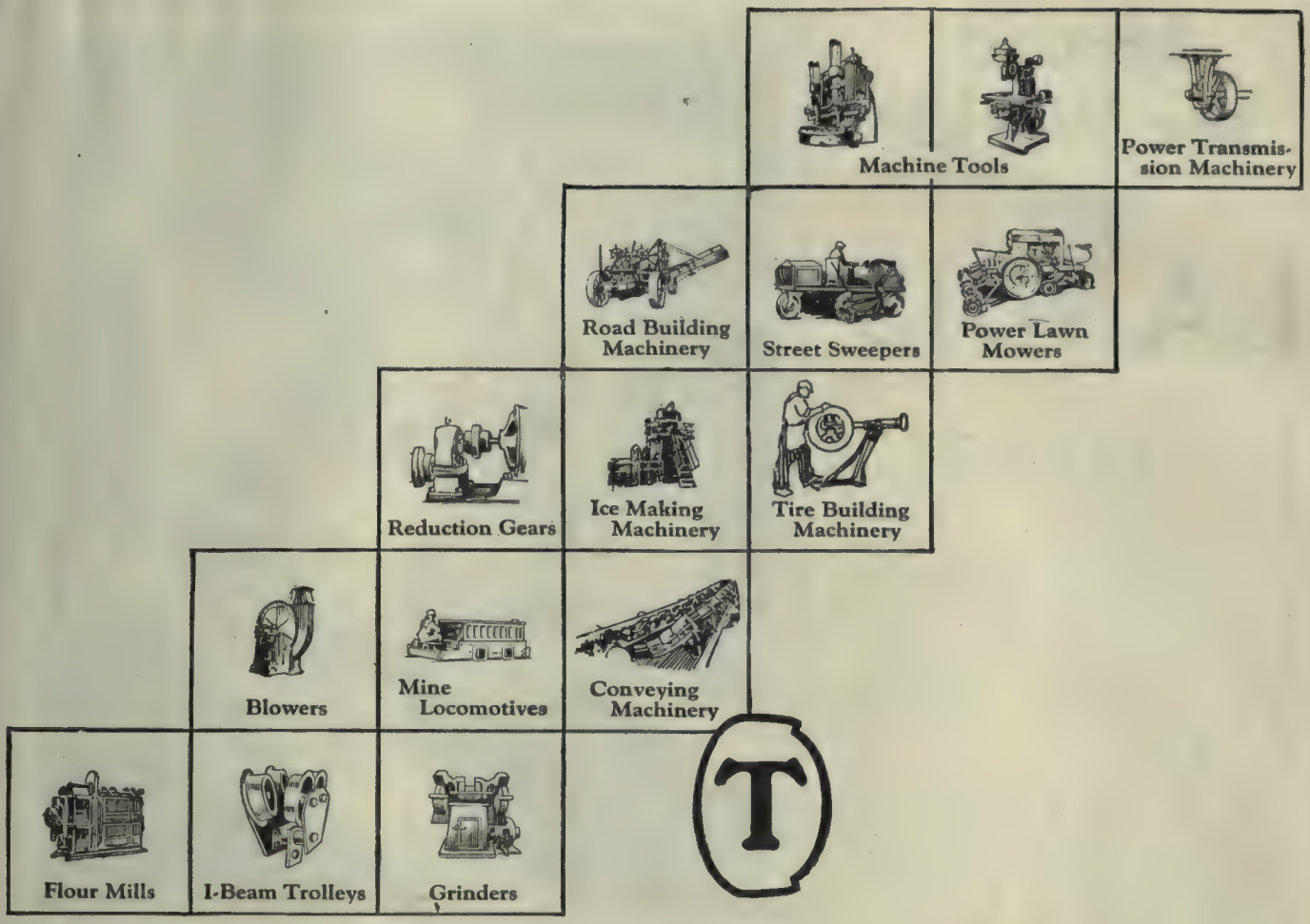

Electric Motors


Paper Machinery


Printing Presses


Electric Hoists

© 1923, By The T R B Co, Canton, O



Timken Universality

Emphasizing the wide adaptability of Timken Tapered Roller Bearings to all industry, illustrations are shown herewith of some of the installations in which Timken Bearing superior efficiency is being demonstrated.

That Timken dominancy, so pronounced in the automotive world, is assured in the world of general industry, is clearly indicated by the ever-increasing number of manufacturers who are turning to Timken Bearings almost daily for the improvement and refinement of their products.

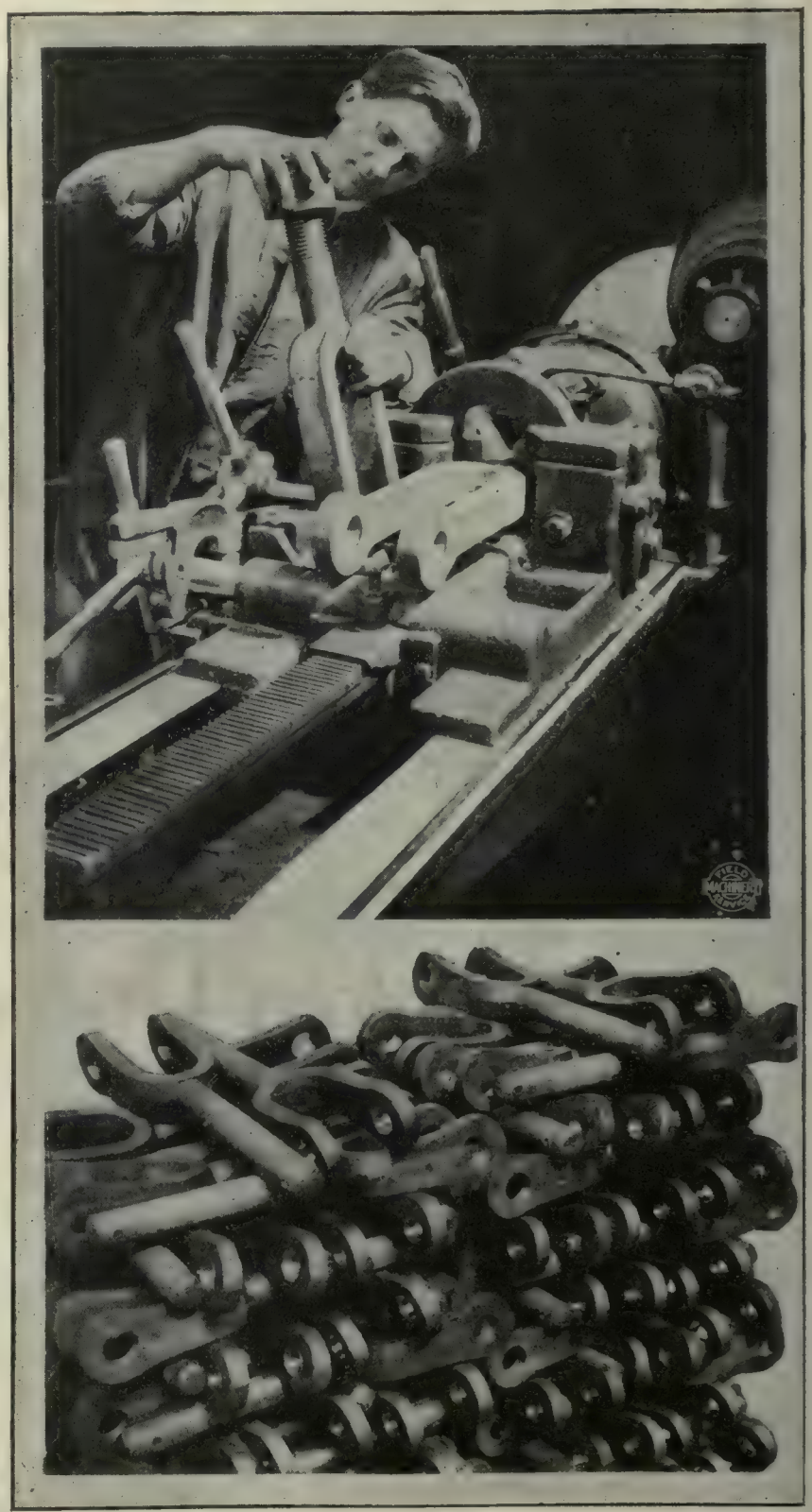
In general industry, as in the automotive industry, Timken Bearings mean not only improved products but always more economical operation of those Timken-equipped products.

This is true because in addition to their anti-frictional qualities; in addition to the ability of Timken Tapered Roller Bearings to carry radial loads, *and* thrust loads, *and* resultant loads, uniformly and simultaneously; in addition to the fact that tapered roller bearings carry more load per unit of space required than any other type of bearing; in addition to all these characteristics Timken Tapered Roller Bearings are adjustable for that wear which *must* follow motion. Just a simple turn of a nut and your Timkens function as when new.

The Timken Roller Bearing Co
CANTON, OHIO

TIMKEN
Tapered
ROLLER BEARINGS

Around the World *with* LANDIS



Draw bars, coupling screws, adjusting screws, etc.—anything and everything requiring clean, true threads within the capacity of the 2-in. Die Head, is brought to this LANDIS Threading Machine—one of several in constant use for years in one of the Wolverton shops of the London and N. W. Railway.

The job shown is wrought iron beam joints, to be threaded a distance of 7 in. with a 1⅝-in., 5 per inch Whitworth pitch thread. Each completed thread is carefully inspected and tested by the young apprentice who operates the machine while the next is being cut; and production is uniform—2 minutes per piece.

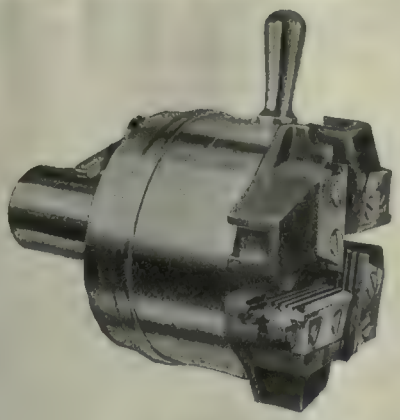
"Dies Last Long and Cut Good, Clean Threads"

The reputation of LANDIS Threading Machines in this English shop is the same as has followed them into practically every industrial center in the world. Let us describe their exclusive advantages.

Landis Machine Co.
Incorporated
Waynesboro, Pa., U. S. A.

LANDIS TRADE MARK

DOMESTIC AGENTS: Marshall & Huschart Machinery Co., Chicago, Ill.; Marshall & Huschart Machinery Co. of Indiana, Indianapolis, Ind.; Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; R. B. Whitacre & Co., St. Paul, Minn.; Hamilton Machinery Company, Chattanooga, Tenn.; Seeger Machine Tool Co., Atlanta, Ga.; Young & Vann Supply Co., Birmingham, Ala.; Woodward, Wright & Co., New Orleans, La.; Jos. T. Ryerson & Sons, Houston, Texas; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.; Salt Lake Hardware Co., Salt Lake City, Utah; Herberts Machinery & Supply Co., San Francisco and Los Angeles, Calif.; Harry M. Euler Co., Portland, Oregon; Hallidie Machy. Co., Seattle, Wash.; Hallidie Co., Spokane, Wash. CANADIAN AGENTS: Canadian Fairbanks-Morse Co., Toronto and Montreal. FOREIGN AGENTS: Alfred Herbert, Ltd., Coventry, England; Calcutta, India; Yokohama, Japan; Allied Machinery Co., Shanghai, China; Barcelona, Spain; Turin, Italy; Zurich, Switzerland; Stokvis & Zonen, Rotterdam, Holland; Lindeteves Stokvis, Batavia, Java; Dutch East Indies; D. Drury & Co., Johannesburg, South Africa; Benson Brothers, Sydney, Australia.



Precision Threading
Long Chaser Life
Maximum Production

LANDIS AUTOMATIC DIE HEAD

Long experience with LANDIS bolt and pipe threading machines gave a hearty welcome to this LANDIS Automatic Die Head. Used for threading bolts, studs and miscellaneous threading, it has well paid for itself.

The easy access to the chasers make changing from one diameter to another a quick operation. The variable rake angle and the tangential contact of the chasers make precision threading a certainty, while the long life of the chasers insures profitable threads and a very low cost of upkeep.

Do you cut threads on a turret lathe? If so, apply the LANDIS Automatic Head and reap the many advantages of this efficient tool.

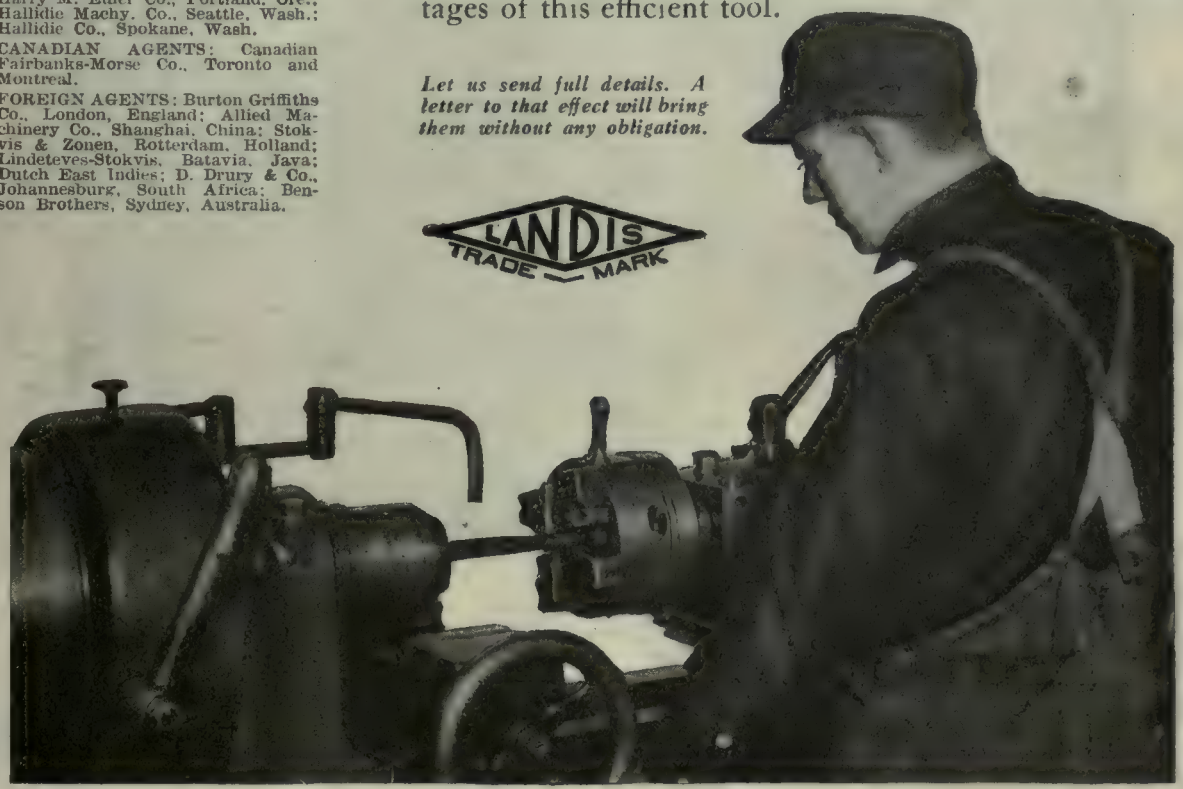
Let us send full details. A letter to that effect will bring them without any obligation.

DOMESTIC AGENTS: Marshall & Huschart Machinery Co., Chicago, Ill.; Marshall & Huschart Machinery Co. of Indiana, Indianapolis, Ind.; Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; R. B. Whitacre & Co., St. Paul, Minn.; Hamilton Machinery Co., Chattanooga, Tenn.; Seeger Machine Tool Co., Atlanta, Ga.; Young & Vann Supply Co., Birmingham, Ala.; Woodward, Wight & Co., New Orleans, La.; Jos. T. Ryerson & Sons, Houston, Texas; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.; Salt Lake Hardware Co., Salt Lake City, Utah; Herberts Machy. & Supply Co., Los Angeles and San Francisco, Cal.; Harry M. Euler Co., Portland, Ore.; Hallidie Machy. Co., Seattle, Wash.; Hallidie Co., Spokane, Wash.

CANADIAN AGENTS: Canadian Fairbanks-Morse Co., Toronto and Montreal.

FOREIGN AGENTS: Burton Griffiths Co., London, England; Allied Machinery Co., Shanghai, China; Stokvis & Zonen, Rotterdam, Holland; Lindeteves-Stokvis, Batavia, Java; Dutch East Indies; D. Drury & Co., Johannesburg, South Africa; Benson Brothers, Sydney, Australia.

LANDIS TRADE MARK



LANDIS MACHINE COMPANY

Waynesboro, Penna., U. S. A.

Doubles Former Production

When W. E. Arnold, Malden, Mass., maker of molds for rubber goods, installed this Whitcomb Planer it was with the distinct understanding that it must beat the production of another machine engaged in the same work in order to complete the sale.

We were sure of the result—he was a little dubious. As a matter of fact it has approximately doubled the best production of the competing machine.

The work shown here—finishing mold plates for rubber heels—is a typical example of Whitcomb production in this plant. The plates are machine steel, 7/16 in. to 1 in. thick, finished to limits of + .002 in.

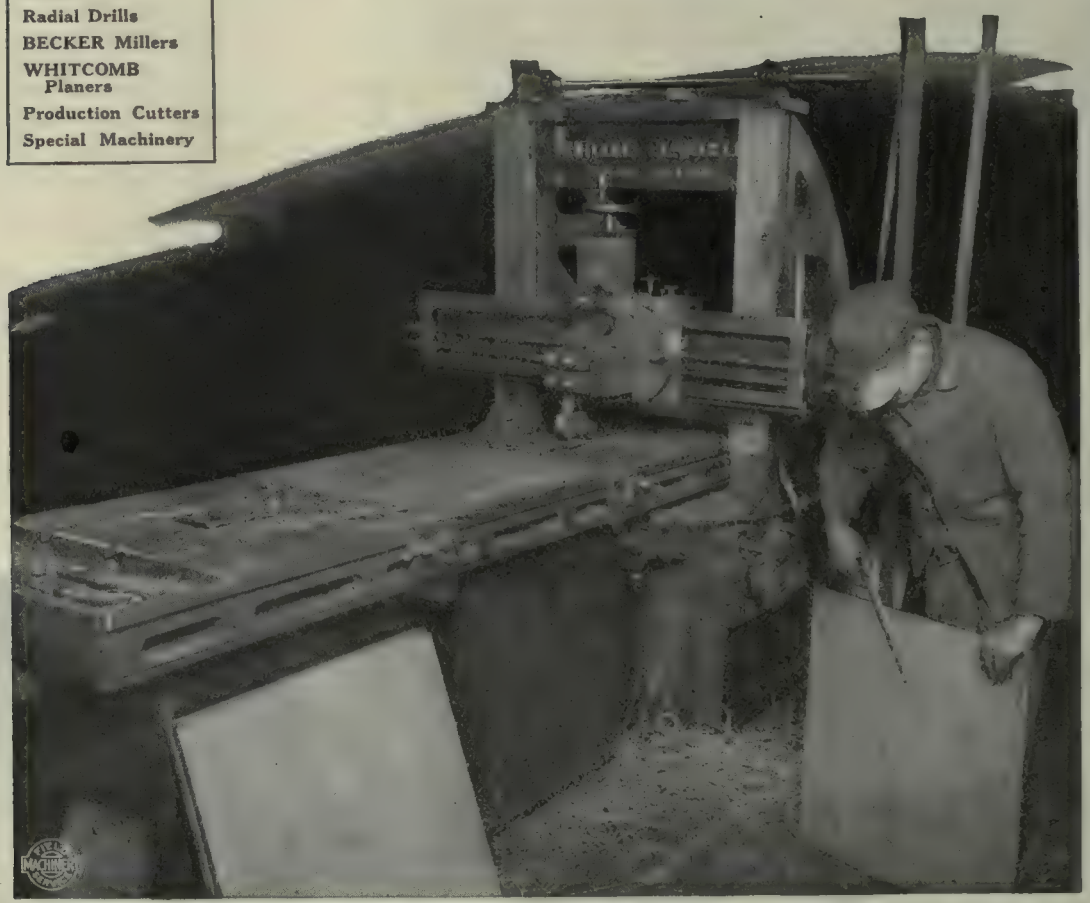
A gang tool-holder with four tools takes a cut ⅛ in. wide on a surface 25 in. long by 25 in. wide in 18 minutes with the table running at 60 ft. per minute. A plate 25 in. by 25 in. rough planed on both sides and finish planed on one side is completed in one hour—floor to floor.

Ask for more performance data on

Whitcomb Planers

REED-PRENTICE MACHINE TOOLS

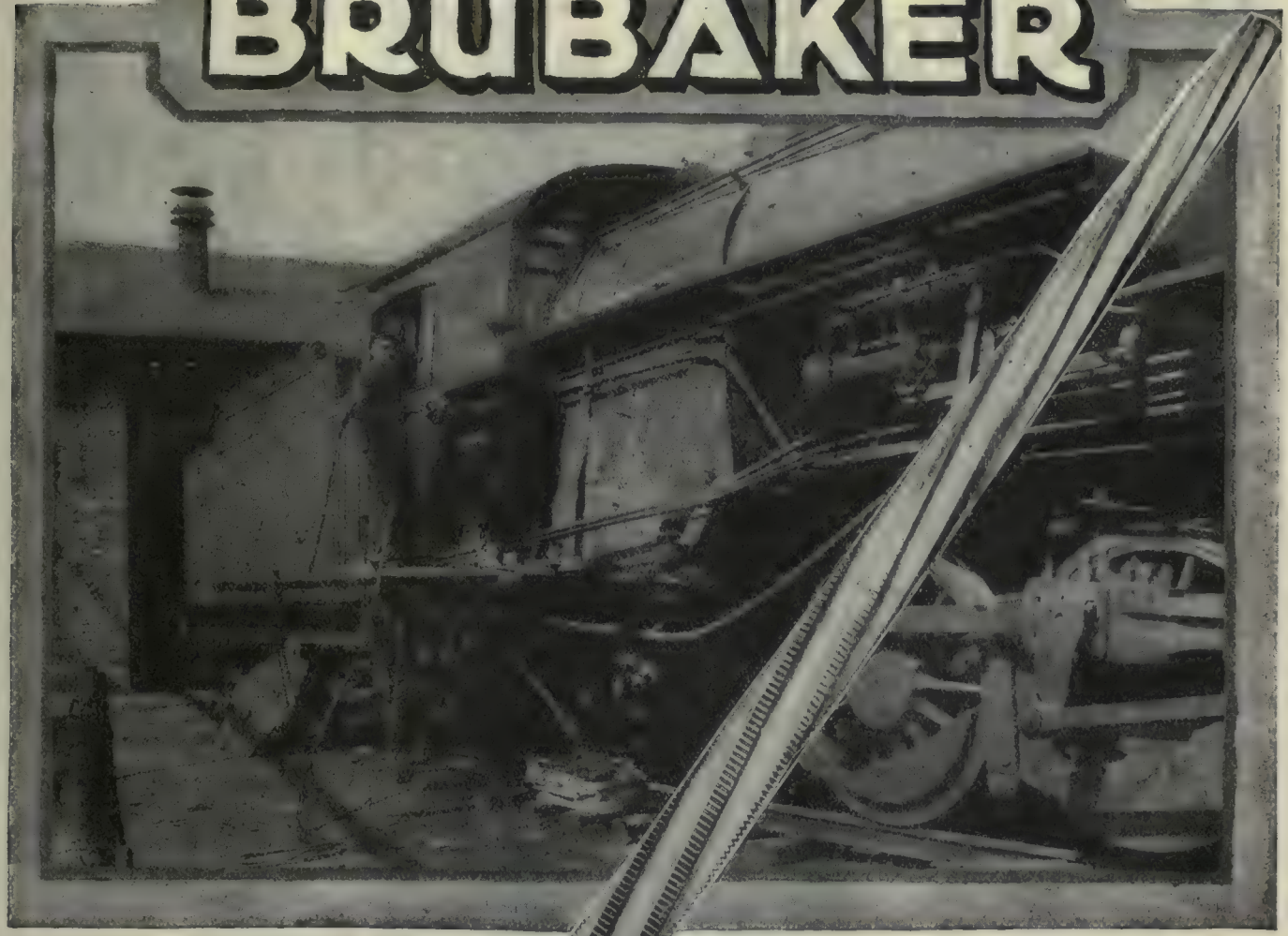
Lathes
Radial Drills
BECKER Millers
WHITCOMB Planers
Production Cutters
Special Machinery



REED-PRENTICE COMPANY

WORCESTER, MASS., U. S. A.

BRUBAKER



Spiral Fluted Staybolt Tap

Patented
Patent No. 1434870

In An Emergency

A Brubaker Staybolt Tap to meet the most exacting conditions of repair work; retapping old sheets, cutting through mud, rust and scale.

THE BRUBAKER SPIRAL FLUTED TAP

has more bearing in the boiler plate, enabling the tap to cut a perfect hole.

A great feature of the spiral fluted tap is that it is a chip breaker throughout its entire length of flute; instead of curling the chips it breaks them, which allows them to pass readily along the flute, and at the same time keeps them from sticking in between the teeth.

For Detailed Description Locomotive Cyclopedia 1922

W. L. BRUBAKER & BROS. CO.

Millersburg, Pa.

50 Church Street, New York

Putting the "lift" in elevator production

Bullard Maxi Mills have been putting the "lift" in elevator production in the plant of the A. B. See Elevator Co. for a good many years—to be exact one **Bullard** has been on the job for over 18 years and a second is near the half score mark.

The **Bullard** shown opposite is turning the outside and inside diameters of Cast Steel Motor Pole Pieces.

Extremely close limits are required on this work yet one complete motor set — eight pole pieces — are set in fixtures, roughed and finished in remarkable time.

Extreme power, absolute rigidity to assure precision, high speed and simultaneous machining on inner and outer surfaces of the pole pieces make for profitable production.

The BULLARD MAXI-MILL is dependable under all working conditions. Every element in its construction has been proved by years of service.

On tough machining propositions, where close accuracy is the prime factor, it produces economically.

Bullard Engineers will convince you of the advantages of Bullard Equipment on your face plate work. Send prints for estimate.

BULLARD

MAXI-MILL

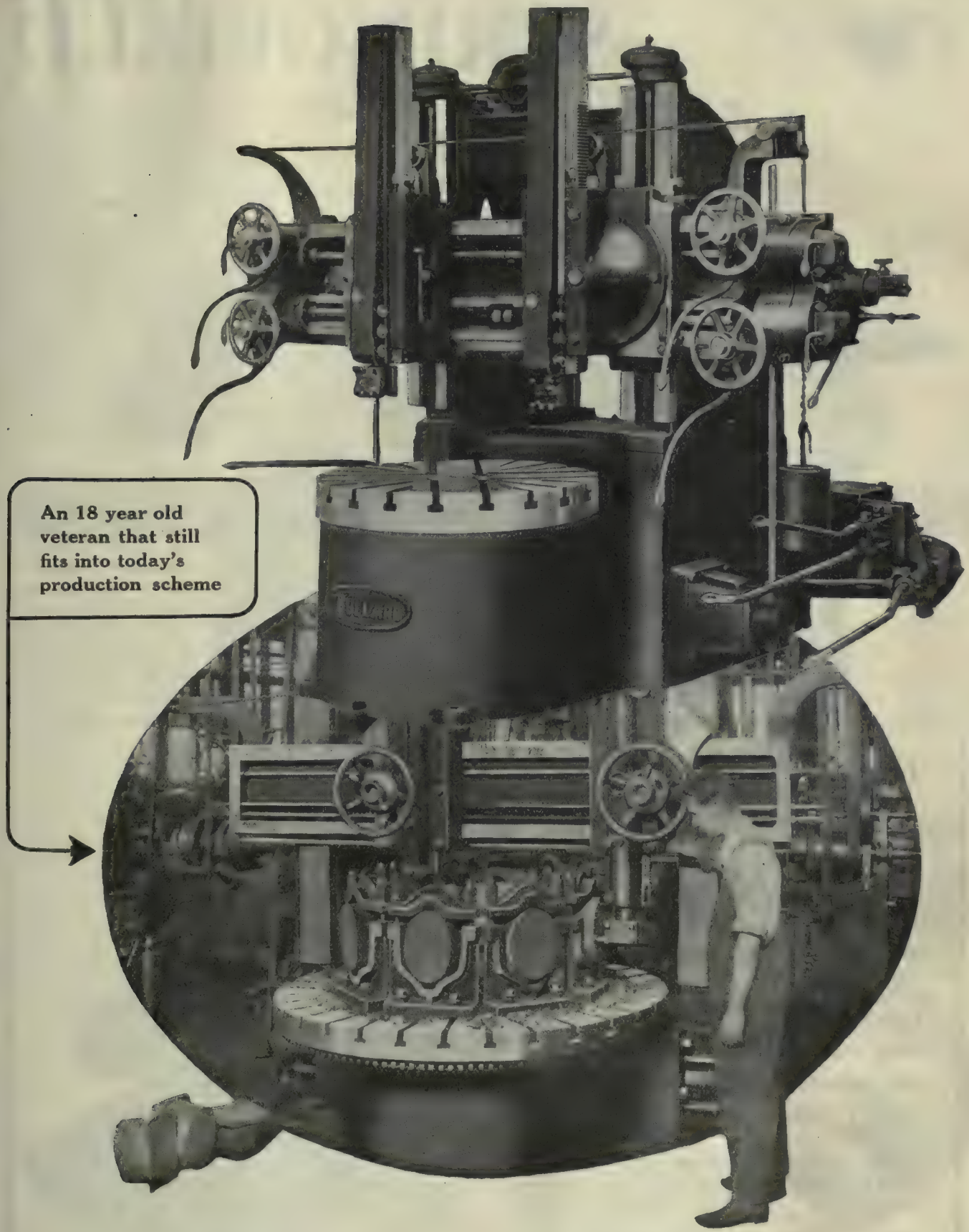
BULLARD
Maxi-Mill
44-in., 54-in., 61-in.

BULLARD
Vertical Turret Lathe
24-in., 36-in., 42-in., 54-in.

BULLARD
Mult-Au-Matic
8-in., 12-in., 16-in.

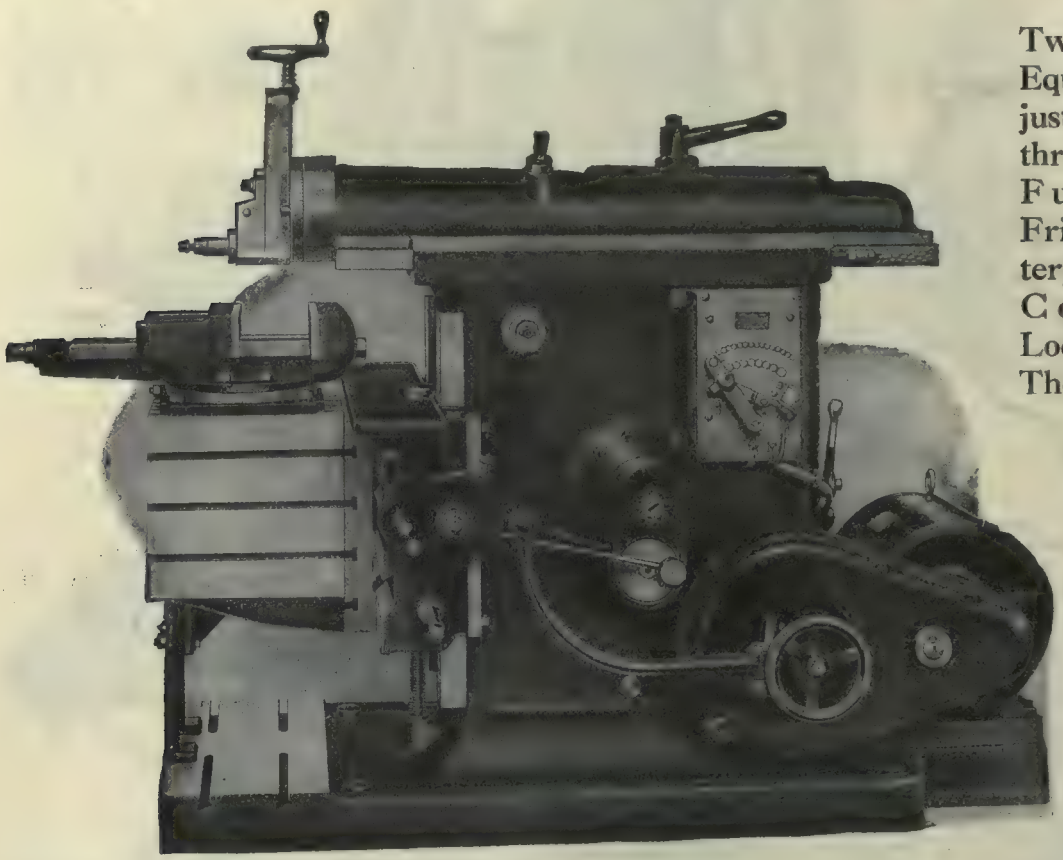
BULLARD
Contin-U-Matic
Chucking and Turning
10-in., 18-in.

The Bullard Machine Tool



Co., Bridgeport, Conn.

SPRINGFIELD



Twenty-inch Shaper Equipped with Adjustable Speed Motor through Gear Train. Furnished with Friction Clutch Interposed with Lever Conveniently Located. All Gears Thoroughly Guarded.

Ask for Illustrated Catalog "J"

The Springfield Machine Tool Co.

Springfield, Ohio, U. S. A.

AGENTS: Manning, Maxwell & Moore, Inc., New York, Boston, Philadelphia, Buffalo, Syracuse, New Haven, Pittsburgh, St. Louis, San Francisco, Seattle, Cincinnati; The E. L. Essley Machinery Co., Chicago, Ill.; The Riverside Machinery Depot, Detroit, Mich.; The Cleveland Duplex Machinery Co., Cleveland, O.

The
FOSTER
1-B Universal Turret Lathe

as the name implies, is an all around machine, with the following capacities:

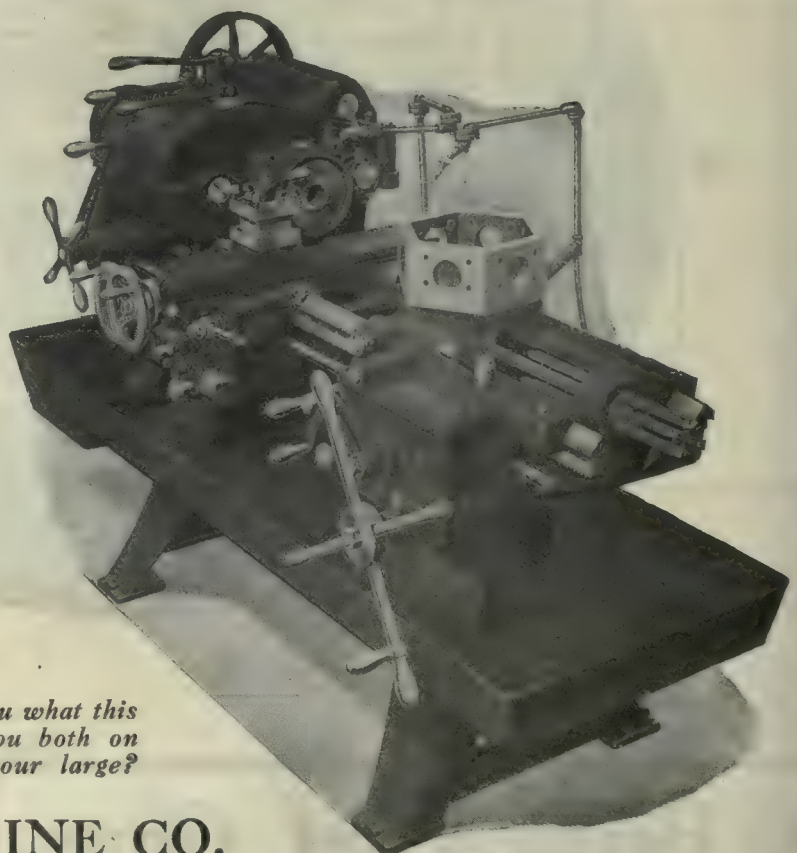
Automatic Chuck (round).. 2 in.

Swing over cross slide..... 8 in.

Swing over bed.....15½ in.

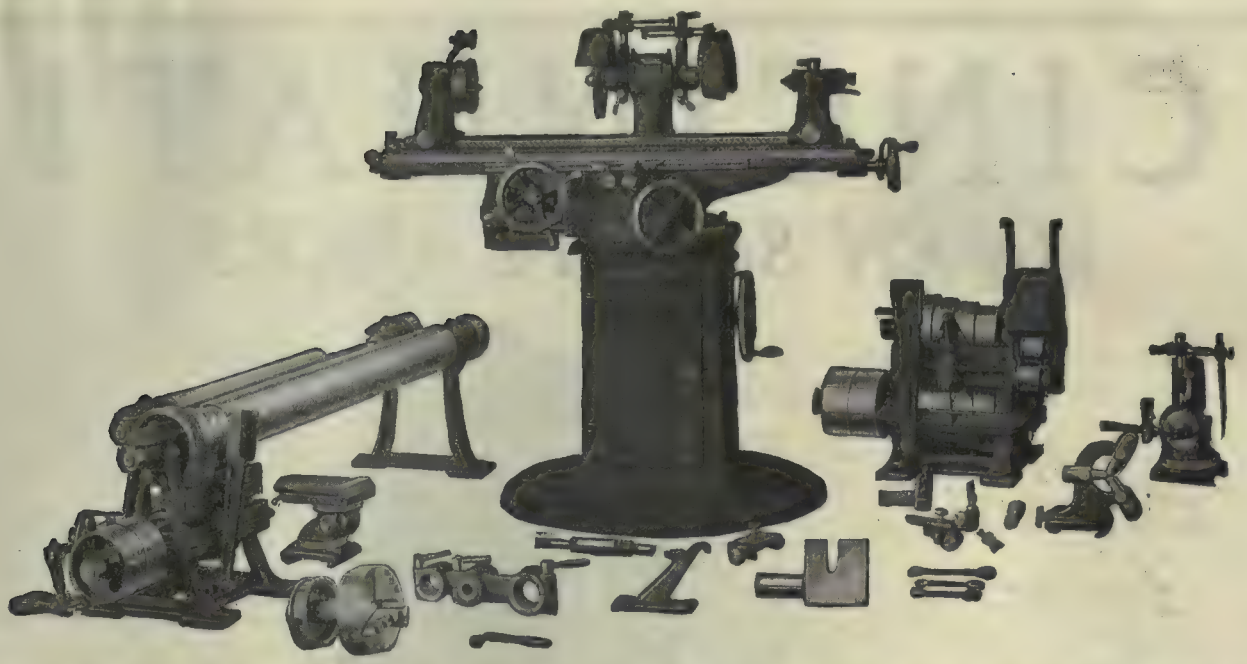
Effective movement of turret.....22 in.

Maximum distance between end of spindle and face of turret .....30 in.



Why not let us show you what this machine will do for you both on your short runs and your large?

FOSTER MACHINE CO.
ELKHART, INDIANA



A Norton Machine for Tool and Cutter Grinding

With a range that meets practically every demand of tool and cutter grinding as well as light cylindrical and surface grinding the Norton Universal Tool and Cutter Grinding Machine is ideally suited for the shop tool room.

It is made in two sizes — No. 1 which swings 8" and takes 15" between centers; and No. 2. which swings 10" and takes 32" between centers.

This machine complete with accessory equipment and attachments as shown is an exceptionally economical investment. Specifications and prices will gladly be furnished upon request.

NORTON COMPANY

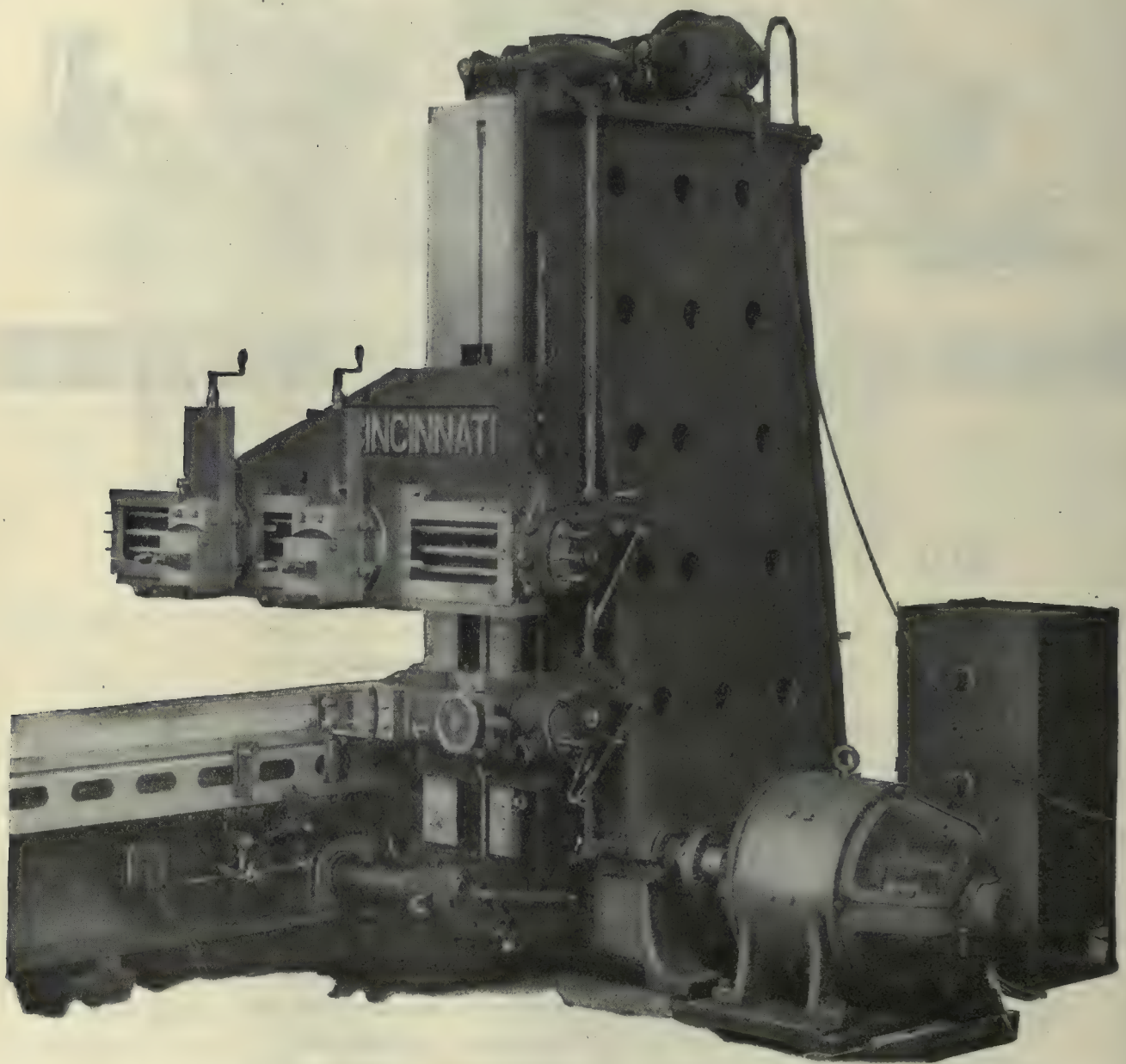
WORCESTER, MASS.

NEW YORK SYRACUSE CHICAGO CLEVELAND DETROIT HARTFORD PHILADELPHIA

M-100

CINCINNATI

OPEN SIDE PLANERS



A planer that has no superior.
Designed to meet all requirements.
Equipped with CINCINNATI'S well known features.

Rapid Power Traverse, Forced Lubrication, Tu-Speed Drive, Herringbone Gears, Box Table and Arch.

PLANERS
BORING MILLS

Our Catalog Gives Full Description

THE CINCINNATI PLANER CO., Cincinnati, Ohio



CYCLONE HOISTS
HIGH SPEED

We Saw this Example of Labor Saving From Our Office Window!

IT took nine husky men, with many a "yo" and a heave, to place this ponderous fitting in position for lowering into a trench dug by the Cleveland Electric Illuminating Co. for laying the steam pipes to the new Union Trust Building, Cleveland.

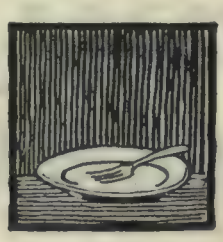
When hooked to the Cyclone Hoist, rigged over the trench, one man alone lowered the same heavy weight into position!

One never need go far to find places where a Cyclone Hoist can save labor and cut costs. Perhaps *you* need only look out *your* window into your factory yard, your shop or warehouse to see instances where a Cyclone Hoist can profitably replace muscle-methods. Look!

Send for catalog covering 1 to 40 Ton Hoists Cranes, Trolleys and Overhead Track Systems.

DISTRIBUTORS EVERYWHERE

The Chisholm-Moore Mfg. Co.
Cleveland, O.
Hoists Cranes Trolleys
Overhead Track Systems
Branches: **New York, Chicago, Pittsburgh**



You can't eat your cake and have it—*Old Proverb*

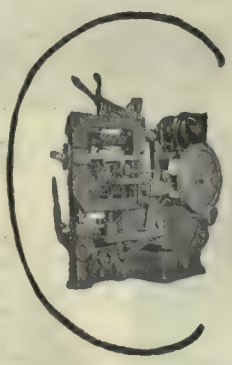
A century or so ago some bewhiskered old chap discovered that once one has eaten one's cake, one cannot longer have it. Cake, of course, being synonymous for everything consumable.

And there's no use denying it; the old boy was right. Which brings us around to an important item of waste—preventable waste, happily.

In many average lathe, milling machine and shaper operations about 20 per cent of the metal involved is reduced to chips—wasted! Formerly it would have been merely lost, but now it is wasted because its loss is unnecessary.

The Peerless Universal Shaping Saw operates with extreme rapidity on much work ordinarily done on a miller or shaper and it does not waste metal. It leaves no chips and consumes stock only the thickness of its blade. Contrast this saving of metal with the loss that may be occurring in your shop. Then get full details about the Peerless Universal Shaping Saw itself.

Peerless



Still Faster UNIVERSAL SHAPING SAW

If you get only one new idea out of "A New Departure in the Sawing of Metals" it will be worth much more than the trouble of asking for it.



PEERLESS MACHINE CO.
1358 Clark St.
Racine, Wisconsin

Gray Planers

DURABLE

Long life and freedom from wear can be secured only by adequate and unfailing lubrication. The following features incorporated in Gray Maximum Service Planers are therefore of the utmost importance:

1st. V's are flooded with filtered oil.

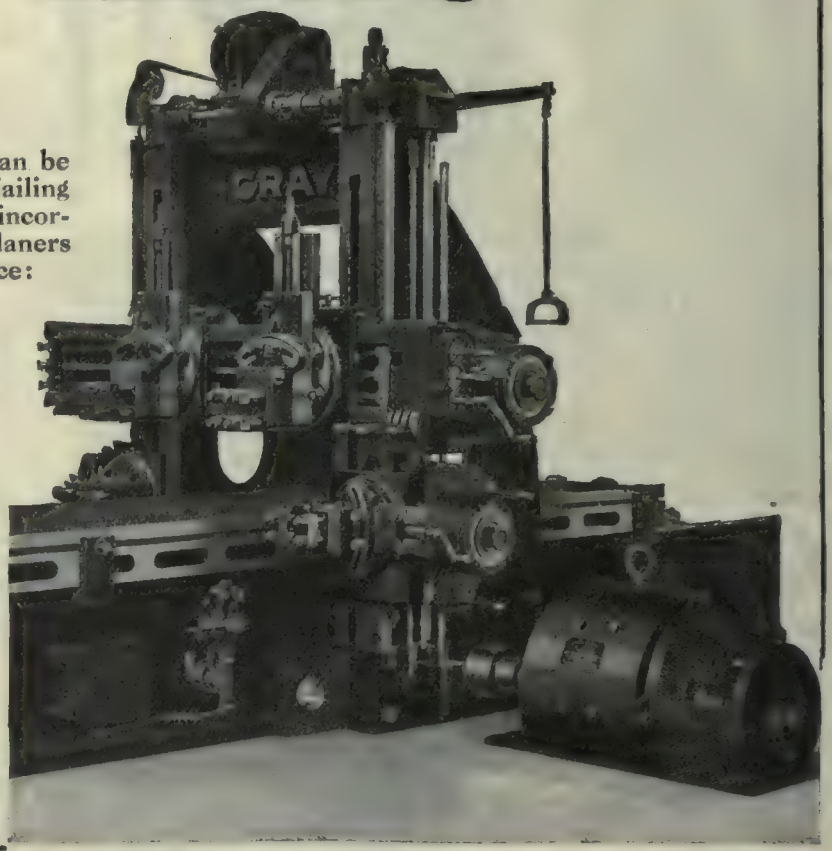
2nd. Gears run in a bath of oil.

3rd. Driving shaft bearings are flooded with filtered oil.

4th. Feed and rapid traverse gears run in oil.

5th. Rail, side heads and top works are lubricated from centralized oil reservoirs.

May we tell you of the many other features that make the Gray Maximum Service Planers so easy to take care of and also such big producers?



Write for our fully illustrated Catalog

THE G. A. GRAY CO.
CINCINNATI, OHIO

CLEVELAND'S CAPACITY UNEQUALED



Finishing 1 in. Globe Valve Spindle Castings—

at the rate of

124

per minute

Illustrating a practical application of the Magazine Feed

Conveyor carries part from magazine to chuck.

A circular tool necks casting while a straightening block straightens from the front cross slide. This operation is followed closely by the Three Tool Roughing Mill from the turret which rough turns three diameters and finish turns small thread diameter.

A two tool finishing mill turns the Acme thread diameter and ½ in. diameter, the large S. O. Die Head cuts the Acme thread and is followed by the small S. O. Die Head which cuts the small thread on the end of the spindle.

The ¾ in. and ⅝ in. diameters are finish formed on the end while the spindle is cut off from the rear cross slide.

The operations are timed to follow rapidly, some overlapping the preceding operation.

Wouldn't this kind of a Cleveland application save money on some of your parts? We'll gladly furnish you full details upon request.

The Cleveland Automatic Machine Company
Cleveland, Ohio

Another Good Job
for a
GARDNER DISC GRINDER

GARDNER-GRINDING is the Ideal and Most Economical Method of Finishing Jobs Such as This!



Name: Woodworker's vice jaws.

Approximate area: 30 sq. in.

Approximate stock removed: 1/16 in.

PRODUCTION: 70 per hour complete (2 operations necessary, roughing and finishing.)

Machine used: No. 6 Gardner Disc Grinder; 26-in disc wheels; lever feed table.

Abrasive disc used: No. 126 G. I. A.

Fixture used: 90° angle plate with studs for backing up. Piece not clamped.

"Gardner-Grind Your Flat Surfaces"

Gardner Machine Company

410 E. Gardner St., Beloit, Wis., U. S. A.

Bigger Savings on Small Threading Operations



GEOMETRIC Bench Threading Machines, equipped with Geometric Rotary Die Heads, are big factors in raising production and minimizing machining losses on small threaded parts.

They are practically indispensable in the manufacture of interchangeable parts. Compactness is an outstanding feature and sturdy design insures long service life.

Geometric
Bench Threading Machine

weighs but 90 pounds and takes bench space of only 9½x29 inches.

The 5/16-in. Geometric Rotary Die Head with which the machine is fitted cuts threads of standard and finer pitch on diameters 1/16 in. to 5/16 in. inclusive. The machine is arranged for bolting to a bench, or it may be mounted on a separate pedestal for floor use.

Let us show you some of the savings it will make on your work

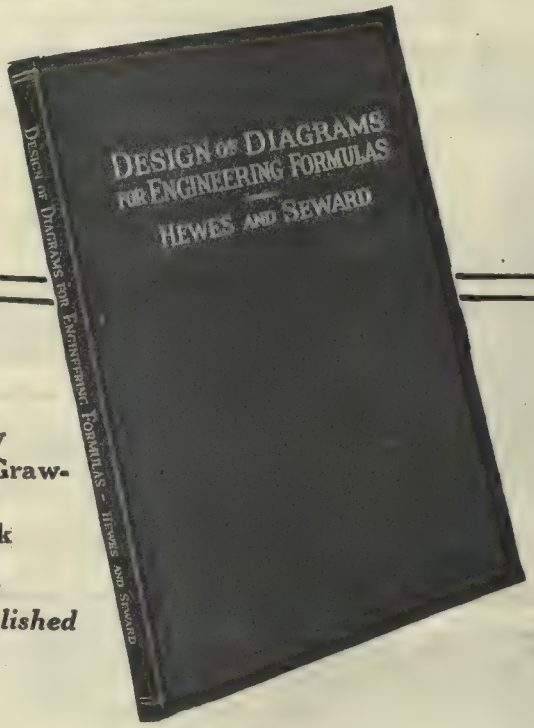
The Geometric Tool Co.

New Haven, Conn., U. S. A.

The Art of Designing Diagrams for any Formula

No one who has been called upon to solve repeatedly an engineering formula of considerable resistance can fail to appreciate the usefulness of an accurate diagram which immediately gives the value of the unknown in the most complicated formulas of standard use.

Here is a book that will enable any engineer to understand better the diagrams that are published from time to time.



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The book contains 80 selected diagrams from the simplest function scale to the most comprehensive and elaborate diagram for the solution of the equation of the fourth degree. These diagrams are alone worth the price of the book to any engineer.

Diagrams for such important formulas as Kutter's formula for the flow of water in open channels, Green's formula for the transfer of heat, the so-called Open Belt formula, Bond Valuation, etc.

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GLEASON

25-in. Quenching Press

New Design

for

Bevel and Internal Gears

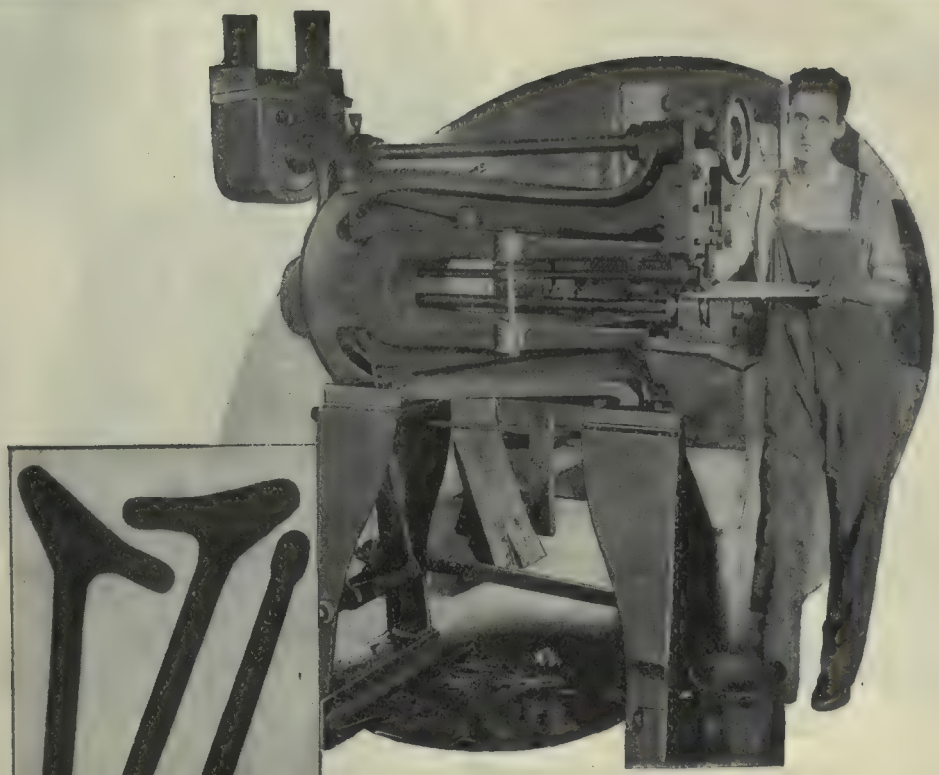


Distortion of Bevel Gears during heat treatment the cause of many rejections and losses. Insure yourself against it.

Write for full particulars

GLEASON WORKS

ROCHESTER, N. Y.



Cold Rolled Special Steel Doesn't Stop the "Gray"

Down at Pensacola, when this picture was taken, there was a rush demand for sea-planes—yet every man on the job realized that one faulty step in workmanship might cost several lives.

That's why they turned over their intricate sheet metal cutting to the

GRAY'S Sheet Metal Cutter

for there is no more speedy, yet easily controlled machine. The radiator braces shown, 18 ft. x 5 in., are cut from 3/16-in. C. R. Special Analysis Steel at the rate of 18 per hour—about 200 seconds per piece!

The Gray feeds itself—follows any pattern, and doesn't need to begin at the edge. It takes out a kerf, like a jig saw in wood—no burrs or buckling.

The foreman of the Sheet Metal Shop stated "One of the best and most useful machines in the shop."

To see this machine in operation is a revelation. Let us refer you to a near-by installation.

W. J. SAVAGE COMPANY, Inc.

Knoxville, Tenn.

European Agents: Alfred Herbert, Ltd., Coventry, England

GRAY'S Sheet Metal Cutter

Outstanding Accomplishments of the "WRIGHT" Design

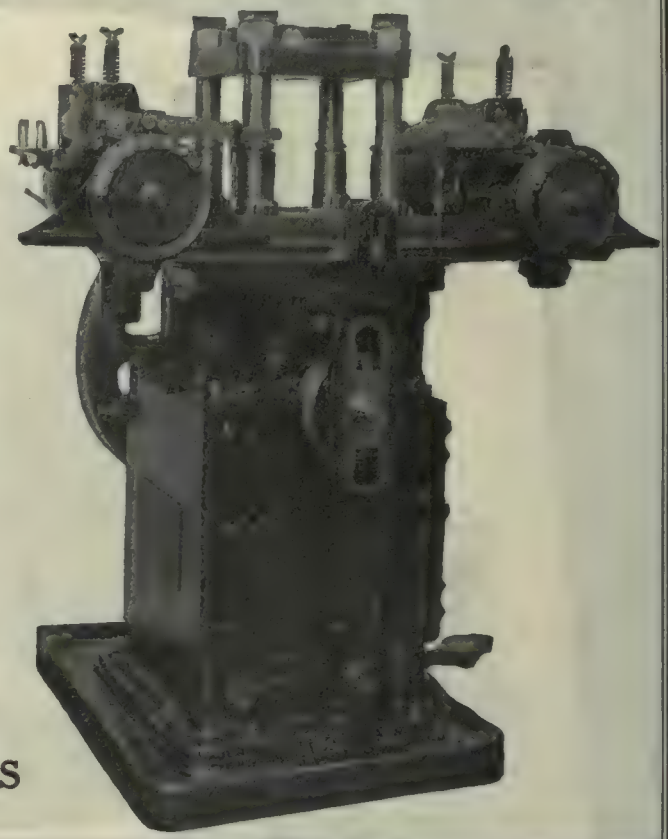
More parts per hour—Because the underslung flywheel is mounted low—underneath the dies—more revolutions per minute is possible without the usual vibration of overhead flywheels. More R.P.M. = more parts per hour.

Labor cost cut to the bone—The automatic feed rolls does away with slow hand feeding—the interruptions due to operator fatigue and, most important—**one man can oversee a whole battery of Wright Dieing Machines.** Easily equipped with magazine for 2nd operation bending and forming.

Longer Die Life—The four steel guides working in adjustable bronze bushings **makes every Die a sub-press Die.** Positive alignment at all times—a better grade of work and a surprising increase in life between grinds are just a few benefits from the revolutionary WRIGHT principles.

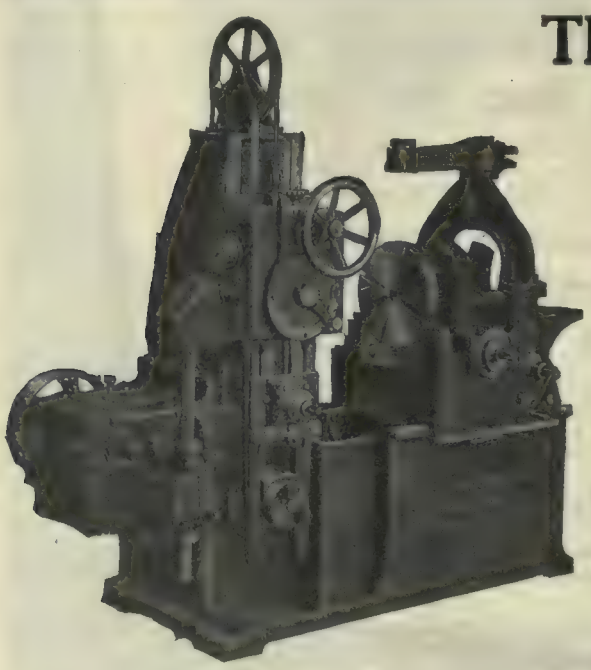
Freedom From Shifting Labor—The "greenest" hand after **one hour's instruction** can equal the output of the most competent Punch Press Operator, because WRIGHT DIEING MACHINE production isn't dependent upon human skill—it's entirely automatic.

Get in step by sending for the Wright Dieing Machine catalog —or send us your prints for a production estimate—there's no obligation in any way.



The Henry & Wright Manufacturing Co.
Hartford, Conn., U. S. A.

DRILLING MACHINES **DIEING MACHINES**



The better the cam the bigger the output

Smooth machine movement permits of higher speeds and, consequently, increases hourly production. Lower cost per part is what the plant manager of today is insisting upon.

The **Rowbottom Universal Cam Milling Machine** has an established reputation for producing cams of the highest quality.

Cams of every known style can be fashioned on it, and sixteen feed changes adapt it to metals of every sort.

The **Rowbottom** has every modern feature for the furtherance of high-grade production.

It will pay you well to install the **Rowbottom.** It will also profit you to let us cut your cams in our own shops.

Rowbottom for Cams

Full details will prove the advantages of incorporating Rowbottom Cams in your products. We are ready to furnish them.

The Rowbottom Machine Co.
Waterbury, Conn.
Factory: Waterville, Conn.

Nothing takes the place of **Leather**



They have paid for themselves several times

THE right belt in the right place. The right quality of leather, the right tanning methods, the right weight, flexibility and thickness to transmit the right amount of power—this is what the Graton and Knight Standardized Series of Belts means. And this is belting economy.

Out in the Middle West the manager of a large mill after making several severe tests with different sorts of belts decided to rebelt his entire mill with leather. Among the leather belts that were used for making the tests were some members of the Graton and Knight Standardized Series.

The Graton and Knight Belts stood the tests so much better than any of their competitors that they were chosen for the job.

And this is what the manager of the mill* wrote us some years later:

> "Some of your belts have been running for several years and as they are in as good condition as when they were installed we are unable to give you any opinion as to the length of service we will get out of them, but at this time we are convinced that they have paid for themselves several times."

Send for the book "The Standardization of Belting," and at the same time let us know the type of power transmission you are most interested in. This book tells how, through constant study and analyzation of transmission problems, we have developed a series of belts to meet every condition.

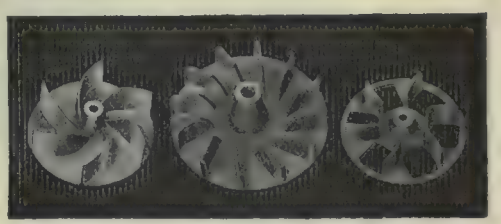
We will gladly have a Graton and Knight engineer call upon you and place at your disposal one of the widest belting experiences in the world.

*Name upon request.

GRATON & KNIGHT
WORCESTER, MASS.

GRATON & KNIGHT

DOEHLER
The World's Largest Producer of
DIE-CASTINGS



To produce one good die-casting, is one thing. To produce ten thousand or a hundred thousand of those die-castings, equally good, is another thing.

Absolute uniformity of quality, dimensions and finish can be maintained only where the die-casting producer realizes his responsibility, willingly assumes it, and makes provision accordingly.

The voluntary replacement of worn dies with new ones, without cost to the customer, is only one of the factors which have established the Doehler reputation for producing die-castings absolutely uniform in quality, whatever the quantity.

DOEHLER DIE-CASTING CO.
BROOKLYN, N.Y.
TOLEDO, OHIO.

"There's "a kick to it"—



"He profits most who serves best!" isn't an axiom to pin on the wall.

It's a basic business principle and the guiding element behind the production of Butterfield Threading Tools.

That's why a rapidly increasing number of representative concerns are adopting Butterfield Taps. They've found out you can't spend 43 years doing one thing without doing it supremely well.

Our Special Tools department is in excellent position to turn out Reamers, Taps and Dies to your specifications Estimates gladly furnished upon receipt of prints.

BUTTERFIELD THE BETTER TOOLS

The whole line of BUTTERFIELD TOOLS is listed in Catalog No. 18—have you a copy?

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Union Twist Drill Co.

Derby Line, Vt., U. S. A.

***Stores:* New York, 62 Reade St. Chicago, 11 So. Clinton St.**

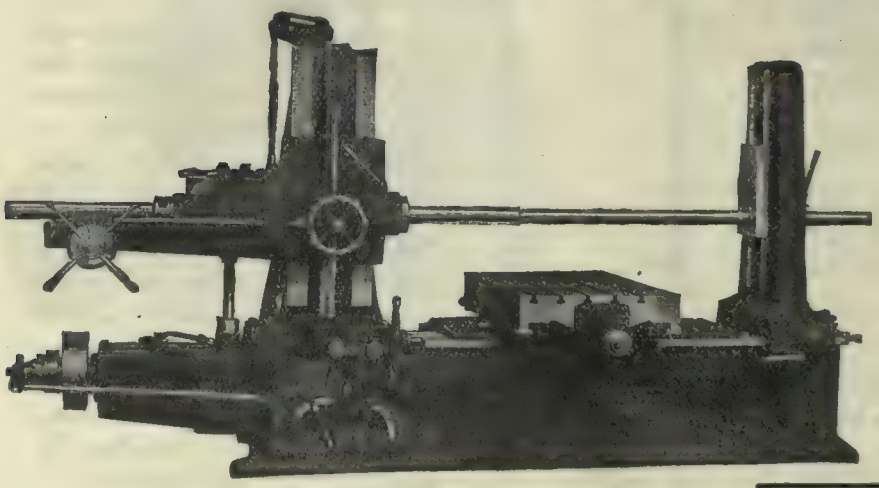
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Some of our friends, under the obsession of commercialism, say that we make the

"PRECISION" BORING DRILLING AND MILLING MACHINE



Too Good!

But—aside from pride in our product—we are convinced that a machine that lasts twice as long will find more than twice the market.

Lucas Machine Tool Co.

Cleveland, Ohio

U. S. A.



WE ALSO MAKE THE

LUCAS POWER Forcing Press



Good Tools Reduce Maintenance Costs

Saving a few hundred dollars by purchasing cheaper machine tools is often a costly "economy."

From the minute such tools start work, they commence to waste repair money. This may continue for 20 years.

For the sake of future maintenance costs, only the most efficient machine tools deserve consideration. In a lathe this means the Ryerson-Conradson machine.

Ryerson-Conradson Engine Lathes embody such work-speeding features as centralized operating controls, shifting of feeds and speeds while the spindle is in motion, and unusual facility of thread-cutting. On the average shop jobs they have reduced the time consumed by 25%.

Bulletin 1301 *gives the details—Ask for it*

JOSEPH T. RYERSON & SON INC.

Established 1842 Incorporated 1888

PLANTS: CHICAGO ST. LOUIS DETROIT CINCINNATI BUFFALO NEW YORK

BRANCH OFFICES: MINNEAPOLIS MILWAUKEE DENVER TULSA HOUSTON SAN FRANCISCO

RYERSON MACHINERY

Saves time and eliminates guesswork



The **Hartness Screw Thread** has risen to a practically indispensable position in the screw-thread production departments of modern manufacturers.

It never fails to show faults in threads and their true nature—a thing impossible with the "feel" methods of gauging. More than this, it is ten times faster in operation than hand checking systems. Users of the

Hartness Screw Thread Comparator

can reduce their inspection force and save the loss due to rejecting threaded parts that do not "feel" right, yet are not too faulty for use.

The **Hartness Method** will make similar savings in your plant that it has in hundreds of others.

Let us explain all its points of advantage



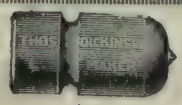
Jones & Lamson Machine Co., Springfield, Vt., U. S. A.

"Universal" Hack Saw Blades

Our hack saw missionary man will be glad to demonstrate the superior quality of these famous blades.

MILLERS FALLS TOOLS

MILLERS FALLS CO.
Millers Falls, Mass.
Manufacturers of Carpenters' Tools, Hack Saws and Automobile Tools



DIAMOND TOOLS for MECHANICAL and SCIENTIFIC PURPOSES

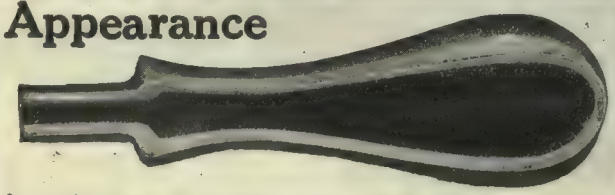
Our tools are all stamped "Dickinson Maker, N. Y." We are proud of a long record for satisfactory service

THOS. L. DICKINSON, 38 Gold Street, New York City
Successor to John Dickinson **Established 1796**



Electric Industrial Crane Truck
One of 25 Types Each Built for Special Lift and Carry Service
Request Catalog 811
The Elwell-Parker Electric Co.
Cleveland, Ohio

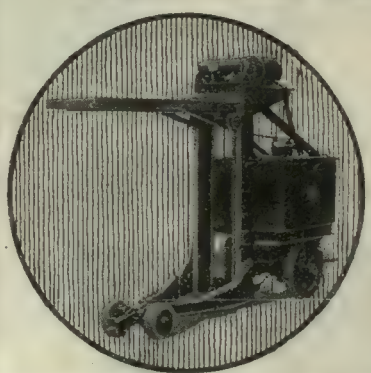
Appearance



is a sales factor in machine tools. **Rockwood Pressed Steel Machine Handles** are neat, light and uniform in shape. They possess a strength that ably resists any operating strain. Rockwood Handles are hollow and seamless. Made in eleven sizes to meet every handwheel and lever need. Send for samples and prices.

Rockwood Sprinkler Co. of Massachusetts
General Manufacturers of Pressed Steel Products.
Worcester, Mass.
London Office: 147 Queen Victoria St., E. C. 4

LAKEWOOD TIER-LIFTS



Will Lift the Burden of High Handling Cost in Your Shop—

For handling dies, stacking tin plate, unloading motor trucks, piling in the stock room, transporting and elevating 4000 lb. loads up to heights of 96 in., the Lakewood Tier-Lift can serve you.

The application of the trucks may be readily seen in photographs.

Send for Series "A"

Lakewood Engineering Co.
Cleveland, O.

American Machinist
Volume 59 NEW YORK, DECEMBER 27, 1923 Number 26

933

That Repair Order!

By H. S. RIGGS
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A system of handling repair orders quickly, without necessitating personal attention, as practiced in the plant of the Lodge & Shipley Machine Tool Co., Cincinnati, Ohio

"—and please rush it!"

That was the closing sentence in a letter from The Brown Co., to which was attached an order for repair parts. It happened that the lathe for which repairs were wanted had seen 23 years' service. It was of obsolete design and not all of the parts wanted were in stock. The Brown Co. wanted its order filled immediately, and yet hundreds of other repair orders were going through the shop, most of which were "rush" jobs. It is human nature to "want what you want when you want it." The reason the average machine shop wants its repair jobs rushed must be because shops were trained during the war to have all equipment in tip-top shape and they still are, more or less, under the spell. An idle lathe attracts a lot of attention and in a short time becomes a "white elephant" to everyone who works near it.

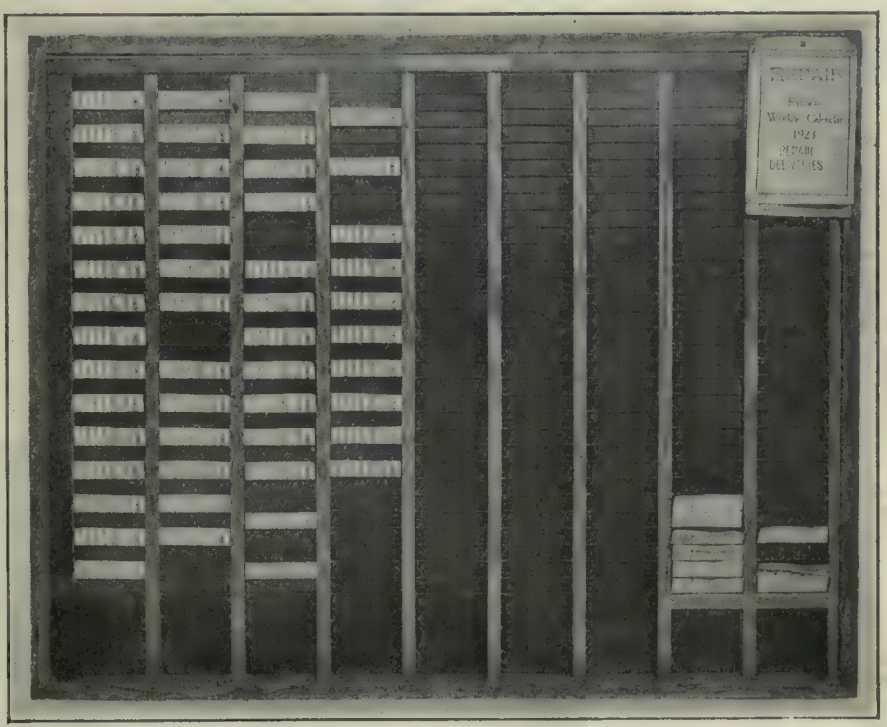


FIG. 1—REPAIR ORDER CONTROL BOARD

Requisitions for parts short on an order are filed in this board until finished. As they are finished the requisitions are taken out. The parts are stored in bins until the order is completed. Complete record of why held can be had instantly.

But getting back to the business of filling the order: If a man insists on having his order filled quickly, it must be done and when many orders are received every day, each marked "rush," a system of handling orders, one that is absolutely fool-proof, must be used. To this end Lodge & Shipley has gradually improved its system of handling repair orders, so that today a maximum number of "rush" jobs can be run through the shop, each automatically getting the best possible attention.

When the Brown people sent us their order, they, of course, were concerned only with that particular one, whereas we have hundreds of others that are in just as big a hurry. We, however, want to further the belief that their order is the only one we have to think about. In doing this a feeling of satisfaction is brought about that all of us want when we buy something. In handling a large volume of business this would be impossible without a good reliable system. Let's see how it works. In the commercial office the order is given a number by which it will be identified and indexed in the Repair Order Book. It is acknowledged and a promise is given to name the delivery date within a few days. The order is then sent to the engineering department, where it is analyzed. First of all the lathe serial number is verified from a machine record file. The drawings for all L. & S. lathes are keyed under this serial number. After the serial number, size, length of bed and style of headstock, given by the customer, check up against our records, the drawings for the parts wanted are looked up.

On the machine card are the construction numbers

of all the units which make up the lathe, such as the headstock, tailstock, carriage, apron, etc. If a part of the carriage is to be replaced, the parts list for the carriage assembly is located and from it the piece and drawing numbers of the parts wanted are secured. From the drawing number the tracing is located and a blueprint is made. This blueprint accompanies the repair order in all its travels throughout the shop. As a matter of fact, each repair order is accompanied by a blueprint from which accurate and detailed information can always be secured.

It can be appreciated that with drawings for a great number of styles of lathes, made within the last 31 years, it would be difficult to supply repair parts if a system such as this were not maintained.

Shop Clerical Details

After the order has been interpreted and the drawing number and piece number located, the data are written out on what is termed a Parts List, *A*, Fig. 5. Five carbon copies of this parts list are made. One copy goes with the envelope, *B*, to the repair department; one copy to the works office; one to the stock control desk; one is kept as a permanent record in the engineering department; while the original is sent to the cost department to be held for pricing. Experience has shown the importance of these five copies.

After the parts list is written, the order sheet, *C*, is made out, showing the order number, size, machine number, piece and drawing number, and names of the parts. Four carbon copies are made, as shown in *D*. These are for the works office; shop assembly department; engineering department; and the shipping or packing list. They are each of a different color so as to make them readily distinguishable. The engineering department copy is kept as a permanent record. The works office copy goes out just as soon as the repair order is written so that the works manager, his assistant and the tracers will know just what is coming through the shop. The tracer's copy stays in envelope *B*, and the shipping copy is turned in on completion of the order to the shipping department.

When Parts Are in Stock

The shop copy, shipping list, and shop parts list, together with requisitions calling for the parts on order, all in envelope *B*, are sent to the "finished stock keeper" to fill. If all the parts called for are on hand he fills the order and sends it to the inspection department. From there it is packed and shipped. When the parts are in stock the order is not held up for the shop credentials, but is shipped immediately, the records being completed later.

In case he is short any of the parts called for, he writes out a green shortage slip, *E*, Fig. 7, which is later posted in the Repair Order Control Board, Fig. 1. The tracer is then called upon to fill these shortages. The green slips, together with the parts on hand, are sent to the repair assembly department, Fig. 2. If advisable, a part shipment is made. If not, the parts on hand are tagged and stored in one of the bins shown in the illustration.

In the works office the order is looked up. What does it call for? Parts that must be made up; parts that are in stock finished; or parts which can be purchased finished? The piece and drawing number of the parts wanted are looked up and that information determined. The envelope and parts list are sent to the stock control desk for reservations. The parts list shows just what parts are wanted and gives the quantity, piece and drawing number of each.

The stock control cards, *F*, *G*, and *H*, Fig. 7 (finished piece, raw stock and purchased finished) covering the piece number of parts called for on the parts list, are then taken out to determine just what pieces are on hand. The stock control card for the first item listed on the parts list is taken out and a reservation is made for the quantity called for. On each card is marked a low limit and the quantity that should be ordered when the low limit is reached. If the reservation calls for more pieces than are on hand a new lot is started through the shop. The quantity ordered through is posted on the stock card and from this can be determined later just how many are in process.

Ordering Castings

After reserving the new lot, the raw stock card, *H*, is looked up to determine how many raw castings are on hand. If a new lot is necessary, the reservation is posted and an order for the pattern to be sent the foundry is sent to the pattern shop. The castings are then ordered and the name of the maker of the castings posted on the raw stock cards. A pattern notice is sent to the casting tracer who keeps a continual check on the order to insure its prompt delivery. The first item on the parts list is then checked and the quantity ordered shown. The same procedure holds good with all other items on the parts list.

Routing the Order

The works office parts list and envelope are then sent to the engineering department. There the element blueprint for the parts specified is made and sent with *B* and *A* to the routing department. This is done to be sure to include any new pieces designed since the previous lot was routed. There, the routing card, *I*, is issued, put into envelope *B* and returned to the works office.

In the meantime a shop copy has been sent to the storekeeper and a correct account of all parts on hand and short, of those called for, is given and sent to the assembly department.

In the works office the traveler tag, *J*, Fig. 6, the time tickets, *K*, the cost cards, *L*, the tracer shortage, *M*, Fig. 7, and the master follower tag, *N*, Fig. 6, are written out. The routing is copied from *I*, the routing card. The cards are sent to the following departments: Traveler tag to the raw stores; time ticket to the timekeeper; cost card to the cost department; tracer shortage to the works manager's Master Shortage Book (a copy of this goes to stock tracer); master tracer tag to the works office control desk.

Keeping the Order Moving

The parts not in stock must, of course, be made up. The raw stock called for on the traveler tag is sent to the first operation. As soon as the job is sent to the first operation a "Shop Tickler," *O*, Fig. 6, is sent to the foreman of that department. The shop tickler has on it complete information and is a simple and direct means of informing the foreman of that department of the number of jobs in his department and how long he has had each. This card is hung up on a board over his desk. It is obvious that with the date of issue stamped in large figures on it, continually reminding the foreman how old it is, he will exert his best efforts



FIG. 2—REPAIR ASSEMBLY DEPARTMENT

All repair orders are assembled here. If some parts are short, the available parts of each order are stored in bins which are marked with the repair number. The parts short are represented by green shortage slips which can be seen in the board at the extreme left of the picture. The tracer is checking over parts preparatory to having them taken to the inspection department by the electric mule seen at the left.



FIG. 3—INSPECTION DEPARTMENT

All jobs are inspected here before being taken to the next department specified on traveler tag. This arrangement insures that the job will be finished correctly by all departments. Note the electric mule at right, about to haul away three tailstocks.



FIG. 4—SHIPPING DEPARTMENT

All repair orders upon completion are brought to this department. The parts are checked against the packing list and boxed. The shipping clerk meanwhile has received notice that the order is ready for shipment, and has prepared tags and documents. The shipments are then hauled to a place where they are picked up and forwarded parcel post, express, or freight, according to instructions.

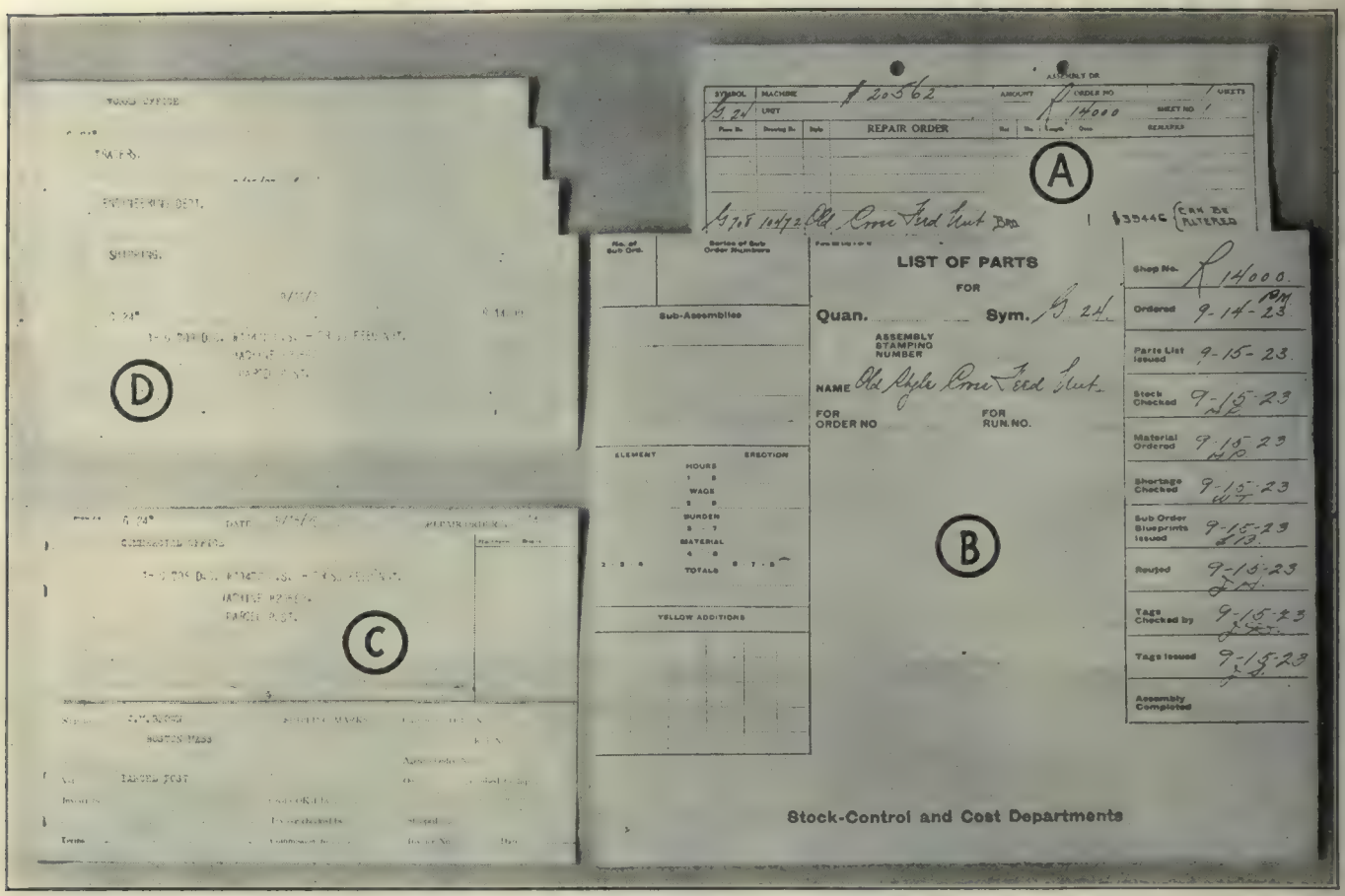


FIG. 5—FORMS FOR REPAIR ORDERS

A, Parts list. *B*, Parts list envelope. *C*, Commercial office order sheet. *D*, Order notification slips for shipping department, engineering department, tracers, and works office

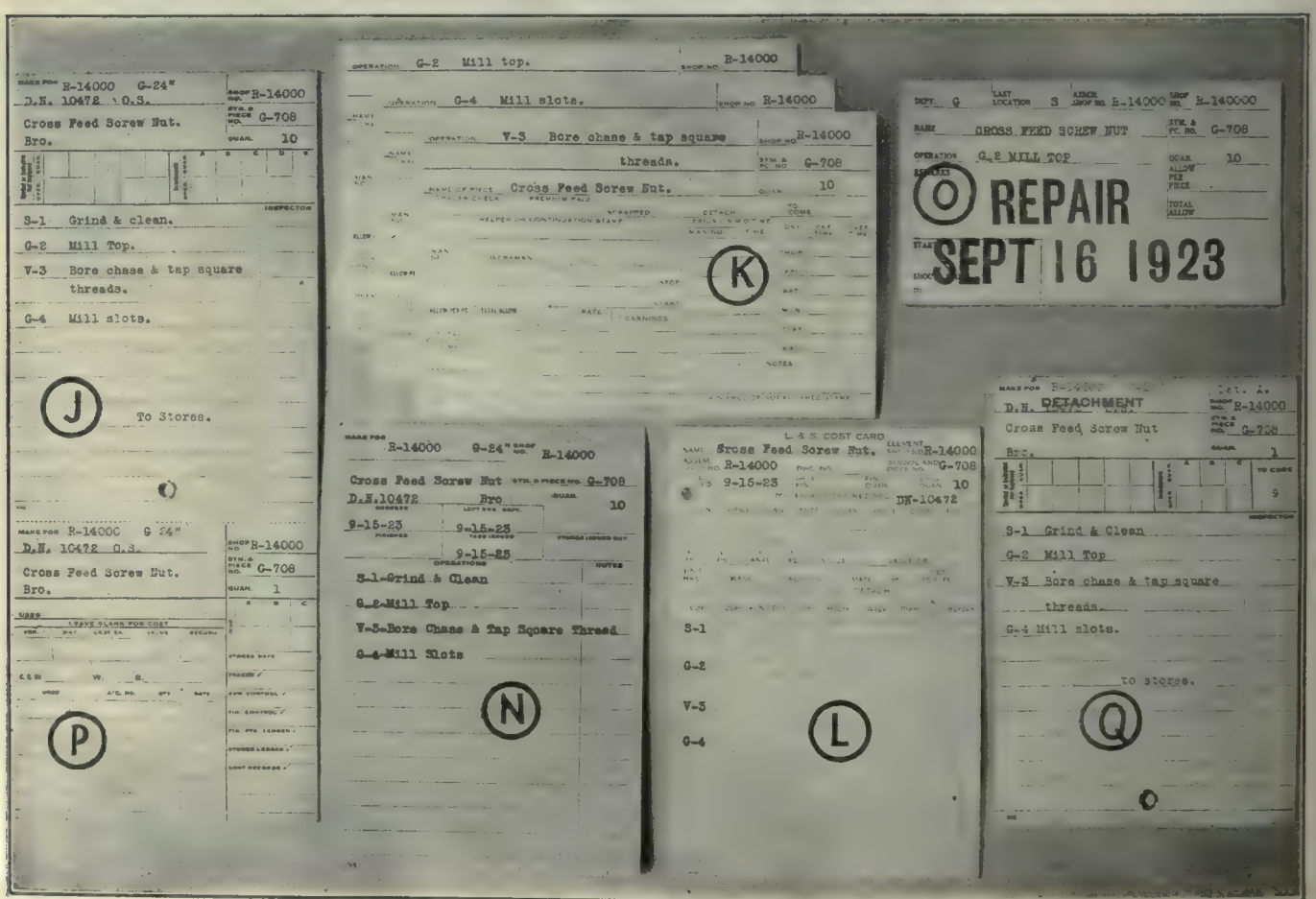


FIG. 6—FORMS USED FOR REPAIR ORDERS

J, Traveler or follower tag. *K*, Time tickets. *L*, Cost card. *N*, Master tracer tag. *O*, Shop tickler. *P*, Weight stub. *Q*, Detachment tag

to get rid of the older dates as quickly as possible. This has been found a very effective method of keeping jobs moving in the sequence in which they are received.

The master tracer shortage is checked daily. The operations are dated and when the job fails to move, the look-up tracer is sent out to find out why. The follower tag calls for material out of stock. The weight tag, *P*, is torn off and sent to the tracer clerk, notifying him that the job has been sent to the first operation called for.

A metal signal is clipped on the master tracer, opposite the first operation, after a shop tickler has been sent to the department where the first operation is to be done. This tickler is sent out just as soon as the master tracer is filed in the control desk. When the time ticket on the first operation is received by the tracer posting clerk the workman's number is posted and the signal is pushed up to the top right-hand corner of the card. The position of this signal notifies the tracer clerk to type the shop tickler for the next operation. After this is done the signal is placed opposite that operation and the date when the tickler is sent out is marked next to it. This is repeated for each operation. The value of such a proceeding is in knowing at any time just where the job is and to be able to determine quickly the reason, if any, for its delay.

When the last operation is performed, the job is sent to the finished stock room and the stockkeeper looks over the shortage requisitions and sends all parts just received, that are short, to the assembly department. All operations are carefully followed by the shop tracer on shortage and also cross-checked by the works manager's office on tracer shortage. This means a double check.

A Detachment

When it has been found necessary to make up any of the parts called for, a lot of that particular part is run through the shop. In the case of the cross-feed screw nut as shown on *Q*, Fig. 6, a lot of 10 pieces has been ordered through. However, if this particular order is urgently needed and one cross-feed nut is wanted as quickly as possible, a short cut is necessary. A detachment, *Q*, is made out. It is similar to form *J*, only it calls for one nut with nine to follow. All shop and cost cards made out when *J* is issued are duplicated when a detachment is made, with the exception of the requisition, *R*. The procedure through the shop is exactly the same as was explained for the regular lots only the foremen recognize a detachment as something that is in a hurry and give it preference over other jobs.

Through means of this detachment it is possible to bring through in advance one or more pieces of a lot and thereby save considerable time. This method, of course, does not require personal attention, but accomplishes the same thing on jobs that must be rushed. It goes without saying that with such a procedure the costs are necessarily higher, but when a job must be had quickly that is to be expected.

Inspection

Each department has its "Move Station," a spot marked off on the floor. Each foreman is responsible for any job in his department up to the time it is put into the move station. The responsibility then goes to the trucking system. Truckers, operating electric mules, call at each depot at regular intervals. The jobs are placed on lift trucks and pulled to the next department as specified on the traveler tag, after they have first been taken to the central inspection department, inspected and punched. The inspection department also has its move station, and this insures prompt removal of all jobs which have been inspected. Each operation is inspected, thereby avoiding delay by detecting the part spoiled or defective before it is finished.

After each operation is performed the work is sent to a central inspection department, Fig. 3, and carefully inspected before being sent to the next department, or before the next operation is done, as designated on the master tracer. This arrangement insures correct work

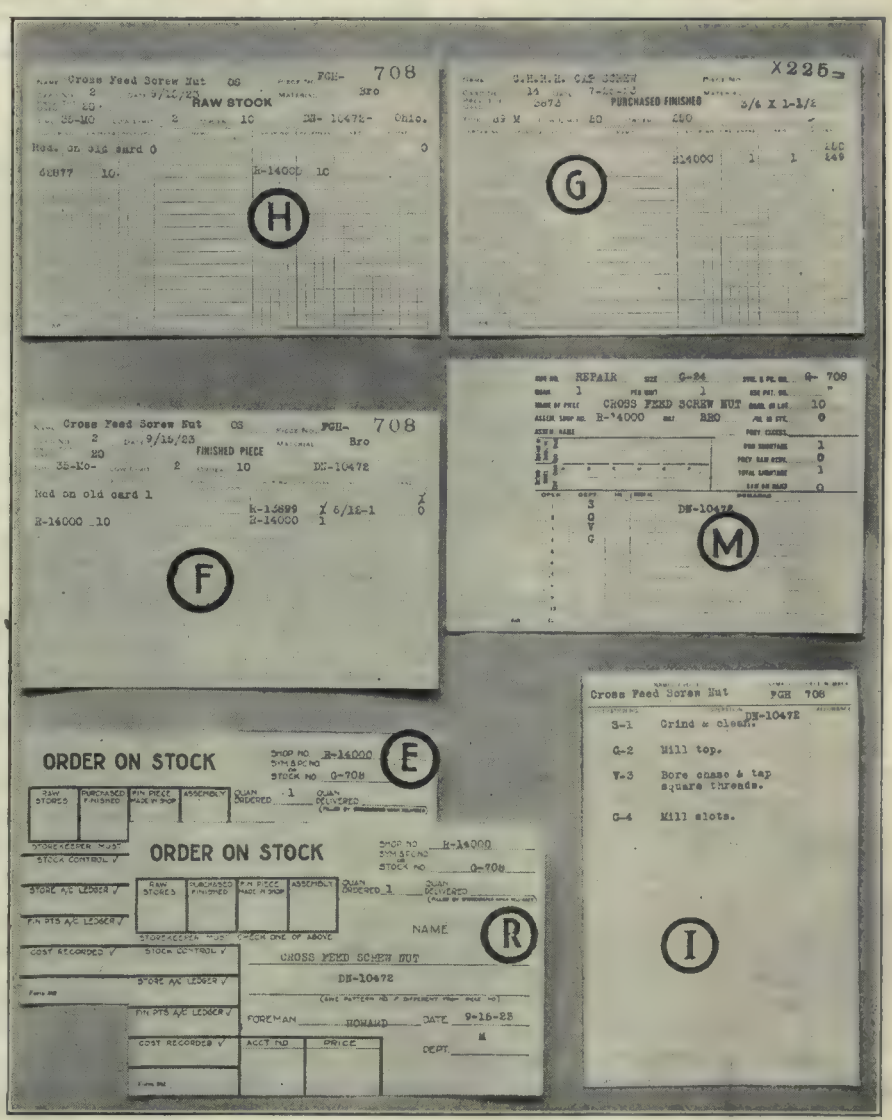


FIG. 7—FORMS USED FOR REPAIR ORDERS
E, Green shortage slip used in control board. *F*, *G*, *H*, Stock control cards. *I*, Routing card. *M*, Tracer shortage. *R*, Stock requisition

from the very start. When the assembly department has received all parts called for on the parts list, the parts are assembled and taken to the inspector's desk and checked. From there they are taken to the shipping floor, Fig. 4. Accompanying the order is the shipping list.

Another inspector checks over the parts against the shipping list and then the job is painted and all machined parts are slushed. The order is then ready for packing. The shipping list is packed with the order and the number is marked on the outside of the box by the packer. The shipping clerk has in the meantime received his copy of form *D* (marked SHIPPING). He makes out tags and shipping documents and the order goes on its way.

Conclusion

From the foregoing description it may be seen how everything that goes through the plant is carefully inspected and checked; how orders are received and filled in sequence; that there is a way to rush one or more parts through in advance of others; and that at no time does the system rely upon any one man. The responsibility is divided so that all have a part in doing their bit toward getting repairs out with as little delay as is humanly possible. With such a system, any quantity of repair orders can be handled in record time; any order can be given "preferred attention" and yet not take up extra time on the part of any one individual. The result is more orders filled and more satisfaction to customers.

Jot It Down

By W. Roland Needham

Often amidst the routine of calculations or design, some thought or idea registers upon the active consciousness, and at times the suggestions seem quite worthy, and apparently merit careful consideration. More frequently than not they apply to some issue other than that immediately engaging the attention.

Such ideas are for the most part extremely shy creatures. At the time, one's impression is that they are there to stay, for the illusion is well nigh complete and one feels instinctively that the ideas can be called upon or re-called at will. That is the illusion. It is probably true enough that few ideas are ever absolutely lost, but for practical purposes they might often just as well be lost. Without mechanical or precautionary aids they are seldom recallable at the time they are really needed. They probably lie more or less deeply sunk into one's subconsciousness, and it will require some happy coincidence—some striking parallelism—ere the timid creature can be enticed across the threshold into the open of one's work-a-day consciousness.

What does persist is just the tantalizing, annoying recollection that whatever the idea was, it seemed to promise well for good and useful service.

These ideas—inspirations, rather, when they are of the highest order—need never lapse into the abyss at all, because the fugitive, ephemeral thing can be caught, caged, and produced at will. The remedy is, once the suggestion comes, to snatch there and then a minute or two from the task immediately in hand, in order simply to note down the salient points.

Should a runaway idea return, one should see to it straight away that it does not escape again. When the wanderer returns, the trap should be ready.

Bolt-Heads, Nuts and Wrench Openings

In March, 1922, the Sectional Committee for the Standardization of Bolt, Nut and Rivet Proportions was organized under the rules of procedure of the American Engineering Standards Committee by the American Society of Mechanical Engineers and the Society of Automotive Engineers acting as joint sponsors. A subcommittee, designated as No. 2, was appointed to report on wrench bolt-heads and nuts and, after obtaining and analyzing data covering practice in the United States and abroad, has submitted a tentative report for circularizing. Although the data in this report have been given some publicity, the subcommittee desires a careful review of them by all industries followed by the submission of whatever criticisms they may have to offer.

Included in the report is an analysis of the variations in dimensions for corresponding bolt sizes that exist generally throughout the industry in the United States, England and Germany. The recommendations in the report include dimensions of the heads, heavy nuts and jam nuts for rough and finished square and hexagonal bolts, finished light nuts, finished hexagonal and square cap screws and the corresponding wrench openings required to fit properly.

The dimensions for the heavy and light nuts correspond to those used by some manufacturers in their present practice, but the subcommittee states that it has not been able to prepare tables of sizes that would meet the present practice of all industries, although the tendency in recent years has been toward more economical use of material for screws, bolts and nuts such as those made to the S.A.E. standard. This part of the report is submitted particularly for consideration looking toward the use by all industries of a single standard for bolt-heads and nuts, using only light-nut dimensions for $\frac{5}{8}$-in. bolts and smaller except that the width across flats of the $\frac{7}{8}$-in. bolt be made $1\frac{1}{8}$ in. instead of $\frac{7}{8}$ in. The tables of proposed dimensions, however, include the heavy nuts for the $\frac{5}{8}$-in. size and smaller and the $\frac{5}{8}$-in. width across flats for the $\frac{7}{8}$-in. size.

Tolerances for Rough and Finished Products

The proposed tolerances are from basic to minus for all bolt-heads and nuts and from basic to plus for wrench openings to provide sufficient wrench fit clearance. The amounts of tolerance have been selected for "rough" and "finished" products, "rough" finish pertaining to stock made by cold or hot pressing, punching or forging, but not to semi-finished products made by any process. The "finished" class of products pertains to bolt-heads and nuts that are machined all over and includes those that are semi-finished by any process.

After the report has been approved by the Sectional Committee, it must be submitted to and approved by the sponsor societies before it can be finally approved by the American Engineering Standards Committee as American Standard. It is very desirable, however, that the proposal be carefully reviewed by the industries before a final report is drafted. Criticisms by all those interested in the manufacture and use of these products are solicited. Copies of the subcommittee's report in pamphlet form may be obtained on request to the American Society of Mechanical Engineers, 29 West 39th St., New York City, and written comments on the report should be addressed to the Chairman of Subcommittee No. 2, Sectional Committee on Bolt, Nut and Rivet Proportions, at the same address.

The New Thread Standard—VI

BY RALPH E. FLANDERS
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Provisions for special threads and fits in the Screw Thread Report of the A.E.S.C.—"Mixing the fits" to minimize tooling expense — Tables and charts showing tolerances

IT HAS been made sufficiently plain that the Screw Thread Report presented by the Sectional Committee of the American Engineering Standards Committee is intended to apply only to certain standard thread sizes for bolts, machine screws, nuts, commercial tapped holes, etc., so far as setting definite standards is concerned. It is recognized, however, that the tolerance tables may prove useful in special thread sizes, and to cover this contingency the following instructions are given:

IV—CLASSIFICATION OF FITS

3—SPECIAL CONDITIONS

(a) *Conditions Requiring Special Fits*—In cases where looser fits are required than those given by the above named classes, the use of the Loose Fit of the National Screw Thread Commission is recommended.

The Loose-Fit Tables are placed in the appendix of the Sectional Committee's report, and are here given as Tables VI and VII for guidance in all cases where an especially loose fit is required. It should be observed that this fit provides for an *allowance*. That is to say, the maximum pitch diameter of the screw is smaller than the minimum pitch diameter of the nut, so that there is always some shake even on the closest fit possible. This construction permits threaded parts to be rapidly spun together, and allows also for easy assembly under field conditions, where the threads may be filled with dirt or hardened grease. The loose fit is expected to be particularly applicable to threaded ammunition components, and to other parts used in warfare.

APPENDIX C—TOLERANCES FOR LOOSE FITS (CLASS 1)

This fit is recommended whenever an *allowance* is required between the maximum screw and the minimum nut, and in the cases where larger tolerances than those given by the Free Fit (Class 2) are needed.

This class of screw threads will be defined and specified as follows:

Minimum Nut is Basic.

Maximum Screw is Below Basic: The major diameter and pitch diameter of the maximum screw will be below basic, in accordance with the diameters specified in Tables VI and VII.

Direction of Tolerance on the Nut: The tolerance on the nut will be plus.

Direction of Tolerance on the Screw: The tolerance on the screw will be minus.

Tolerance Values: The tolerances on a screw or nut of given diameter and pitch will be such as to result from the dimensions given in Tables VI and VII.

While the Class 1 or Loose Fit is the only one in which an allowance is definitely provided for, a virtual allowance will result from ordinary manufacturing practice in the Class 2, Free Fit, and in the Class 3, Medium Fit, as well. When plug and ring gages are used, they will be made to a manufacturing tolerance which tends to keep the finished work from the extreme sizes. The "Go" plug gage, for instance, will be made correct within a range of from basic to 0.0001 or 0.0002 in. large. It will never be made smaller than basic. The minimum

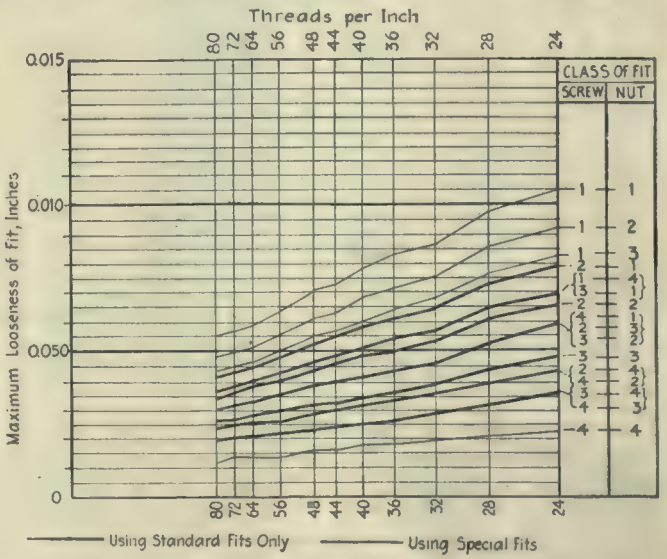


FIG. 9—CHART SHOWING FOR NUMBERED SIZES THE MAXIMUM LOOSENESS OF FIT OBTAINED BY MIXING SCREWS AND NUTS OF DIFFERENT CLASSES OF FIT

tapped hole will thus tend to be slightly larger than basic. This tendency will be accentuated by the desire of the workman to keep away from the extreme condition in which the "Go" plug gage screws in with difficulty.

The same conditions operate on the ring gage to keep screws and bolts well below basic; and the combination of the two produces the "virtual allowance" referred to above. The same condition, but in a greater degree, results from optical inspection of screws and taps, in which the natural tendency of the operator is to keep near the safest area at the middle of the tolerance range. The effect of gage tolerances on the final fit of the thread is called the "gage increment" in the Commission's Progress Report.

On the Class 4, or Close Fit, it will be remembered that a slight interference is provided for, in that the maximum pitch diameter of the screw is slightly larger than the minimum pitch diameter of the tapped hole.

Table VI — Tolerances — Coarse-Thread Series — Loose Fit (Class 1)

Figures taken from the Screw Thread Standard Report of the American Engineering Standards Committee

		SCREWS					NUTS						
1	2	3 Major Diameter	4 Major Diameter	5 Pitch Diameter	6 Pitch Diameter	7	8	9 Pitch Diameter	10 Pitch Diameter	11 Minor Diameter	12 Minor Diameter	1	2
Size	Threads per Inch	Maximum (Inches)	Minimum (Inches)	Maximum (Inches)	Minimum (Inches)	Maximum Minor[2] (Inches)	Minimum Major[1] Diameter[3] (Inches)	Minimum (Inches)	Maximum (Inches)	Minimum (Inches)	Maximum (Inches)	Size	Threads per Inch
1	64	0.0723	0.0671	0.0622	0.0596	0.0531	0.0730	0.0629	0.0655	0.0561	0.0578	1	64
2	56	0.0852	0.0796	0.0736	0.0708	0.0633	0.0860	0.0744	0.0772	0.0667	0.0686	2	56
3	48	0.0981	0.9190	0.0846	0.0815	0.0725	0.0990	0.0855	0.0886	0.0764	0.0787	3	48
4	40	0.1110	0.1042	0.0948	0.0914	0.0803	0.1120	0.0958	0.0992	0.0849	0.0876	4	40
5	40	0.1240	0.1172	0.1078	0.1044	0.0933	0.1250	0.1088	0.1122	0.1979	0.1006	5	40
6	32	0.1369	0.1293	0.1166	0.1128	0.0986	0.1380	0.1177	0.1215	0.1042	0.1076	6	32
8	32	0.1629	0.1553	0.1426	0.1388	0.1246	0.1640	0.1437	0.1475	0.1302	0.1336	8	32
10	24	0.1887	0.1795	0.1616	0.1570	0.1376	0.1900	0.1629	0.1675	0.1449	0.1494	10	24
12	24	0.2147	0.2055	0.1876	0.1830	0.1636	0.2160	0.1889	0.1935	0.1709	0.1754	12	24
1/4	20	0.2485	0.2383	0.2160	0.2109	0.1872	0.2500	0.2175	0.2226	0.1959	0.2013	1/4	20
5/16	18	0.3109	0.2995	0.2748	0.2691	0.2427	0.3125	0.2764	0.2821	0.2524	0.2584	5/16	18
3/8	16	0.3732	0.3606	0.3326	0.3263	0.2965	0.3750	0.3344	0.3407	0.3073	0.3141	3/8	16
7/16	14	0.4354	0.4214	0.3890	0.3820	0.3478	0.4375	0.3911	0.3981	0.3602	0.3679	7/16	14
1/2	13	0.4978	0.4830	0.4478	0.4404	0.4034	0.5000	0.4500	0.4574	0.4167	0.4251	1/2	13
9/16	12	0.5601	0.5443	0.5060	0.4981	0.4579	0.5625	0.5084	0.5163	0.4723	0.4713	9/16	12
5/8	11	0.6224	0.6054	0.5634	0.5549	0.5109	0.6250	0.5660	0.5745	0.5266	0.5364	5/8	11
3/4	10	0.7472	0.7288	0.6822	0.6730	0.6245	0.7500	0.6850	0.6942	0.6417	0.6526	3/4	10
7/8	9	0.8719	0.8519	0.7997	0.7897	0.7356	0.8750	0.8028	0.8128	0.7547	0.7667	7/8	9
1	8	0.9966	0.9744	0.9154	0.9043	0.8432	1.0000	0.9188	0.9299	0.8647	0.8782	1	8
1 1/8	7	1.1211	1.0963	1.0283	1.0159	0.9458	1.1250	1.0322	1.0446	0.9704	0.9858	1 1/8	7
1 1/4	7	1.2461	1.2213	1.1533	1.1409	1.0708	1.250	1.1572	1.1696	1.0954	1.1108	1 1/4	7
1 1/2	6	1.4956	1.4666	1.3873	1.3728	1.2911	1.500	1.3917	1.4062	1.3196	1.3376	1 1/2	6
1 3/4	5	1.7448	1.7110	1.6149	1.5980	1.4994	1.750	1.6201	1.6370	1.5335	1.5551	1 3/4	5
2	4 1/2	1.9943	1.9575	1.8500	1.8316	1.7217	2.000	1.8557	1.8741	1.7594	1.7835	2	4 1/2
2 1/4	4 1/2	2.2443	2.2075	2.1000	2.0816	1.9717	2.250	2.1057	2.1241	2.0094	2.0335	2 1/4	4 1/2
2 1/2	4	2.4936	2.4528	2.3312	2.3108	2.1869	2.500	2.3376	2.3580	2.2294	2.2564	2 1/2	4
2 3/4	4	2.7436	2.7028	2.5812	2.5608	2.4369	2.750	2.5876	2.6080	2.4794	2.5064	2 3/4	4
3	4	2.9936	2.9528	2.8312	2.8108	2.6869	3.000	2.8376	2.8580	2.7294	2.7564	3	4

[1] Basic diameter.

[2] Dimensions given are figured to the intersection of the worn tool arc with a centerline through crest and root. Minimum flat at root equals $\frac{1}{8} \times p$.

[3] Dimensions given are allowable only with tap having theoretically sharp corners. Threaded hole must not reject correct basic "Go" gage by interference with rounded roots due to worn tap. Minimum flat at root equals $\frac{1}{24} \times p$.

This interference is calculated to about take up the "gage increment," so that in practice the maximum screw may be expected to fit snugly in the minimum hole without interference. It is, nevertheless, stated in the report that "selective assembly may be required."

It is believed that the provision of the three fits, Free, Medium and Close, will cover the major part of the requirements of industry, and that the inclusion of the Loose Fit as a recognized "special" will meet extraordinary requirements. Wrench and stud fits remain undetermined, on the grounds that further experiments are required, while varying conditions of material and thickness of section render the problem a complicated one. Something definite may be given on this subject later.

Every effort should, then, be made to confine all practice to the standard fits already given, the wide variety of which fits would seem to meet all requirements. There are always, however, those engineers who want something special, and who will be setting tolerances of their own, intermediate between those specified in the standards. Fortunately there is a way of meeting their requirements without departing from the standards, and that is by "mixing the fits" in other combinations, in the same way as officially provided for obtaining the Medium Fit by mixing the Free and the Close Fits.

In Fig. 9 is a diagram showing the results of mixing all the recognized fits for the numbered sizes of threads. Class 4, Close Fit, is not regular for nuts in the numbered sizes, nor is Class 1 for screws, so that all combinations in which they are used must be classed as special. Class 4 nuts could be employed on precision work only where cost is not a prime factor.

With the Close Fit fourteen combinations are possible, covering a wide range of tolerances. Within this range are surely included all tolerances that are of practical use. If we omit those combinations which bring extremes together, such as the use of a Class I screw in a Class IV hole, we have the following combinations:

Class 1 screw in Class 1 hole
Class 1 screw in Class 2 hole
Class 2 screw in Class 1 hole
Class 2 screw in Class 2 hole
{Class 2 screw in Class 3 hole or / Class 3 screw in Class 2 hole}
{Class 3 screw in Class 4 hole or / Class 4 screw in Class 3 hole}
Class 4 screw in Class 4 hole

These nine combinations, giving seven fits evenly distributed over the whole tolerance range, will surely meet all reasonable requirements.

On this diagram the lines are so close together that it was not feasible to distinguish between combinations varying from each other by only one or two ten-thousandths of an inch. For instance, the combination of a Class 1 screw and a Class 4 nut (a somewhat unlikely

combination, by the way) is only slightly larger than that of the Class 3 screw and Class 1 nut.

The Class 2—3 combination is identical with the Class 3—2, and only slightly smaller than the Class 4—1. Class 2—4 differs from Class 4—2 only by the amount of the small negative allowance, or interference, permitted by the Class 4 screw. The same is true of the Class 3—4 and 4—3 combinations.

For the fractional sizes the conditions are as shown in Fig. 10. The same combinations may be employed as for numbered sizes, remembering that the combination of Classes 2 and 4 is officially recommended as a substitute for Class 3. As indicated on the diagram, both forms of the combination give tolerances very slightly less than the regular Class 3. All combinations on this diagram employing a Class 1 Fit are, of course, special.

One criticism made of the report is directed at the policy of setting the same tolerance on the screw as on the tapped hole, for a given fit. It is pointed out that the adjustable cutting tools used for screw threading give a much closer diameter control than can be obtained with the commercial tap, and it has been urged that this fact be recognized by giving more of the total tolerance to the tapped hole, and less to the screw. It was felt, however, that the development of the ground tap might reverse these conditions. The tolerances were, therefore, left the same for both, as averaging present and future possibilities.

By following the diagrams in Figs. 9 and 10, however, individual manufacturers who feel the situation mentioned above, and who control the production of both screw and tapped hole, can pick out combinations which recognize the difference in inherent accuracy of the two, and at the same time produce the desired final effect.

Let it be clearly understood that only one of the possible combinations, namely, that for obtaining Class 3 by mixing Classes 2 and 4, is officially recognized as standard. The others can only be used on the responsi-

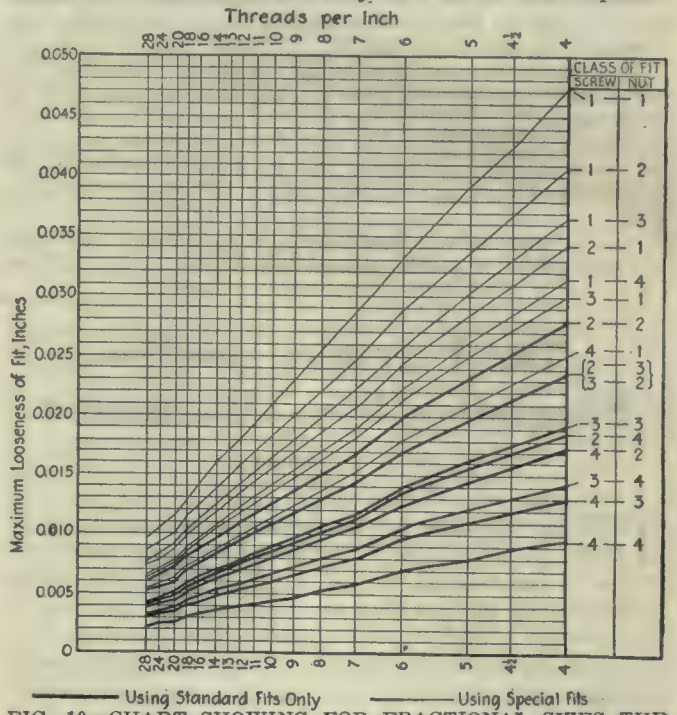


FIG. 10—CHART SHOWING FOR FRACTIONAL SIZES THE MAXIMUM LOOSENESS OF FIT OBTAINED BY MIXING SCREWS AND NUTS OF DIFFERENT CLASSES OF FIT

Table VII—Tolerances—Fine Thread Series—Loose Fit (Class 1)

Figures taken from the Screw Thread Standard Report of the American Engineering Standards Committee

		SCREWS					NUTS						
1	2	3	4	5	6	7	8	9	10	11	12	1	2
		Major Diameter		Pitch Diameter				Pitch	Diameter	Minor Diameter			
Size	Threads per Inch	Maximum (Inches)	Minimum (Inches)	Maximum (Inches)	Minimum (Inches)	Maximum Minor[2] (Inches)	Minimum Major[1] Diameter[3] (Inches)	Minimum (Inches)	Maximum (Inches)	Minimum (Inches)	Maximum (Inches)	Size	Threads per Inch
0	80	0.0593	0.0545	0.0512	0.0488	0.0440	0.0600	0.0519	0.0543	0.0465	0.0478	0	80
1	72	0.0723	0.0673	0.0633	0.0608	0.0553	0.0730	0.0640	0.0665	0.0580	0.0595	1	72
2	64	0.0853	0.0801	0.0752	0.0726	0.0661	0.0860	0.0759	0.0785	0.0691	0.0708	2	64
3	56	0.0982	0.0926	0.0866	0.0838	0.0763	0.0990	0.0874	0.0902	0.0797	0.0816	3	56
4	48	0.1111	0.1049	0.0976	0.0945	0.0855	0.1120	0.0985	0.1016	0.0894	0.0917	4	48
5	44	0.1241	0.1177	0.1093	0.1061	0.0962	0.1250	0.1102	0.1134	0.1004	0.1029	5	44
6	40	0.1370	0.1302	0.1208	0.1174	0.1063	0.1380	0.1218	0.1252	0.1109	0.1136	6	40
8	36	0.1629	0.1557	0.1449	0.1413	0.1288	0.1640	0.1460	0.1496	0.1339	0.1369	8	36
10	32	0.1889	0.1813	0.1686	0.1648	0.1506	0.1900	0.1697	0.1735	0.1562	0.1596	10	32
12	28	0.2148	0.2062	0.1916	0.1873	0.1710	0.2160	0.1928	0.1971	0.1773	0.1812	12	28
1/4	28	0.2488	0.2402	0.2256	0.2213	0.2050	0.2500	0.2268	0.2311	0.2113	0.2152	1/4	28
5/16	24	0.3112	0.3020	0.2841	0.2795	0.2601	0.3125	0.2854	0.2900	0.2674	0.2719	5/16	24
3/8	24	0.3737	0.3645	0.3466	0.3420	0.3226	0.3750	0.3479	0.3525	0.3299	0.3344	3/8	24
7/16	20	0.4360	0.4258	0.4035	0.3984	0.3747	0.4375	0.4050	0.4101	0.3834	0.3888	7/16	20
1/2	20	0.4985	0.4883	0.4660	0.4609	0.4372	0.5000	0.4675	0.4726	0.4459	0.4513	1/2	20
9/16	18	0.5609	0.5495	0.5248	0.5191	0.4927	0.5625	0.5264	0.5321	0.5024	0.5084	9/16	18
5/8	18	0.6234	0.6120	0.5873	0.5816	0.5552	0.6250	0.5889	0.5946	0.5649	0.5709	5/8	18
3/4	16	0.7482	0.7356	0.7076	0.7013	0.6715	0.7500	0.7094	0.7157	0.6823	0.6891	3/4	16
7/8	14	0.8729	0.8589	0.8265	0.8195	0.7853	0.8750	0.8286	0.8356	0.7977	0.8054	7/8	14
1	14	0.9979	0.9839	0.9515	0.9445	0.9103	1.0000	0.9536	0.9606	0.9227	0.9304	1	14
1 1/8	12	1.1226	1.1068	1.0685	1.0606	1.0204	1.1250	1.0709	1.0788	1.0348	1.0438	1 1/8	12
1 1/4	12	1.2476	1.2318	1.1935	1.1856	1.1454	1.2500	1.1959	1.2038	1.1598	1.1688	1 1/4	12
1 1/2	12	1.4976	1.4818	1.4435	1.4356	1.3954	1.5000	1.4459	1.4538	1.4098	1.4188	1 1/2	12

[1] Basic diameter.

[2] Dimensions given are figured to the intersection of the worn tool arc with a centerline through crest and root. Minimum flat at root equals $\frac{1}{8} \times p$.

[3] Dimensions given are allowable only with tap having theoretically sharp corners. Threaded hole must not reject correct basic "Go" gage by interference with rounded roots due to worn tap. Minimum flat at root equals $\frac{1}{24} \times p$.

bility of the individual manufacturer to meet his own real or fancied *special* conditions.

The following paragraphs cover the references in the Report to special diameters and pitches:

(b) *Special Pitch and Diameter Combinations*—In general the tables given are intended for use with the two standard thread series only.

The application of fine pitches to large diameters involves questions of workmanship, which affect the grade of fit chosen.

When a pitch of thread is used with a diameter not called for in a standard thread series, it shall be defined as of "American (National) Form," but not as "American Standard."

(c) *Tolerances for Special Pitches*—Where tolerances are desired for a special thread and the pitch is not listed in the tables given, the tolerance values should be chosen corresponding to the number of threads per inch nearest to that of the special thread being produced. Where the number of threads per inch is midway between two of the pitches listed, the tolerance corresponding to the coarser pitch should be used. For instance, the tolerance on a screw having 11½ threads per inch would correspond to the tolerance specified for a thread of 11 threads per inch.

Major Earle Buckingham of the Commission is working on a scientific method of determining tolerances for special diameters and pitches, taking into account also the effects of length of engagement and quality of fit desired. These factors are combined for any pitch and diameter in a simple and logical way, and it is hoped that his suggestions will soon be ready for publication.

The Foreman and the Suggestion Box—Discussion

By J. E. Powell
Bexley Heath, Kent, England

THE contribution of W. Roland Needham on page 208, Vol. 59 of the *American Machinist*, with reference to the suggestion box caught my eye and, being interested in the question of suggestions, I venture to forward my views on this matter. Mr. Needham hits the nail right on the head when he says that much depends upon the mentality of the men themselves, foremen included. I would submit, however, that it is necessary to go further, and suggest that the term "men" must also include the management. What line does the management take over the matter? There is a big human question behind all this and the managements themselves can be held largely responsible for the answer.

It is all Mr. Needham says—a question of mentality and imagination—and the firm which gets these two factors right and keeps them right will find it good business. But that is just the problem. There is no doubt that putting forward suggestions has gotten many men fired, either for putting forward suggestions at all or because the suggestions were really good. The writer, as a workman, has personally experienced the dangers of making suggestions and his fear of the results is the fear of many workmen today.

This Suggestion Proved a Boomerang

On one occasion solely to find out what would befall the author of a suggestion I sent one forward under a nom de plume. The suggestion was accepted and the management posted a note on the departmental notice board asking for the identity of the successful man. Emulating Brer Rabbit, however, I lay low and, not long after, became the unsought confidante of the foreman's clerk who was specially commissioned to find out quietly who the individual was. When found out, he was to be "Johnnie Walker." I did not disclose my identity, nor did I take another risk.

On the other hand I have seen that the risk can be as real to the foreman as to the workman. It is true that a small minded foreman is capable of firing a workman because the man's suggestions indicate that his brains and knowledge are equal to or superior to the foreman's own, and to lose such a foreman would not be a great loss, provided there were no other grounds for the action taken. But there's the rub; what line does the management take? Suppose a foreman encourages workmen to send in suggestions, and they do—I have had foremen bring them to me personally—does the management feel disposed to think a suggestion by a workman is a reflection on the foreman's ability, that what the workman has seen the foreman ought to have seen? How would they consider a foreman from whose department a greater proportion of good suggestions were sent than from any other? Would it suggest to them that he was not so good as the men he supervised, or alternatively that he was so good a man himself that he could get good men to work for him? All the brains in the world are not to be found under one hat and this is a fact which ought to be kept in mind. In some works the evidence is that altogether the wrong view is taken by the management, and workmen's suggestions have been used to flog the foreman.

The Foreman and the Management

Foremanship is becoming more a question of man management than ever, and that foreman will be most successful who can not only get the best men to work for him, but can also get them to do their best. It is not inconceivable that many suggestions could emanate from a department where such a foreman was in control and, if the managers were as big men as their foreman and the "foreman's workmen," a suggestion scheme would probably be a success. If they were not, however, the foreman would take his cue from his short-sighted superiors and in self-defence would discourage the making of suggestions. The suggestion scheme would fail, killed by the management.

For a suggestion scheme to be truly effective broad views are necessary. There can be no doubt that many suggestions can be made from a department where the ability of a foreman is low, but it is a misuse of the suggestion scheme if the management uses it to ascertain this fact. If it knows its business, it will find this out without seeking the aid of the workmen in this manner. The managers should first satisfy themselves that their choice of foremen is right and then do all in their power to encourage suggestions by payments, appropriate in amount, freely although not carelessly given. They would do well to congratulate the foremen from whose departments good suggestions were received. One great advantage both to workmen and management which can arise from a successful suggestion scheme is the opportunity for talent and brains to express themselves and from the ranks of "suggesters" can be recruited the future staff.

What Ford Has Done in the Lincoln Plant

By FRED H. COLVIN
Editor, *American Machinist*

Assembling and inspecting Lincoln motor parts—Honing cylinders and polishing gear teeth—Keeping the camshaft straight—Fixtures for assembling and gaging piston alignment—Second article

WHILE it is not to be expected that the methods developed in any one shop will differ in every respect from all others, it is instructive to note some of the smaller details which are being used in producing a thoroughly high-grade car.

The problem of finishing cylinder bores is always a subject for discussion among automotive engineers. Before the general use of the cylinder grinder, the combination of boring, reaming, and lapping was supposed to be the last word in cylinder finishing. Then lapping gradually gave way to grinding, and different grinding men, as well as car builders, vied with each other in the perfection of cylinder bores, that should be as round as possible, should not vary appreciably in diameter, and should have a mirror-like finish. There is, however, a tendency at the present time not only to grind as good a hole as possible, but to supplement the grinding with a light lapping or honing process. This is the practice in both the Lincoln and the Rolls-Royce plants.

The Lincoln engineers have developed the honing machine shown in Fig. 11, especially for handling the complete cylinder block at one operation. There are four hones in each cylinder, all being carefully turned to the proper radius and held against the cylinder walls by light springs. The hones are of No. 180 carborundum and travel up and down 110 strokes per min. and at the same time they are revolved at the top and bottom of each stroke by an abrupt unequally spaced ratchet so as to make one complete revolution per minute. The hones thus assume different paths at each stroke. Each hone is liberally supplied with kerosene from the pipe shown just behind it. The hones have the same stroke as the piston in the cylinder, 5 in., and are allowed to make two complete revolutions, which occupy two minutes. The amount of metal removed is hardly appreciable, but the hones impart a finish to the cylinder walls which is not only pleasing to the eye but is giving excellent results in service.

Keeping Camshafts Straight in Hardening

Another special device which has just been put in operation is shown in Fig. 12. This is for holding camshafts straight and true during the hardening process, and so eliminates practically all spring or distortion, which is so common in long shafts of this kind. When a camshaft is withdrawn from the heated furnace, it is quickly placed in the vertical position in the hardening machine, as shown at *A*, where it rests against two sets of supporting rollers, as at *B* and *C*. Then, the substantial frame *D*, which also carries six rollers, is swung in front of the camshaft, locked in position, and power applied to one of the roller shafts by the motor on top of the hardening machine. At the same time, the cooling-water supply is turned on and a large volume of water from three vertical pipes immediately floods the whole shaft and cools it quickly. Some of the spray nozzles are shown at *E*. In this manner the camshaft is held against excessive springing during the cooling, which saves considerable time in straightening after hardening.

Details of the Fixture

The supporting and driving rollers are knurled and grip the camshaft firmly in order to insure its being revolved at approximately 110 r.p.m. The sliding door *F* is, of course, closed in front of the work before the water is turned on. The camshaft laid in front of the opening shows the four large bearings which are gripped by the smaller rollers, while the larger knurled wheels grip the ends which are of smaller diameter.

For testing the alignment of the piston and the crankshaft bearing at the other end of the rod, the device shown in Fig. 13 is used. The bearing end of the rod is slipped over the mandrel *A*, which represents a crankpin. The second rod is supported by the pin *B*. Then the clamp *C* is placed over the bolt-heads of the rod being tested (the single rod in this case), with the end of the lever *D* inside the clamp. Pressure is then applied to the other end of the lever by means of a screw operated by the handle *E*, until the slack has been taken up between the two rods. This slack, of course, is only the necessary allowance for the lubricating oil film, which is approximately 0.0015 in., but this slack is taken up in order that the alignment of the piston and the crankpin bearing may be as nearly exact as it is possible to make it.

The piston rests on the steel angle plate *F*, the back side of which carries a floating straight-edge at *G*. The straight-edge is connected to the dial indicator shown and tells exactly how much the piston deviates from exact alignment, if any. The double or spade rod is also tested on the same fixture by simply reversing the rod assembly. In this case, however, the clamp *H*, having the double rings to reach all four bolt-heads, is used in place of clamp *C*.

The method of holding the piston pin in the piston is unusual, and the device for putting the locking pin in place is of interest. The locking pin is straight and is made from stock selected to a 0.0005-in. limit. It has rounded ends, and is casehardened. Some of the

NEW METHOD OF PREVENTING CONTINUAL DISTORTION - FIG. 12
LOCKING THE PISTON PIN IN PLACE - FIG. 14
SPECIAL MACHINE FOR HONING CYLINDERS - FIG. 11
TESTING ALIGNMENT OF PISTON - FIG. 13
LINCOLN

pins can be seen in Fig. 14, at *A*. The close-diameter size is maintained in order to insure a proper fit in the piston bosses. The locking device is a steel sleeve, slit, some of which are shown in the pen at *B*. The sleeve is not heat treated but is made of hard-drawn material of suitable analysis. The hole in the sleeve being maintained to 0.002-in. limit, is enough smaller than the diameter of the pin, so that when the pin is forced in place through the piston boss, the piston pin, and the locking sleeve, the tension of the sleeve on the pin is sufficient to prevent the possibility of its ever coming loose in service.

How the Locking Pin Is Inserted

In order to insert the locking pin quickly, the assembled rod, piston, and piston pin are placed in the fixture shown in Fig. 14. The hollow piston pin is slipped over the stud *C*, one of the split sleeves inserted in the notch in the end of *C*, and the arm *D* swung up with the left hand, so that the pin *E* pushes the split sleeve into position against the bottom of the slot and brings it in line with the locking pin holes. A locking pin is placed in position, as at *F*, and the right hand of the operator forces down the plunger *G*, which pushes the pin into position, through both sides of the piston boss and piston pin, and through the locking sleeve. This operation is performed in much less time than it takes to describe it and forms an excellent locking device which can be readily removed when occasion requires, without damage.

The method of testing the play or oil-film allowance of the plain or single connecting rods at final assembly is shown in Fig. 16. Here the rods are all in place on the crankshaft in a completely assembled engine, which is shown turned upside down on its assembly stand. The frame of the testing device is fastened to two of the bolts in the double connecting rod, as shown at *A* and *B*. At the upper end of the gage frame is the dial indicator *C*. Between the two uprights of the gage is an arm that rests on the single rod which is between the other two ends of the forked rod. With the steel bar *D* hooked under the middle bolt-head, the operator takes up the slack or play due to oil allowance in the bearing. In this way, it is definitely known that there is a sufficient oil film space in every bearing. The allowance for oil film between the crankpin bearing in the forked rod and the crankpin, is tested in a similar manner. After the assembled engine has been run under its own power on test, these bearings are all removed, inspected, the engine reassembled and the bearings tested as above described.

A Convenient Device

A very convenient assembling device for putting the pin in the valve-slide roller is shown in Fig. 17. One of the slides with the adjusting screw at the top is shown at *A*, and a roller is in position at *B*, ready to be lowered, so that its hole comes in line with the pin *C*. Moving lever *D* to the left lowers the roller to its proper position, and with the slides *A* dropped over the roller, a movement of the lever *E* forces the rack-driven plunger *F* to the left. This pushes the pin *C* in position with its rectangular head vertical, ready to slide in the slot of the guide bushing, and prevents the guide from turning as it travels up and down under action of the cam. Plunger *G* ejects the pin should it be pushed in without the guide in position.

A very unusual method of putting piston rings in their respective grooves is shown in Fig. 18, and the details in Fig. 15. The device consists of a base plate and three heavy steel tubes, the nominal outside diameter of which is approximately the same as that of the inside diameter of the piston ring. The upper ends of these tubes are enlarged, as shown at *A*, Fig. 15, and short sections of thin tubing are fastened to them, the inside diameter of which is slightly larger than the outside diameter of the piston, as shown by the black line *B*. The lower edge and outside diameter of this outside tube merge into the shape of the heavy tube itself which has a tapered portion that expands the rings and allows them to slide up over it as the tube is pushed down. The tubes are then loaded with piston rings from the small end, as shown in Fig. 18, and the ends of the tubes inserted in the base plate. The three tubes are alike, except for the length of the thin tube at the upper end, the long tube being shown at the left

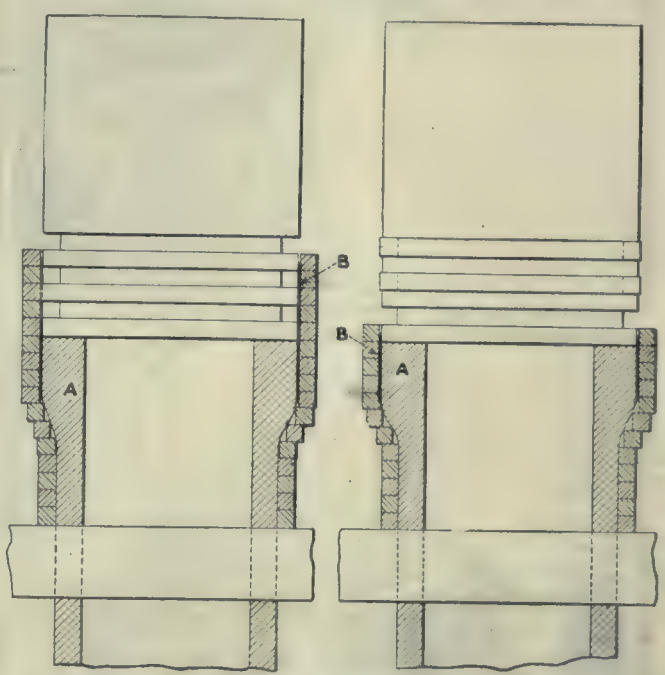
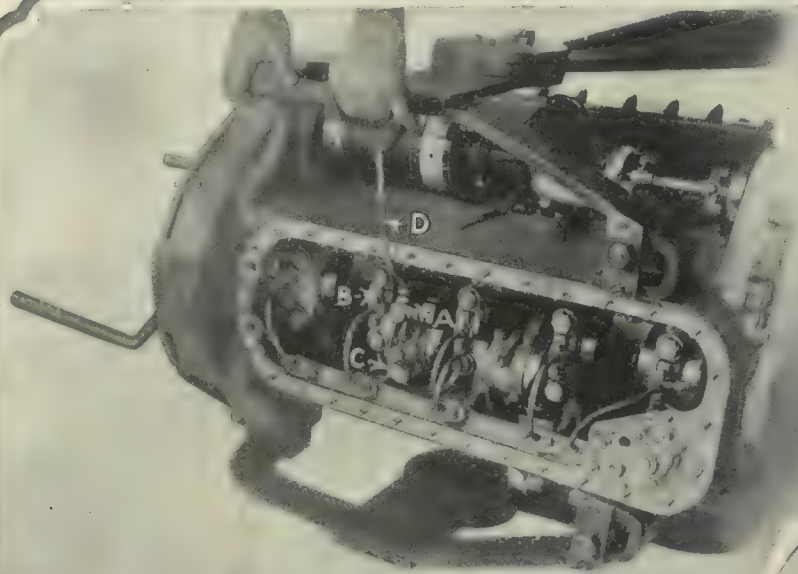


FIG. 15—DETAILS OF PISTON RING DEVICE

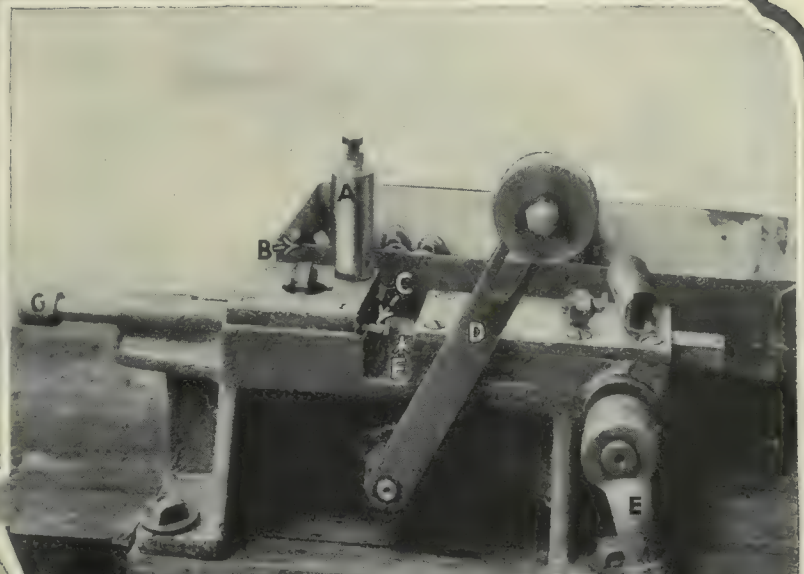
and the short tube at the right of both Figs. 18 and 15. The length of these thin tubes is proportioned in accordance with the spacing of the grooves in the piston, as each tube delivers rings to a definite groove in the piston.

Beginning at *A*, Fig. 18, a piston is inserted head down inside the thin tube which projects from the heavy tube, as shown in Fig. 15. By pushing down on the piston the tube inside the ring is forced down through the base plate, and the upper ring is pushed off the top of the thin tube just as the upper groove in the piston comes even with the ring which is released. The ring snaps into the groove and the piston is then inserted in the middle tube to receive the second ring. The top ring is then put on as shown in Fig. 15 at the right.

Another refinement, in the endeavor to secure the utmost of quietness and smooth running of the transmission gears, is shown in Fig. 19. The teeth of the soft gears are burnished by rolling just enough to remove any roughness from the cutting, but not enough to change the tooth form and after hardening, the teeth are polished on the machine shown in Fig. 19. This



MEASURING OIL FILM ALLOWANCE ON CONNECTING RODS - FIG. 16



ASSEMBLING CAM ROLLER IN SLIDE - FIG. 17

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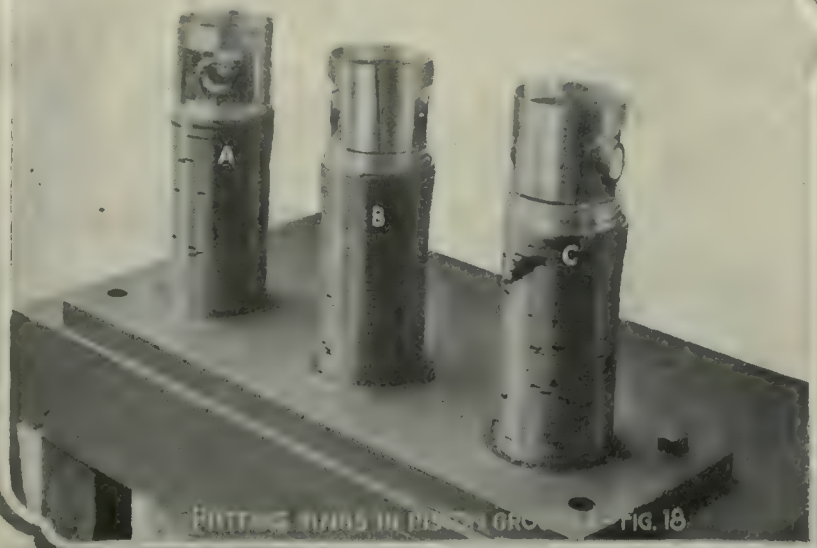
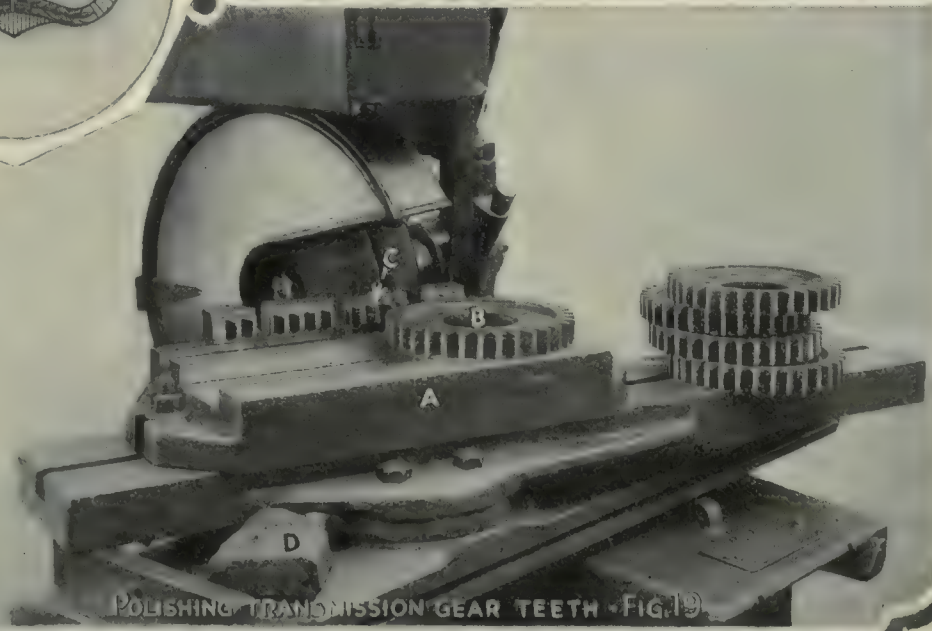


FIG. 18



POLISHING TRANSMISSION GEAR TEETH - FIG. 19

process may perhaps be likened to the honing of the cylinders after they have been beautifully ground on a Heald machine.

In order that the polishing process may not in any way alter the tooth form, the gears to be polished are rolled past the polishing wheel so that the teeth pass in a generated path and the correct contour is maintained. The table *A* is swung to the pressure angle of the gear, and the gear laid on the top of the table, as at *B*, so as to mesh in the rack *C*. The rack is provided with suitable openings through which the polishing wheel can reach the face of the gear tooth. The gear is then simply rolled along the rack past the side of the polishing wheel and receives a high polish. A thin elastic wheel of very fine grain is used which in reality only forms the base or carrier for the polishing material that is applied to its sides. A combination of tripoli and tallow in the form of a cake is used as shown at *D*, and applied to the sides of the wheel from time to time. A beautifully polished surface results from the operation.

Mercury Boiler Promises Economies in Power Developments

A DOUBLE vapor power plant in which turbines for generating electricity are driven both by mercury vapor and water vapor from the same fuel source, with a gain of about 50 per cent in power over present methods, is the outstanding achievement of a new boiler developed by the General Electric Co., Schenectady, N. Y. Two such boilers have been built to date, an experimental apparatus operated at the Schenectady works and an installation now under observation at the Dutch Point station of the Hartford Electric Light Co. at Hartford, Conn.

This installation is the first of its kind in the world although experiments have been conducted by the General Electric Co. over a period of several years. The success of these preliminary experiments warranted the construction of a set of commercial size and it was arranged between the two companies that this installation should be made in Hartford. The equipment is now being operated under a partial load for the purpose of getting further experience in the operation of the system.

The process is novel in every particular, and it was necessary to study the characteristics of mercury and its vapor carefully and on an elaborate scale. During the earlier experiments it was found that no form of packing or calking for the joints of the apparatus would resist the mercury vapor, and the development of electric and acetylene welding has made such apparatus possible.

Development of Apparatus and Process

Since there was no precedent by which to work, it was necessary not only to design and manufacture the apparatus, but also to devise methods of operation. The process involves the vaporization of the mercury in a boiler, the driving of a turbine by the mercury vapor, and the condensation of the exhaust in a condenser, where its latent heat is delivered to water. This action generates steam at a pressure suitable for use in existing steam plants.

The condensed mercury runs back to the boiler by gravity, and the mercury vapor therefore acts as a heat conveyor as well as furnishing power for its turbine. A means is thus provided by which the temperature range of operation is more than doubled as compared with steam processes, and the efficiency is consequently greatly increased. A steam superheater and a feed water heater are used to reduce the temperature of the flue gases to usual steam plant values.

Mercury boils and condenses much like water, except that its density is much greater and its boiling temperature much higher. At atmospheric pressure mercury boils at 677 degrees F. and water at 212 degrees. Mercury condenses in a 28-in. vacuum at 455 degrees F. and water at 100 degrees.

At present mercury sells for about 80 cents a pound and the boiler installed in Hartford contains 30,000 pounds. It is designed to give from mercury and steam about 4,100 kw., which is about 7.3 lb. of mercury per kw., but recent experiments indicate that in future designs 4 lb. per kw. will be sufficient.

The original application of this process on a considerable scale was built at Schenectady and operated experimentally on many occasions, but, although it was designed to deliver 1,500 kw. from the mercury turbine, it was never run at a load exceeding 1,050 kw. Of this power 800 kw. constitutes net gain as compared with a 200-lb. steam process, operating under similar firing conditions. With the steam produced in the process used as in the best power stations, this result is equivalent to about 11,300 B.t.u. per kw.-hr., while 18,000 B.t.u. per kw.-hr. is considered extremely good in existing steam plants.

The question which naturally arises in connection with the process is raised by the danger from mercurial poisoning, either to the community or to the attendants. As previously stated, all the joints are welded, so that it is impossible for the mercury to escape except through accident, and arrangements are made so that any leakage which may occur will go into the stack where it will do no harm.

W. L. R. Emmet, consulting engineer of the General Electric Co. and inventor of the mercury process, estimates that if the mercury boiler comes up to all expectations, it will produce at 35 lb. per sq.in. gage pressure, 52 per cent more output in electricity per pound of fuel than a steam turbine plant using steam at 200 pounds pressure. Mr. Emmet has had an important part in the designing of electrical apparatus for the company and in the development of its uses from the time of the company's formation. Among the more important developments for which he has been responsible are the Curtis turbine and electric ship propulsion.

Small Milling Cutter Data

I recently saw an interesting job in a special milling machine, a spiral groove being cut in a small shaft. Several cuts were made and the cutter was fed into the shaft by a very slow cam in increments of half a thousandth of an inch (0.0005) at each end of the groove. The cutter was an end mill having four cutting lips, and only forty thousandths of an inch (0.040) in diameter. The depth of cut was determined by experience, and the half-thousandth was found to be all that the cutter could be depended upon to stand, even when flooded with oil.

Getting the Safety Idea Over

By J. E. Bullard

WHEN an investigation was made through questionnaires and interviews to determine the attitude of manufacturers, machine shop men and the like, toward a certain safety article designed for the workman to wear, answers indicating reactions all the way from the greatest pessimism to the greatest optimism were given. Some men replied that you couldn't get the workmen to wear anything that would promote their safety, that they would rather take a chance. Others replied that they were having great success and gave figures showing to what an extent the accidents had been reduced.

The man who was able to keep up enthusiasm got results. The man who was not able to keep up enthusiasm did not get results. The man who tried to force his men to wear these things did not always succeed. The man who taught them and got them really enthusiastic about these articles, who used posters in his plant and left nothing undone to drive home their great value, did get results.

There is, however a class of men who always seem to want to take a chance. A little analysis of the character of these men will reveal the fact that the motive back of it all is usually the desire to attract attention. They have a hunger for notoriety, and often the only way to get these men to take a real interest in the safety idea is to feed this desire for notoriety to the fullest extent.

When photographs are taken of accidents and posted as horrible examples, there is always danger that this practice will actually encourage the notoriety seekers to expose themselves to accidents. In that way they will be brought to the attention of everyone in the shop. Therefore, where there are a large number of men working, calling too much attention to the accidents that have taken place may bring, at least in the case of some individuals, just the opposite of the desired result.

The Desire for Publicity

In the breast of nearly every human being there is a desire for fame, a desire to attract to themselves the attention of their fellow men. In every shop where there are many men employed there will be found some who have this trait of character more or less prominently developed, and if the accidents in that shop are to be reduced to the minimum, the psychology of these men will have to be considered. If the accidents they meet with gain any great amount of publicity, if the attention of everyone in the shop is called to them, if news of them gets into the papers, it is then going to be extremely hard to keep these notoriety-seeking men from taking chances.

Because of all this it may be necessary to give more publicity to the lack of accidents than to the accidents themselves in order to get the safety idea over with greater effect. This can be done in various ways. Employees who have been in the employ of the company for a certain length of time without having an accident of any kind may be given a medal, in the form of a button or other insignia that can be worn at all times. If this can be presented in a public way and the presentation be given a great deal of publicity, so much the better. If the company publishes an employee's magazine, the names and the pictures of these men together with something about them should appear in the pages of the magazine. In this way that innate desire for fame is in a measure satisfied, and many a person who would never be careful under any other circumstances will do all in his power to avoid accidents, in order that he too may acquire that modicum of fame.

Contests can be conducted between different departments, and possibly between different groups in the same department, for the reduction of accidents, some honor that means publicity being conferred on the department that wins the contest. And right in this connection it is well to bear in mind that, as a rule, a contest of any kind is not at all likely to get the best results unless a great deal of the right kind of publicity can be given to it.

The Contest Should Be Advertised

If you want a really good and a really exciting contest, you simply have to give it a lot of publicity, you have to get a lot of people to watch it, and you have to attract a lot of attention to the contestants. Do this and the contest becomes spirited. Announce a contest and give it no publicity, just let the contestants compete with each other, don't tell anyone else about it, don't even let the contestants know where they are standing until the end of the race, and it is all bound to fall flat. Little, if anything, is accomplished.

The winning of a prize isn't what counts, even if the prize is really substantial, so much as the publicity that is connected with the winning of that prize. These are facts that must be borne in mind if any contest is to be made the success it should be. Everyone who may be at all interested must be given the news of the contest, they must be kept informed. Then some really interesting results may be anticipated.

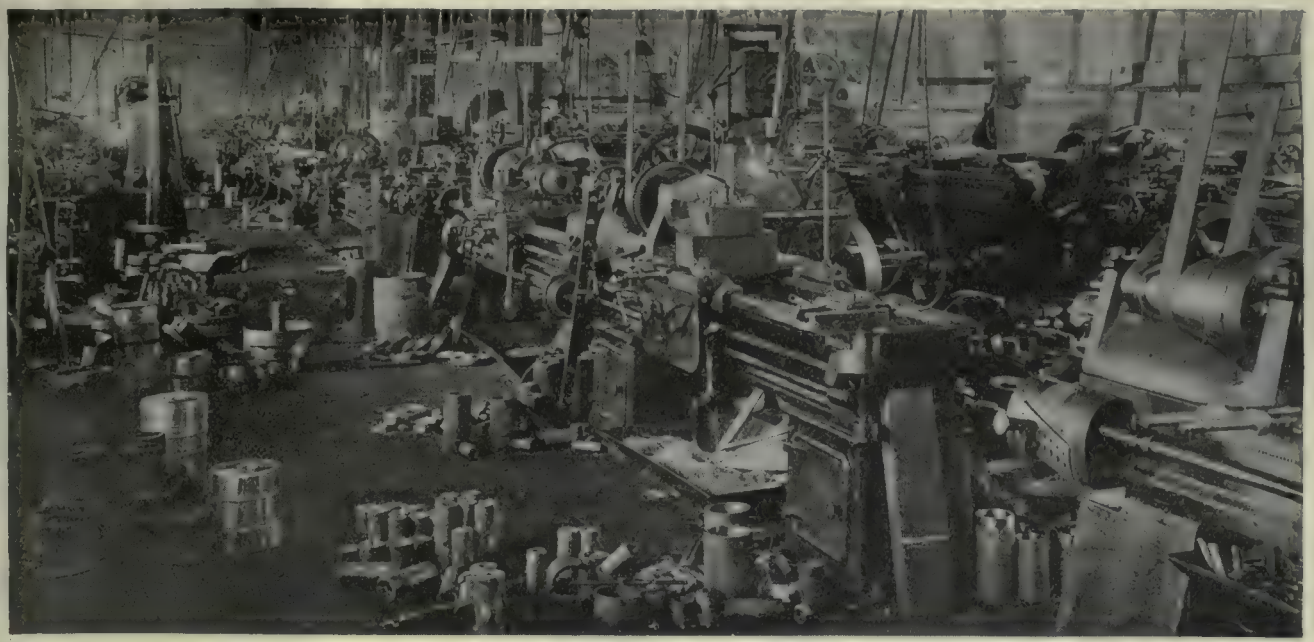
Therefore, if a safety first contest is to be conducted, just as loud a noise about it and its progress must be made as it is possible to make. If you want a man to avoid accidents, it is wise to give just as much attention as possible to the man who doesn't have accidents because he is careful.

There are of course exceptions to this but not so many as one is sometimes led to believe. There are very few people who do not desire fame and a great amount of publicity, but the number is certainly exceedingly small. Usually where it seems to be a case of not desiring the notice, it is really more a fear that the notice may be ridicule rather than praise, that it means disparagement rather than respect. There is probably not a person in the world who is not hungry for and who does not greatly appreciate real praise and respect.

Accomplishments Should Be Praised

This means that when publicity is given to any man, it is wise to make that publicity breathe a spirit of praise and respect. When this is done, the only danger is that it will be overdone to the extent that it will become ridiculous.

The time has come in many fields when it is better to make more noise about the good things and less noise about the bad. Play up the lack of accidents and the success with which they are being prevented, with less stress on the accidents that are actually happening, and among a certain class of people the number of accidents are almost always certain to decrease. The rest of the people are the kind most likely to be careful anyhow.



Where Machine Tools Are Made

Consolidated Machine Tool Corporation of America
Rochester, N. Y.

Newton Works
Founded 1874









How the Hendey Shop

Special Machines

Fig. 1—Planing a string of lathe beds on a Gray planer.

Fig. 2—Another lathe bed planing operation on Chandler planer.

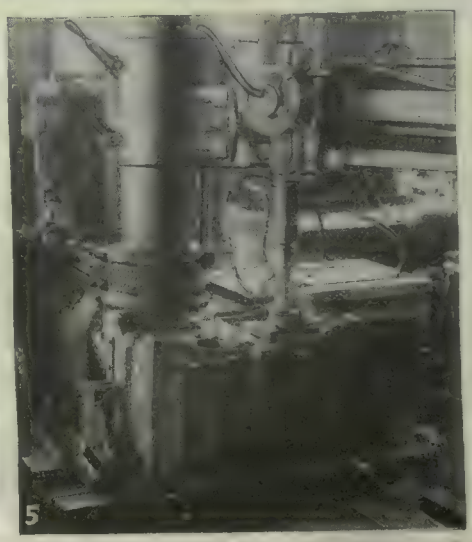
Fig. 3—Boring spindle and back-gear shaft holes in headstock. Special machine for each size headstock.

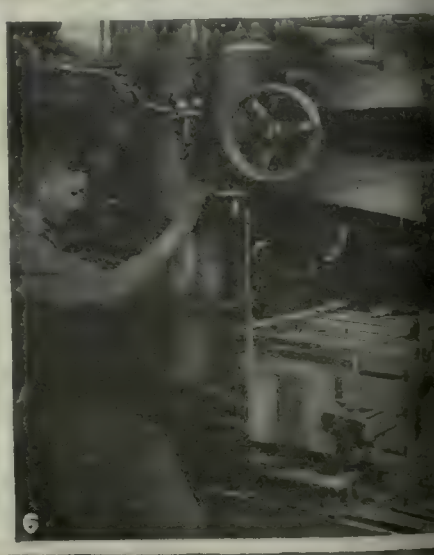
Fig. 4—Turning circular T-slot in base of compound rest.

Fig. 5—Trunnion drilling fixture for carriage apron. All holes drilled at one setting. Cincinnati Bickford drilling machine.

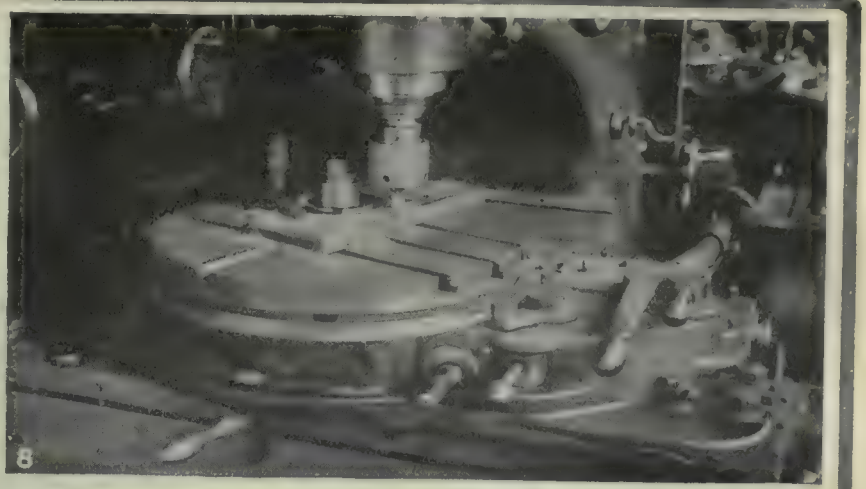
Fig. 6—Drilling and reaming hinge bolt hole in motion platform.











Builds Engine Lathes

and Operations

Fig. 7—Facing bottom of compound slide in a Hendey motor-driven lathe.

Fig. 8—Milling the base of the compound slide in a Becker vertical-spindle machine.

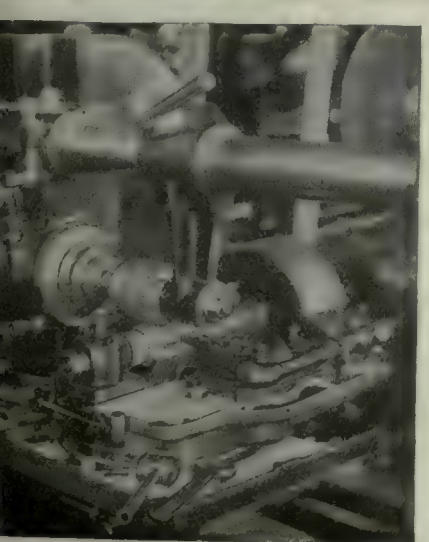
Fig. 9—Turning rim of hand wheel. Machine built from pillar of Hendey shaper and headstock from a lathe.

Fig. 10—Hobbing worm gear for lathe-carriage feed on Colburn gear hobber.

Fig. 11—Cutting the change gears in a Fellows high-speed gear shaper.

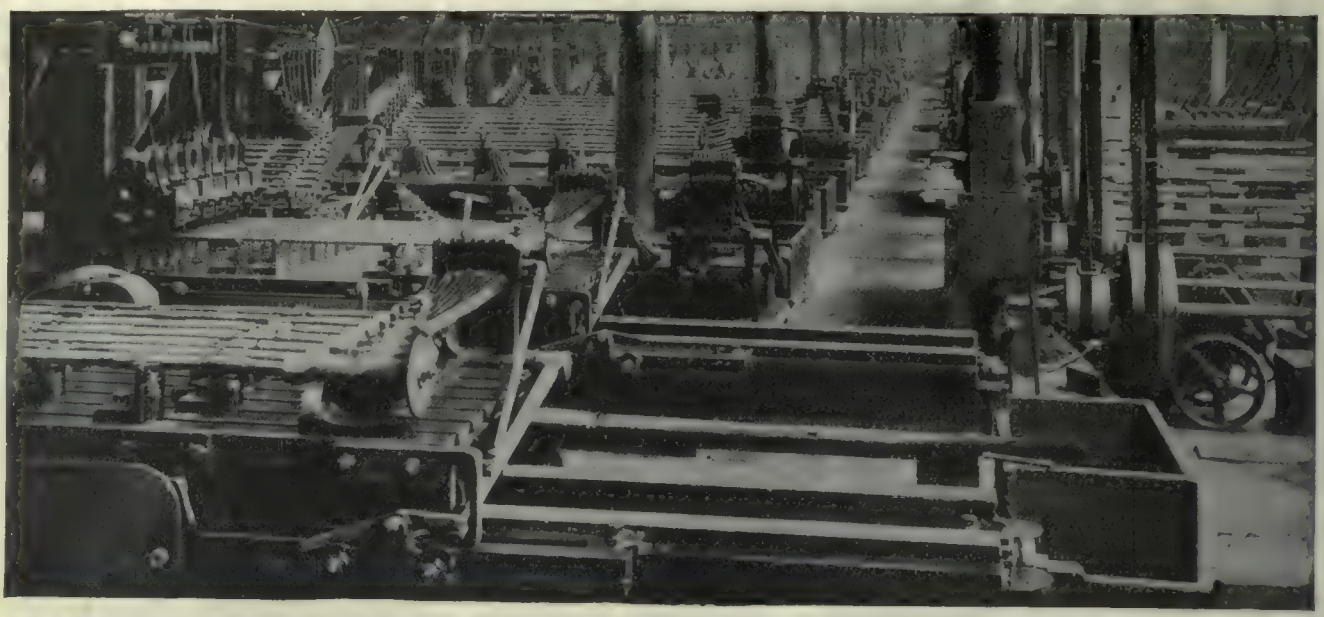
Fig. 12—Cutting multiple thread worm. Tool is hardened worm with cutting edge set below center.

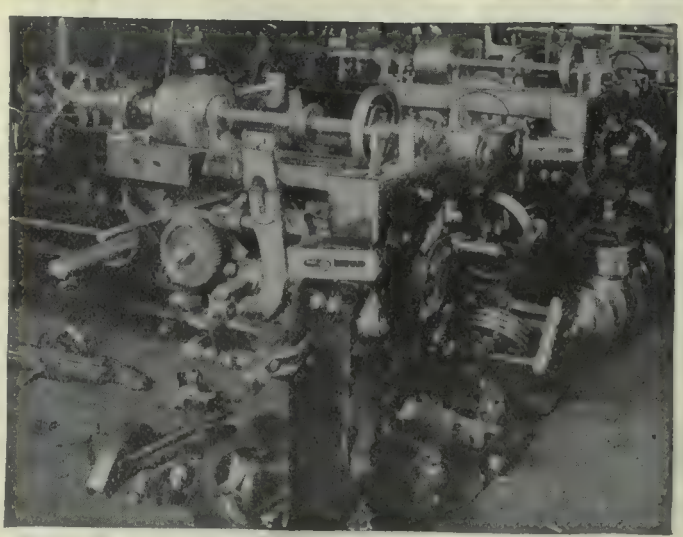








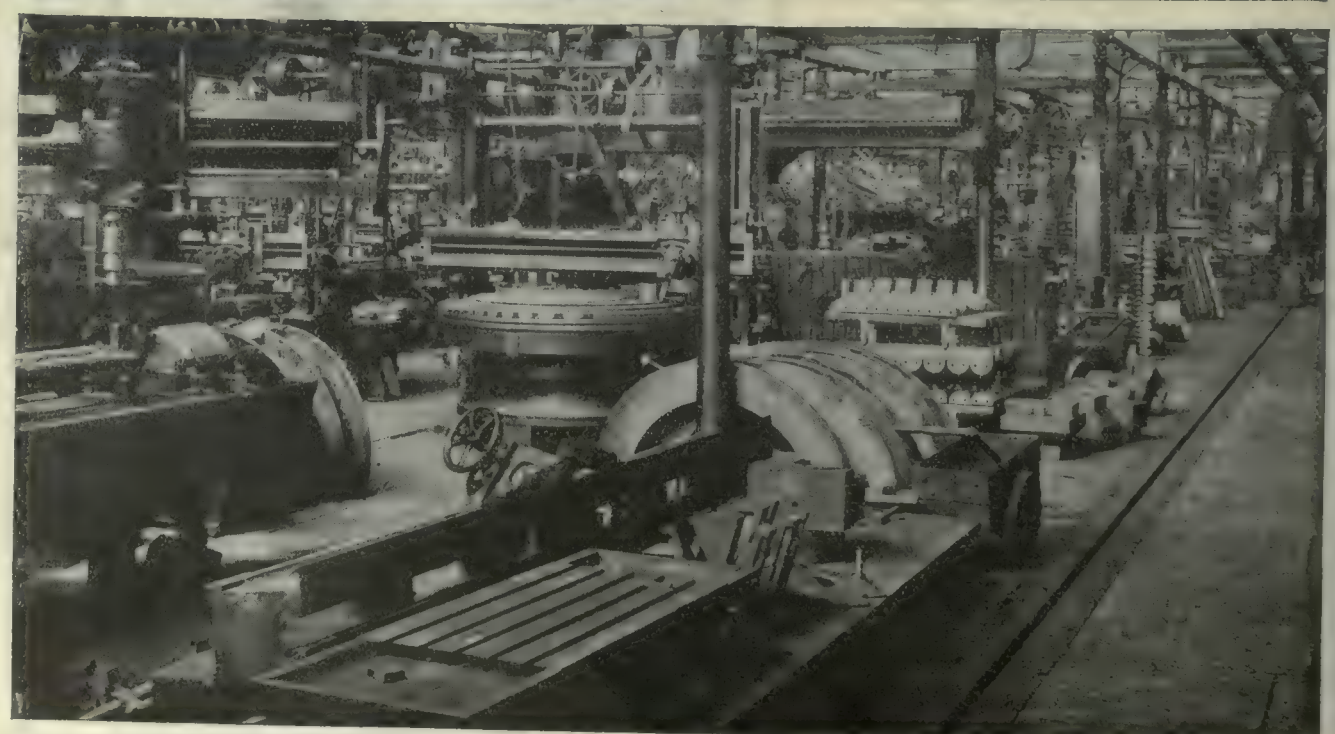




In a British Textile Machine Shop

Platt Brothers & Co., Ltd.
Oldham, England

Above—Planing Bottom Rollers
Left—Erecting Mule Headstock
Below—Boring and Drilling Machines



India—A Field for American Machinery

By F. LESLIE-JONES

Far Eastern country on the threshold of huge industrial development — How machinery is distributed in India — Competition with foreign manufacturers and how to meet it

THE AMERICAN manufacturer and exporter has not yet begun to appreciate the extent and value of the field offered him in India for the expansion and development of his foreign trade; or if he has he is laboring under some effective difficulties as to the means and methods by which he might avail himself of these opportunities. Whichever reason is the cause of his comparative absence or comparative ineffectiveness in that market, the conspicuous fact is that, except in the most isolated instance, he is neglecting a market of greater capacity of demand and greater attractiveness than any other foreign field with which he considerably concerns himself.

India is one of the world's largest consumers of manufactured products, and her present demands, large as they are, are but in the earlier stages of their growth. India, herself, does not possess the manufacturing capacity necessary for the supply of these products, and while her demands continue to increase rapidly the development and growth of her own manufacturing capacity cannot keep pace with them. It is these conditions that make India so worthwhile and attractive a field for international trade.

The American manufacturer of machine tools and accessories—as the American manufacturer and trader in general—does not realize the importance of the market existing for his products in India, its activity and its rapid growth. During recent years American machine tools have been placed in India, and are even still being placed there. But this introduction is being effected promiscuously, completely out of all proportion to the capacity of American manufacturers to meet the demand, and in practically no effective instance is the American machine tool trade being engineered and established in India, either directly or through agency channels, on a basis of permanency and security, or in the interests of American manufacturers.

Selling Agencies Now Employed

The agencies through which American machine tools have been, and are being introduced into India are almost strictly accidental to the manufacturer. During the war, and after, when the customary British, German and other European sources of supply, in the interests of which these agencies were originally and primarily and purposely organized, were unable to meet the Indian demand, American machine tools presented an excellent source of supply for such agencies. This was the institution of American machine tool trade with India, and practically no American machine tool manufacturer is operating in this field except through such agencies. With the recovery of the European production markets, the imports of American machine tools into India have rapidly decreased while the Indian demand has been growing steadily larger. The American machine tool has served the convenience of foreign interests. The American machine tools introduced today through these agencies are largely tools either of special design or particular adaptability which are at present only readily procurable from America, except where the consumer specifically demands a replacement or duplicate of an American machine which he has been supplied with in the past.

American Trade Insecure

Thus while American machines have been introduced into India, and while some are still being supplied, the fact remains that the American manufacturers' hold upon the trade and contact with the market are quite promiscuous and superficial, and their trade with India is consequently insecure, and faced with decline in spite of the rapidly growing market in that country.

This condition is not peculiar to the machine tool trade but is affecting American trade with India in all lines of manufacture. There has been no practical cultivation and development of the market in the strictest interests of the American manufacturers. As has been pointed out above, this has been the effect of an almost universal policy of agency appointments adopted by the manufacturers. These agencies, especially the well-established of them which are the most sought after, have appreciated the value of the market to them. They have been established in the development of trade in behalf of British and other European interests. If it had not been possible for them to tide over their curtailed supplies during recent years by securing them from American sources they would have suffered a loss. They avoided their loss at the temporary gain of American manufacturers. They are now gradually able to return more assiduously to the care of their recovering, original, primary interests. This is not a question of international bias or prejudice; it is simply a matter of national interest, a natural and important feature in the development of any nation's foreign trade.

These agencies have managed their affairs in a strictly business way, but so well that the American manufacturers and exporters, generally, have no practical hold upon the market as yet, and are little able to take material advantage of the present opportunities for trade in the fields.

Our manufacturers have thrown their opportunities of the past for the permanent establishment of an increasing trade with India to the winds, and their present position in the market is easily circumvented by almost every enterprising foreign competitor.

India is about two-thirds the area of the United

States. And the developments producing the demands for every class of manufactured products, particularly machinery are in active progress principally in the provinces and interior districts of the country which are adjacent, mostly, neither to Calcutta or Bombay. While these cities are both excellent centers for purposes of shipping, import and distribution the sales activities of traders must be organized throughout the many and vast inland areas of the country.

It is in this phase, largely, that the lack of proper appreciation of the extent and acuteness of the demand for his products in India has caused the American manufacturer's unsatisfactory organization and unstable development of his trade in the field. And it is upon the realization of these facts, largely, and his consequent proper organization and establishment of his interests and contacts that American trade with India will develop the permanency and extensive proportions that are easily within its reach.

Indian Consumers

The consumers and purchasers of machine tools are too numerous and various for tabulation here, but they may be mentioned briefly to illustrate the different elements constituting the market's demand.

The Government railroads, company railroads, and the independent industrial railroads are extensive users of machine tools in their locomotive repair shops, carriage and wagon (car) shops, structural shops. These shops and factories are as numerous as the convenience and facilities of each railroad demand. They are consequently located at numerous centers throughout the country, generally, though not always, in the larger cities.

In every town and city are the municipal workshops, operated for the upkeep of the machinery and plant and various structural work that comes under the jurisdiction of the municipalities.

In Karachi, Bombay, Madras, Calcutta and Rangoon and every other port of the country machine tools are extensively required and employed in the workshops and factories catering to the repair work and construction work incidental to shipping and port operations. Some of these workshops are operated by the Port Trusts; most of them, however, are private enterprises.

The extensive mining industry of the country is variously spread over the Eastern Provinces of Bengal, the Central Provinces, Central India and Southern India, and these operations along with those of the subsidiary industries depending upon them, and the numerous public and private workshops and factories, demand and use an increasing quantity of machine tools in their individual and relative interests.

The Military Works Department's factories, Ordnance Factories, the Public Works Department's workshops, and special Government-operated factories, as, for instance, those to serve cable and telegraph facilities, are among the principal Government consumers and purchasers of machine tools.

Now, it must be apparent that the American manufacturer of machine tools, proceeding as he has done and is still doing, to operate through a restricted sales-agency (generally limited to one agent), which agency is in most cases at present mainly and constitutionally a foreign machine tool interest, in a country as extensive as India, with the elements of demand being so varied and divergent as above illustrated—it must be apparent that he is in a most preposterous position with respect to acquiring or establishing his trade with India.

It is surely obvious that such a restricted sales-agency is quite incapable of reaching the above-indicated numerous and varied consumers. The consumers are not confined to one or other section of the country but are everywhere. The most active sales-agencies are operative only in restricted areas. In each section of the market and for each line of products there is a locally active complement of agencies.

Now, for instance, the Railway Board in its program for the next five years (from June 30, 1923) calls for the expenditure of approximately $420,000,000 to be spent in reconditioning, renewing and extending the railroad facilities in India. Nearly $200,000,000 of this sum is to be spent in the purchase of rolling stock, tools and stores (excluding coal, coke, oil and building materials). To meet the requirements for the reconditioning and extension of the railway repair and workshops it is planned to spend $40,000,000 of the above in tools and accessory supplies. These purchases will be made independently by the executive purchasing officials of each railway. To reach these purchasers and establish effective sales-contact with them is, clearly, impossible with a restricted agency or representation that is operative in only one or other confined section of the country.

India Offers Large Opportunities

And the same conditions obtain in every field and industry: The movements producing the demands, the consumers and purchasers are distributed over the whole country, the activities are too widespread, and the country too large for American manufacturers, without any specific field interests in their own behalf, and with their present insufficient agency representation, to develop and establish their trade with India.

The solution of the manufacturer's problem, of course, is in the selection and appointment of a proper sales-agent in each section of the market in virtue of the particular ability of such agents to cultivate and maintain the trade in the respective manufactures. This can be effectively done and must be done. It appears surprising that the agents of American manufacturers have not themselves effected this solution; but for an agent to appoint sub-agents would mean, immediately, the diminishing of his percentage commissions or profits, and in many cases, no doubt, would mean, eventually, too great an introduction of American products into the market—both of which conditions, as has been already shown, are not particularly desired by agency interests which are not only non-American but often specifically foreign interests.

The attention of American manufacturers and exporters is being turned towards India. The success of the few seriously active enterprises is arresting attention. The field for the American manufacturer is large, but the market still remains totally unorganized by the American manufacturer in his own behalf. The opportunities offered are potentially vital, and of today, and by the application of serious effort American trade with India can be efficiently established upon a basis of increasing returns, and developed as a permanent channel for the outlet of our increasing capacity and surplus of production.

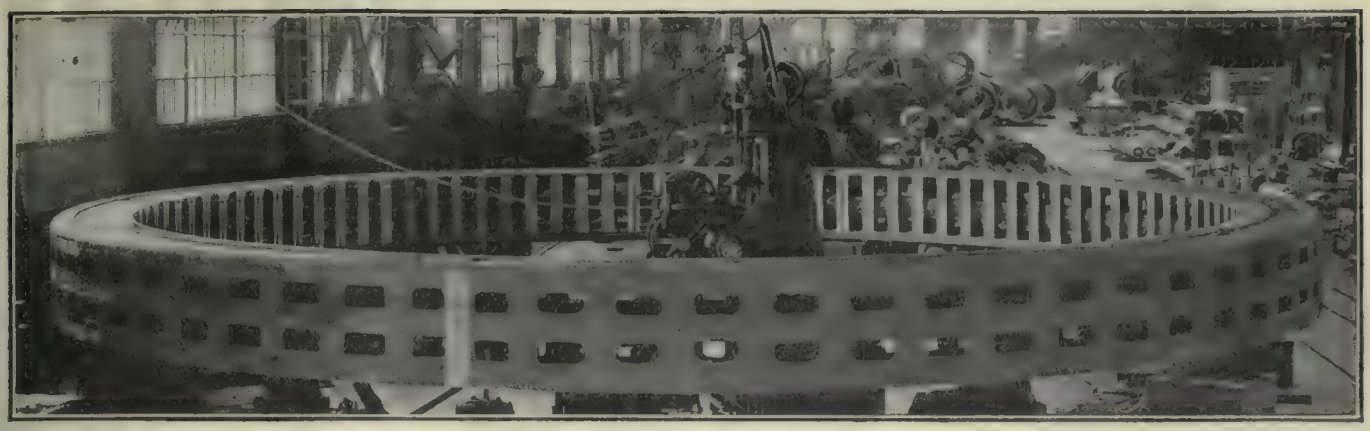


FIG. 1—MILLING DOVETAIL SLOTS IN FRAME

Machining a 37-ft. Generator Stator Frame

By E. T. SPIDY
Asst. Supt., Dominion Engineering Works, Ltd., Montreal, Canada.

IT SEEMS to be the very nature of a machine shop to be getting work that needs a machine just a little larger, with just a little more stroke, or just a little something, different from anything we have.

The machine shop of the Dominion Engineering Works, Montreal, Can., is particularly equipped to handle large work, but even at this, its largest vertical boring mill will only swing work up to 35 ft. in diameter between the housings, and up to 18 ft. high under the crossrail. This is one of the only machines of this size we know of, but when the job comes 37 ft. in diameter, what are you going to do? This was the position with regard to the large generator stator frame shown herewith.

The boring of this frame is shown in Fig. 2. In setting up the stator frame, which is in four sections, the skids were all set up and grouted solidly in the floor. Then a facing cut was taken over the whole twelve of the skids to insure alignment with the table. The distance blocks were then set on each of the skids, they having been planed in one batch to insure uniformity in height. Each section of the stator frame was milled off square on the bottom before the boring operation, the work being done on the large milling machine to be

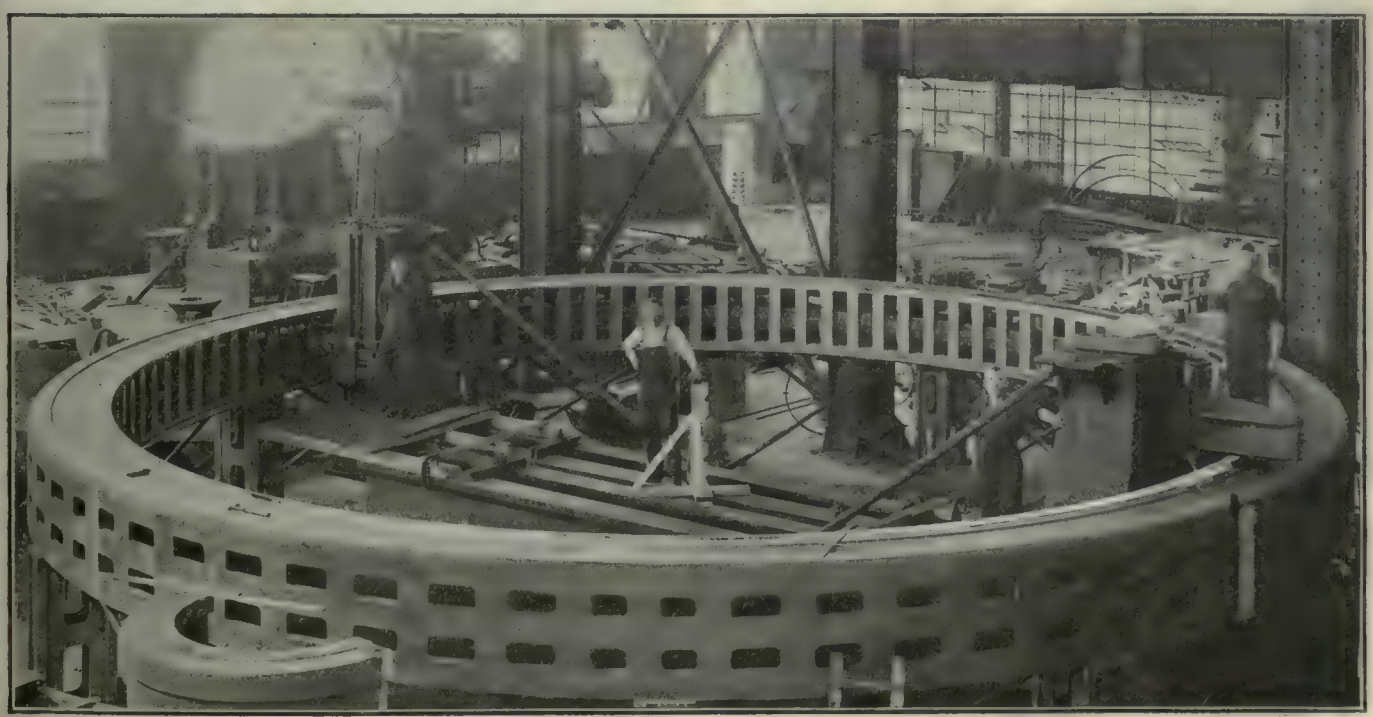


FIG. 2—BORING 37-FT. STATOR FRAME BY IMPROVISED METHODS

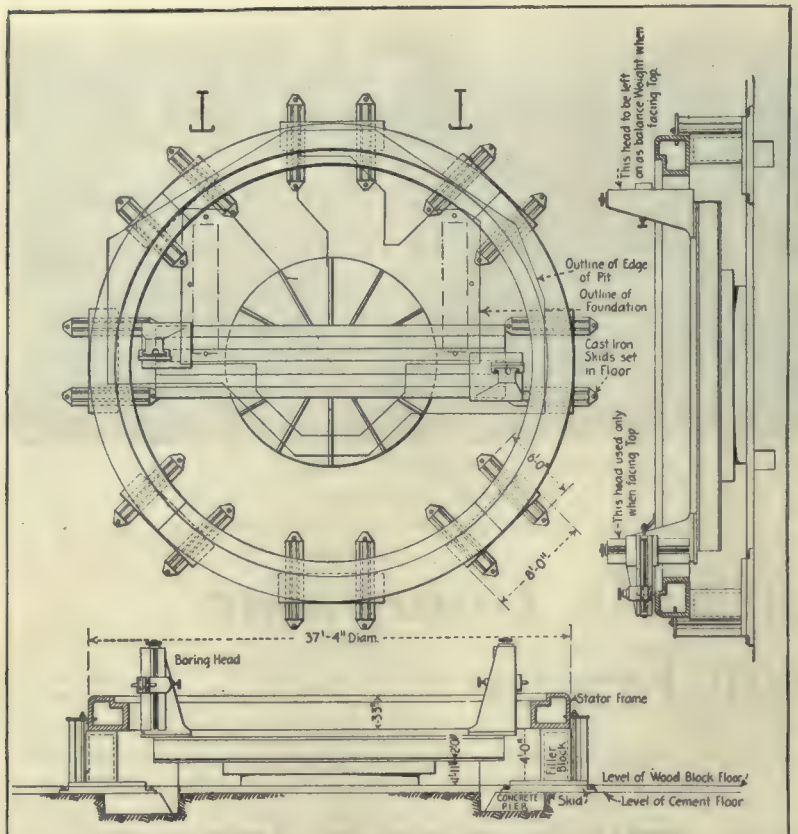


FIG. 3—DIAGRAM OF MACHINE AND TOOL LAYOUT

seen in the rear of Fig. 2. Pin gages were used to check all diameters and, in view of the difficulty of boring over a series of bars such as the interior diameter of this stator frame presented, the job was highly successful.

The diagram, Fig. 3, shows how the boring and facing operations were planned and carried out. A Niles boring mill, regularly rated as being 18 ft. between housings, was decided on as being most suitable for the operations, mainly because of the ease with which the housings and crossrail could be dismantled both from the bed and the drive mechanism of the machine. This machine has a table 16 ft. in diameter, and we fastened two long lathe beds side by side to the table.

On the lathe beds, which extended to the desired internal diameter of the job, we bolted two portable boring and facing heads. So instead of the work being rotated, and the tools held stationary, the process was reversed.

The next operation on the stator frame was to cut dovetail slots down the bars, or ribs, on the inside diameter. This necessitated another special set up. On another part of the floor we set up base blocks, on which we mounted the stator frame as shown in Fig. 1. These base blocks carry rollers on which the whole stator was rotated by means of a chain block attached to one of the shop posts. After each slot was milled the frame was turned to the next position. Internal roller guides were also mounted on the base blocks engaging the internal diameter of the stator, to hold the frame in position during rotation. The slots were accurately laid out and a stationary pointer erected for purposes of setting the frame at the center line of each slot.

A portable milling machine was set up at one point and accurately lined up so as to mill the desired slot vertically. Each slot was first roughed out and then a dovetail cutter was used to finish it. Fig. 4 shows a close up view of this operation.

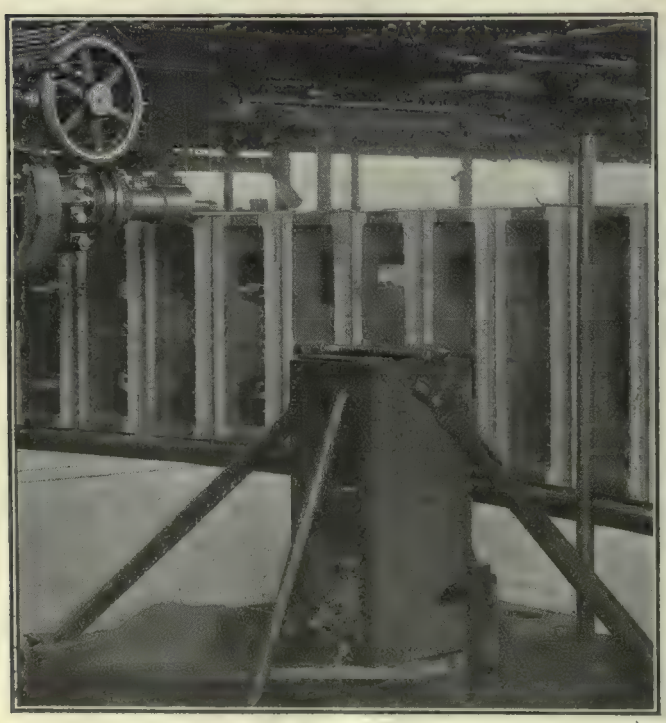


FIG. 4—A CLOSE UP OF THE DOVETAIL OPERATION

Eliminating Fatigue

BY WILLIAM R. BASSET

It has been calculated that, on the average, every workman, each day, turns out 20 cents worth of product less than he might, because of unnecessary fatigue. Multiply that by the number of workers you employ and then by the number of working days in a year and you will be astonished at the total cost to you.

Much of this fatigue can be eliminated.

In one plant as a result of a study, the working day was shortened 45 minutes, proper rest periods allowed and methods of doing work improved. The result was an increase of 35 per cent in the daily production. Similar results have been achieved in many plants.

The common causes of unnecessary fatigue are:

Poor light — Noise
Awkward position — Improper tools
Too high or too low speed of working.

I have seen production of bench workers increased 22 per cent merely by raising the height of the stools 2 in. Unnecessary noise has been found to be very tiring.

Anyone doing an operation over and over tends to strike a rhythm of movement, which, when found, greatly reduces the fatigue. Inability to find the proper rhythm may result in greatly reduced production. For this reason a rapid pace may be less tiring than a slow one, if it meets the rhythm of the worker.

For the sake of increased profits, if for no other reason, it pays to study the methods of doing work, so that needless fatigue may be eliminated.

Ideas from Practical Men

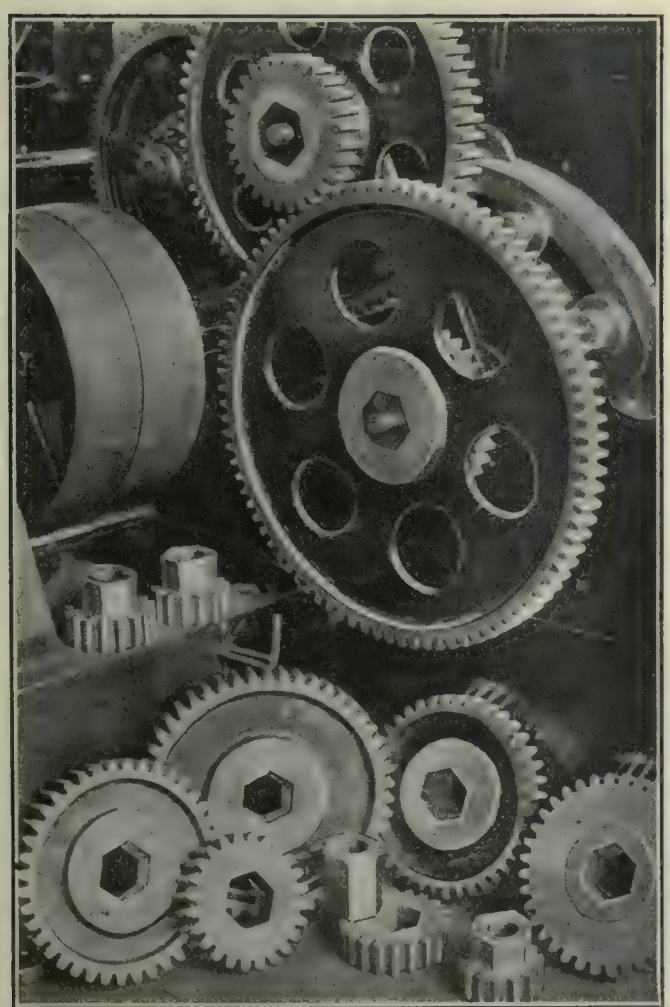
Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Hexagonal Holes in Change Gears

By John Williams

Ever since the screw-cutting lathe was invented, and perhaps before, we have had change gears; and the universal method of holding them stationary with respect to their driving or driven shafts has been by means of the "key," "spline" or "feather," as it is variously called.

So long as the powers transmitted by such gears are



CHANGE GEARS WITH HEXAGONAL HOLES

relatively small the spline is a very satisfactory driver, is not too difficult to make, and is very easy to manipulate when changing gears. Perhaps its most serious drawback is its tendency to work loose during years of service and eventually to get lost at a most inopportune moment when changing gears on a hurry-up job.

On the other hand, as powers increase in proportion to the allowable size of gear hub the single spline is unable to carry the load and the multiple spline is the method usually adopted, but the multiple spline *is* difficult to make, especially when the shafts are to be hardened. The accompanying illustration shows another method that is used by one of the manufacturers of heavy machinery that requires change gears.

The holes in the gear hubs are broached to a hexagon shape and the ends of the shafts upon which the gears are to be mounted are milled accurately to fit them. Bushings, having round holes for the studs and made hexagonal upon their outer surfaces, provide for compounding. This method has the advantage of increased strength without loose parts, and the gears will go to place in any one of six positions.

This application is shown by courtesy of Mr. Hartley, of Sleeper & Hartley, builders of wire-coiling machinery. Mr. Hartley does not claim to have discovered anything new, but merely to have applied a well-known principle to his purposes to overcome the trouble caused by the inadequacy of the single spline.

Turning Convex or Concave Surfaces in the Lathe

By Harry S. Clark

A concave or convex surface may be turned upon the face of a piece of work held in the chuck of a lathe by means of the following simple expedient:

Procure a piece of drill rod of about ¼ in. diameter and of a length sufficiently greater than the desired radius to allow the ends to be ground to a sharp point and finish to the exact length of the radius.

Next make a prick-punch mark in the cross-slide of the lathe at a point about midway of its length; on the side toward the tailstock if a concave surface is to be turned or toward the headstock if the desired surface is to be convex. Make a corresponding prick-punch mark at the same level upon the adjacent surface of the tailstock or headstock, as the case may be.

The work should be roughed out approximately to shape by the aid of a templet. It can then be finished to the exact radius by putting a sharp round-nosed tool in the toolpost, setting the double-pointed rod into its respective prick-punch marks and feeding the cross-slide inward or outward, to or from the center of the work, while the carriage is held back against the rod by means of the traverse handwheel.

It makes no difference what position the point of the tool occupies with respect to the end of the pointed rod except that it be at the center of the work when the rod is parallel with the shears of the lathe; its movement will describe a true arc of a radius equal to its length. The tool may be adjusted for successive cuts by tapping it out after partially tightening the toolpost screw, or the same result may be obtained by advancing the tailstock if the rod is on that side. If the lathe is provided with a compound rest, the setting of the tool is much simplified, for if the rod is used on the side toward the headstock the only adjustment possible is of the tool itself.

A Fixture That Reduces Milling Costs

By Donald A. Hampson

A milling fixture used for machining the three surfaces of the casting *A*, is shown in Fig. 1. The cuts to be made as at *F*, Fig. 2, originally required three separate operations, the pieces being clamped in a row and a set of them being run while the operator loaded another set on the second one of the removable "magazines." This method was slow because of the number of handlings and, during the latter operations, the castings were apt to lose the necessary degree of parallelism and accuracy.

A glance at Fig. 2 would seem to indicate that the

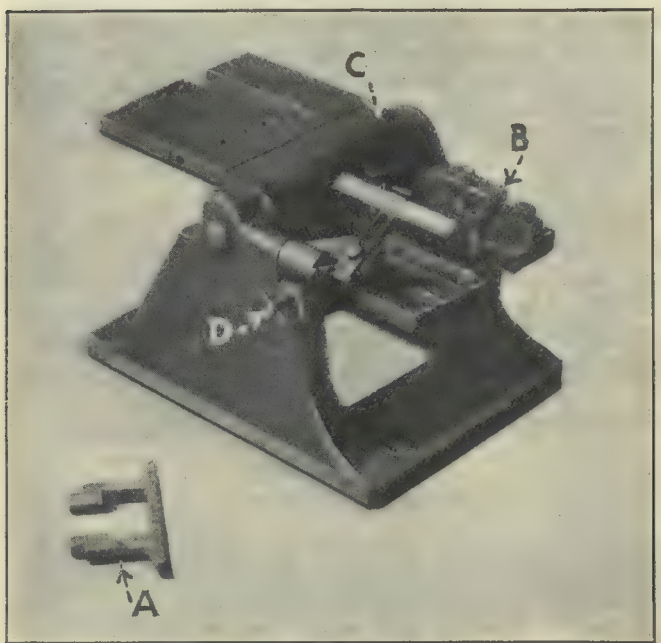


FIG. 1—FIXTURE AND WORK

work could best be done by three end mills carried in as many spindles. However, the width of slot that must be maintained takes the work out of the end mill class.

Obviously, the most economical way to do the work is to machine all three surfaces at the same time. But the lengths of the slots and of the facing cuts differ more than 50 per cent while the distance required for the periphery of a plain mill to enter its full depth is much more than that needed for a small end mill to approach its cut and pass off again. Then too the cutter speeds must be approximately equal if they are to have the same life between grindings. The arrangement of machine and the fixture design had to be such that adjustments could be made after sharpening and the tools will take care of three sizes of iron castings, differing only in the dimension *X*, Fig. 2.

The plan of operation is shown in Fig. 3. It will be noted that the fixture has a double ended work table that revolves about a horizontal axis. The cutting action resembles that in bridge milling, once so common in firearms work, and the work table is of cantilever design. In the cutting position, the castings are on the under side of the table. This keeps practically all the chips off the work and what few are left are dumped when the table is revolved. A size of end mill is used for the facing cut that just sweeps the work. Its position is ahead of the other two spindles, situated so that it finishes its cut at the same time that the plain slotting mills have just cleared the work.

This fixture has secured a two-thirds reduction in the cost of making these pieces. A further benefit results from the relation of the various machined faces, which now is fixed. The cleaning and brushing, one of the greatest evils of mills, is made unnecessary by this fixture. The operator does not need a brush, for every-

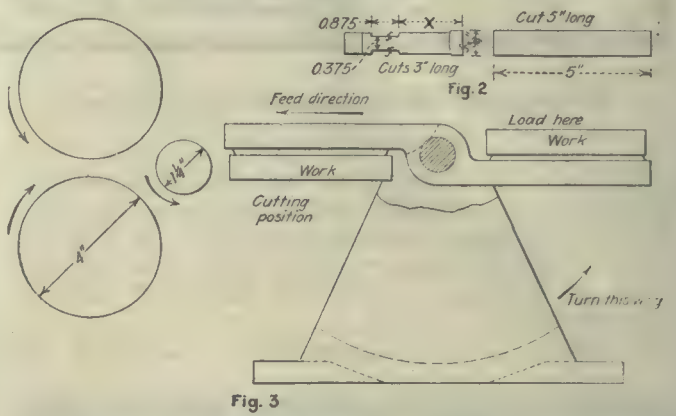


FIG. 2—END ELEVATION SHOWING CUTS. FIG. 3—HOW THE FIXTURE WORKS

thing in the chip line has vanished by the time the table reaches the loading position.

The clamps for holding the work *A*, Fig. 1, are shown at *B*, and a gage for setting it at *C*. The index pin is at *D*. The gage swings out of the way to allow the table to roll over. On account of the shape of the work it was necessary to arrange stops to take the thrust of the cut. One of the stops is adjustable to make up for foundry variations and the operator brings this up after the rest of the clamping.

The three-spindle arrangement of the milling machine is illustrated by Fig. 4. Two old machines contributed to the arrangement employed on this job —one a Lincoln and the other a duplex milling machine. At the left is the headstock of the Lincoln milling machine with its back-gear pulley, the back gears themselves being moved outside the far end of the headstock.

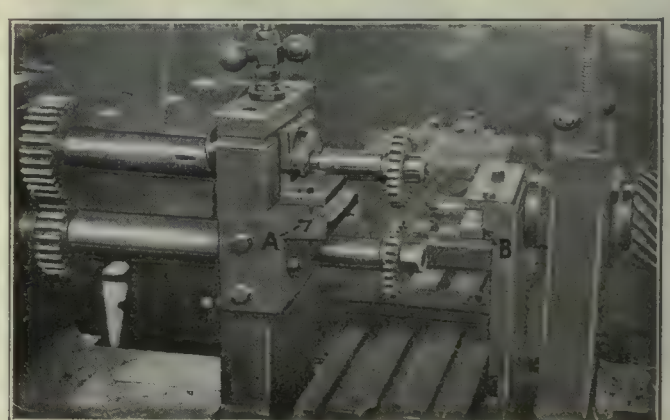


FIG. 4—THE CUTTERS AND GUIDES

At the right is one of the duplex milling machine headstocks, which carries the spindle with the end mill and runs at 270 r.p.m. A second spindle has been added to the slow running head and receives its drive through the spur gears at the left. The same countershaft with same size pulleys drives both heads but the back gears reduce the speed of the cutters 3 to 1, which gives a satisfactory cutting speed for all.

The cutting end of the fixture table appears in Fig.

3 to have no other support than its own strength—a cantilever piece extending toward the cutters. But just before the cut begins, the table enters, slides at *A* and *B*, Fig. 4, which support and guide it on each side. The fixture table travels in ways just as does the machine table below it and in this way steady fast cutting is possible.

The height of the center pin is the working point for setting cutters vertically. The end mill spindle coincides with this height while the other spindles have screw adjustments. To compensate for the three sizes of castings in use, the end-mill spindle is moved longitudinally with its headstock. The clamps and locating pieces on the fixture are also moved.

Tap-Clearance Tool for "Blind" Holes

By J. T. Towlson
London, England

In tapping "blind" holes, the operation will be greatly facilitated if clearance is made for the tap at the bottom of the holes.

A tool for cutting such tap clearances is shown in the accompanying illustration. The tool consists of a shank, slotted at one end to receive two cutters which are pivoted to the shank and are free to swing. Fig. 1 shows the shank and cutters entered in a hole to be tapped with a 2-in. Whitworth thread. The bottoms of the cutters have no clearance and are at an angle from the horizontal.

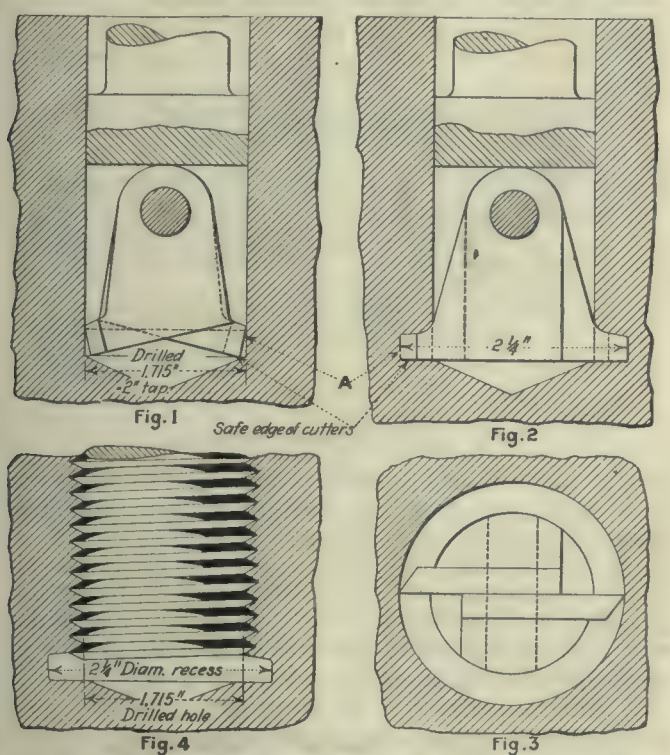


FIG. 1—THE TOOL IN A DRILLED HOLE. FIG. 2—CUTTERS EXPANDED IN THE HOLE. FIG. 3—BOTTOM VIEW OF TOOL WITH CUTTERS EXPANDED IN THE HOLE. FIG. 4—SECTION OF TAPPED HOLE SHOWING CLEARANCE FOR THE TAP

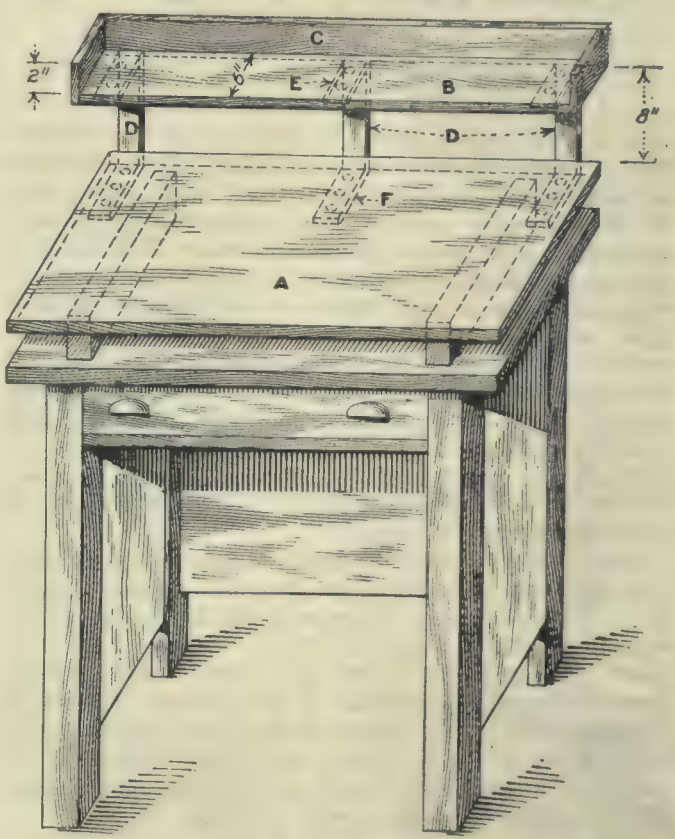
Downward pressure, as in drilling, forces the cutters to expand so that the edges *A* cut a groove in the wall at the bottom of the hole, as shown in Fig. 2. A bottom view of the tool with the cutters expanded in the hole is given in Fig. 3, while in Fig. 4 is a section of a tapped hole showing the clearance for the tap. A tool of this kind will soon pay for itself in the prevention of tap breakage.

Convenient Shelf for Drafting Table

By Albert A. Dowd

Every well appointed drafting room endeavors to provide each draftsman with a reference table or shelf on which he can keep books, instruments or drawings. There are many cases however when congested quarters make a reference table impractical, so that the draftsman is hard put to find a place for his things.

The illustration herewith shows a drafting table *A*



THIS SHELF IS A VALUABLE ACCESSORY TO A DRAFTING TABLE

with a convenient shelf *B* supported on braces *D* in such a way that it does not interfere in any way with the use of the T-square and very seldom with the triangles. The shelf is made of wood and has a projecting ledge *C* around it on three sides to prevent things placed on it from falling off. The shelf should be placed not less than 8 in. above the upper surface of the drafting table and it should not be much over 6 in. wide. The braces *D* are made of ⅛x1 in. flat stock and bent at an angle according to the tilt of the drafting board at *F*. They are screwed on the underside of the board with several wood screws and have a right-angle bend at *E* to support the shelf. Wood screws are also used here to fasten them in place.

A shelf of this kind is a most convenient thing for any draftsman, as he can place on it at one end his reference books that are in constant use, and there is also plenty of room to lay instrument case, triangles and other tools such as pencils and erasers. These items are always at hand when needed, yet never in the way.

Two Railroad Shop Tools

By Herbert F. Crawford

The illustrations show two devices that were recently seen in a contract shop which is repairing locomotives. The first is a gage for use in making new taper keys to replace old ones. It was designed for keys used in taking up the brasses in the back end of the main rod, or at the crosshead pin end, but is equally

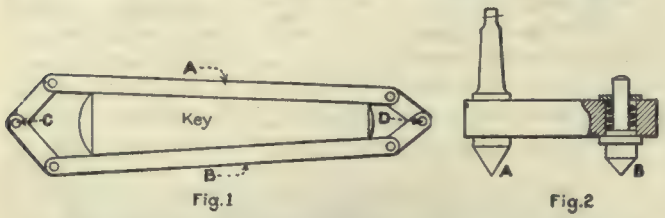


Fig.1 Fig.2

FIG. 1—GAGE FOR TAPER KEYS. FIG. 2—DEVICE FOR SCRIBING CIRCLES ON WHEEL HUBS.

useful for keys for other purposes. It is a very simple device, consisting of two long bars, *A* and *B*, connected at each end by short links, so as to allow the bars *A* and *B* to assume any relation with each other which may be necessary to secure the desired taper. In the tool shown, the joints were simply riveted together in a substantial manner, in the same way as the old firm joint caliper, the friction of the joint being depended upon to hold them in the desired position. In case this should not be found entirely satisfactory, it is an easy matter to put either knurled or thumb nuts at joints *C* and *D*, which will in all probability be sufficient to hold all the members firmly in any desired position. A tool of this kind makes it easy to duplicate keys and saves much time in fitting.

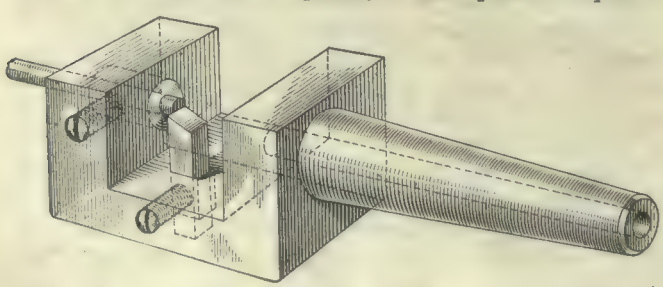
Fig. 2 shows a small scribing device used in connection with the tramming or laying out of valve gears. It is not always easy to tram from the center in the end of the driving axle, as this is usually large and deep. In the device shown, the center *A* fits into the center hole, and as the tool is revolved the scriber *B* marks a circle on the end of the axle, from which tramming is easily done. The scriber *B* is forced out by a spring which holds it automatically in contact with the hub while the tool is being revolved.

Tool for Turning Small Punches

By H. H. Knabe

A simple form of box tool to be used for turning quantities of small punches, or pins of small diameter, from drill rod or similar material has been much used by the writer. It is made to fit the tail spindle of a speed lathe and while there is nothing new about the tool itself I have seldom seen it applied in this way.

The body can be made quickly from a piece of square-



BOX TOOL FOR BENCH OR SPEED LATHE

sectioned cold-rolled steel, and any number of sizes of bushings made to take various diameters of drill rod. The turning tool is a standard high-speed steel tool bit, held in place by a setscrew.

If one has any considerable number of small punches to make this tool will soon save its cost by its superiority over the time-honored method of holding the drill rod in a chuck or collet and worrying off the stock from the unsupported end slowly enough so that the piece will not double up or break.

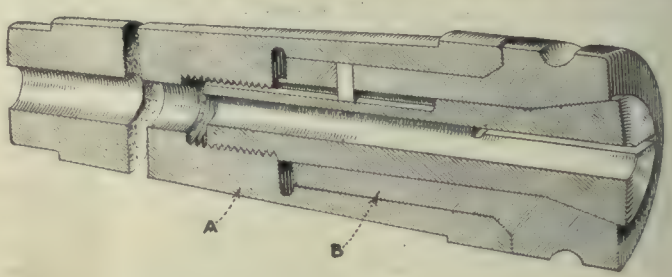
An Adapter for Spring Collets

By Milton Wright

A very neat adapter to hold spring collets in the spindle of a lathe that has no through hole, or is not fitted with a drawbar, is shown in the attached sketch. In order to be accurate, the adapter requires careful workmanship in the making, but any toolmaker whose work demands the accuracy of the bench-lathe collet should possess the skill necessary to make it.

The outer shell *A* is fitted to the taper hole in the spindle of the lathe in which it is to be used, but is not bored to fit the collet. Instead, a parallel hole, or recess, is made to fit the knurled sleeve *B*, and in order to do this nicely the shell must first be hardened and the hole then ground in position in the lathe spindle.

After turning the part A to fit the spindle, a through



ADAPTER FOR SPRING COLLET

hole of the desired size is bored and then counterbored to a depth and diameter equal to the corresponding dimensions of the sleeve *B*, leaving sufficient stock to finish by grinding. The outer end of the counterbored recess is bell-mouthed to about the same angle as the shoulder of the collet, but is, of course, larger in diameter. At the bottom of the recess the smaller hole is tapped to take the threaded end of the collet.

After finishing part *A*, which includes hardening and grinding both inside and out—the inside and bevelled seat being ground in position—the sleeve *B* is made. This should be a very good fit in part *A* but must turn freely with the fingers. The hole in *B* is to be a good fit for the collet and is bell-mouthed to form a seat for the latter. A feather, which may be a round pin flatted off on two sides where it projects into the bore, is fixed in part *B* to act as a key in tightening the collet.

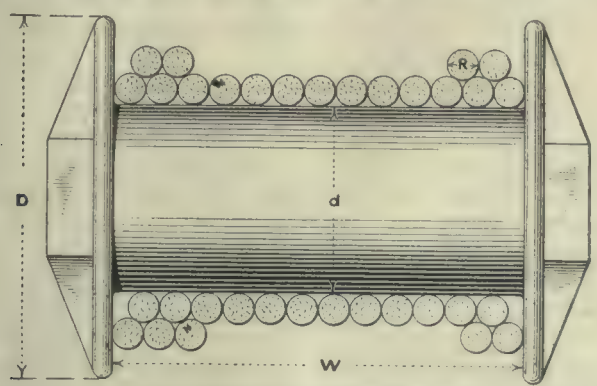
The collet is slipped into the sleeve through which the threaded end projects. The combined parts are then put into the shell *A*, the threads of the collet entering the threads in *A*, and screwed up by means of the sleeve which, by reason of the feather fitting the keyway in the collet, causes the latter to turn with it. When the collet is tightened the bevelled shoulder of the sleeve seats in the correspondingly bevelled recess in *A* in the same manner that the collet itself seats in the sleeve.

This device has the disadvantage of having two conical seats instead of one, but if the work has been carefully done the collet will run as true as if held with a drawbar. The main advantage possessed by it over the type that depends upon some sort of cap to *push* the collet to its seat, lies in the fact that the end of the collet is as fully exposed as when a drawbar is used, and the worker can thus get up close with his tools.

The Capacity of Drums for Wire Rope

BY HENRY C. ORD

This subject is not a new one, but in the formula given there is a new factor that is very important, and especially so when estimating the line capacity of a narrow drum for a rope of large diameter.



CAPACITY OF A ROPE DRUM

Due to the helical (although often called spiral) winding of the rope on the drum, one-half coil is lost at each end, or one coil for each complete layer on the drum. Consequently, when estimating the rope capacity the diameter of the rope should be subtracted from the width of the drum. This value $(W - R)$ is used in the formulas that follow, where,

D = diameter of drum flanges in inches.
d = diameter of drum barrel in inches.
W = width of drum in inches.
R = diameter of rope in inches.
L = length of rope in feet.

The following procedure was used for the derivation of the desired formulas:

When the drum is filled with rope the mean diameter of the coils will be $\frac{D+d}{2}$, and the mean or average length of the coils in feet will equal

$$\frac{D+d}{2} \times \frac{3.1416}{12} = \frac{D+d}{2} \times 0.2618.$$

The number of coils will be

$$\frac{\frac{D-d}{2} \times (W-R)}{R^2}.$$

The length of the rope in feet will equal the mean length of the coils in feet, multiplied by the number of coils, or

$$L = \frac{D+d}{2} \times 0.2618 \times \frac{\frac{D-d}{2} \times (W-R)}{R^2}.$$

Reducing to the lowest terms,

$$L = \frac{0.06545 \times (W-R)}{R^2} \times (D+d) \times (D-d)$$

Or,
$$L = \frac{0.06545}{R^2} \times (W-R) \times (D^2-d^2) \quad (1)$$

From this equation by transposing we find

$$D = \sqrt{\frac{LR^2}{0.06545(W-R)} + d^2} \quad (2)$$

$$d = \sqrt{D^2 - \frac{LR^2}{0.06545(W-R)}} \quad (3)$$

$$W = \frac{LR^2}{0.06545(D+d)(D-d)} + R \quad (4)$$

$$R = \sqrt{\frac{0.06545(W-R)}{L}(D+d)(D-d)} \quad (5)$$

In formula (5), as the value of the factor $(W - R)$ is not known, use W for the first approximation and solve for R. Then subtracting this value of R from W and solving again gives a closer approximation to the true value of R; if necessary this procedure may be repeated for a more accurate value. The value of R from the first approximation will be too large, and from the second a trifle small, although close enough for all practical purposes, as we would have to use the nearest commercial size of rope.

Let us now examine the capacities of rope drums under these conditions:

(a) The comparative length of rope of different sizes on the same drum.

(b) The comparative length of rope of the same size on drums of different widths.

Let W = width of wide drum.
w = width of narrow drum.
R = diameter of large rope.
r = diameter of small rope.
L = length of large rope.
l = length of small rope.

(a) $L = l \times \frac{r^2(W-R)}{R^2(w-r)}$ $\quad l = L \times \frac{R^2(w-r)}{r^2(W-R)}$

(b) L = length on wide drum.
l = length on narrow drum.

$$L = l \times \frac{W-R}{w-r} \quad l = L \times \frac{w-r}{W-R}$$

From the above it will be evident that the longer the drum the greater the efficiency for any size of rope, and the larger the rope the lower the efficiency for any size of drum. As an example, let the width of drum $W = 10$ in. and size of rope $R = 1$ in. Then the efficiency $E = \frac{10-1}{10} = \frac{9}{10} = 90$ per cent. If $W = 20$ in., $E = \frac{20-1}{20} = \frac{19}{20} = 95$ per cent.

An infinitely small rope and a drum 10 in. wide gives $E = \frac{10}{10} = 1$, or 100 per cent. A rope 1 in. in diameter gives $E = \frac{10-1}{10} = 90$ per cent; and a 2-in. rope gives $E = \frac{10-2}{10} = 80$ per cent.

The diameter of the drum has no effect on the efficiency as regards capacity; but it is a well-known fact that the larger in diameter the barrel of the drum, the longer the life of the rope.

American Machinist

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KENNETH H. CONDIT AND FRED H. COLVIN

Editors

December 27, 1923

Fair and Warmer —or Unsettled?

WITH the passing of the Christmas holiday season when most people are too busy with other things to bother with orders for machinery the industry can prepare for the new year. The vital question is—will business improve or merely hold its own?

Keen business men are keeping a weather eye on Washington. The President's message was an entirely satisfactory document and the country knows where he stands. But Congress has shown a conspicuous inability to get down to business. Some of the members feel that the country is not greatly in need of more laws and we are inclined to believe that there is some foundation for their attitude. Certainly there is little enthusiasm for the kind of legislation some Washington luminaries would fasten on the railroads.

Apparently no startlingly constructive action is to be expected from Congress. On the other hand, it does not seem probable that any faction is strong enough to pass undesirable bills over the President's veto.

As to the Administration it will certainly do all in its power to keep business going at a steady pace. A presidential campaign will soon open and Mr. Coolidge will undoubtedly be a candidate.

When it comes to general business prospects forecasters disagree, but those in whom most credence can be placed do not look for any serious or immediate recession. In the machine shop field indications are favorable. The railroads will have some money to spend on shop equipment. Automobile plants are planning for large production schedules. Electrical machinery manufacturers are very busy. Industrial buildings contracted for should require many machines when they are ready for occupancy.

Conditions abroad are not all they might be in some countries but on the whole are much nearer to stability than they were a year ago. Japan, the latest victim of calamity, is working courageously to rebuild her shattered cities and plants and may be looked to for machinery business. England seems at last to be emerging from her long depression. France is busy on account of her depreciated currency. Germany shows signs of returning sanity. Russia does not.

At present no serious labor troubles are in sight unless there is a flare-up in the bituminous coal fields in the spring. There is little unemployment and the principal problem seems to be to work out a progressive and practicable immigration program.

So much for our guess concerning 1924 business. As always, the *American Machinist* will endeavor to give its readers an accurate picture of developments in their industry and to offer constructive suggestions.

Hit or Miss Tool Grinding

WHILE MANY may not be willing to admit that there is necessarily one best way for doing all jobs, few will deny that some cutting angles must be better than others, at least for the same shop conditions. And yet we frequently see almost identical work being done, sometimes in the same shop, with cutting tools which differ widely in shape, rake and clearance.

It is to be regretted that we do not know more about cutting tools. But it is very evident that top rakes of two degrees and eighteen degrees cannot both be best for the same job. Nor should it take long to discover which top rake gives better average results on the work in hand. And having found a top rake which gives good average results, the logical step would be to make this standard until later experience discovers one which is better.

Standard tool grinding, however, seems to be one of the most difficult of all shop improvements to put across. It is many years since good tool grinding machines became available and yet it is the exception rather than the rule to find standard lathe and planer tools issued from the tool room. The individual grinding of tools still holds in a great majority of shops.

Opposition to such a change is understandable and inevitable and in too many cases it is left to the discretion of the foreman of different departments. Such a method, however, reflects directly on the shop management and the responsibility must rest at the top, where it belongs.

Failure to standardize cutting tools reveals either a lack of appreciation of its importance or of inability to sell the idea to the foremen and to the men. Arbitrary edicts and methods usually fail in such cases. But a skillful manager can sell the idea to his men by making them see that it not only relieves them of the work, but enables them to increase their production and earnings.

A little diplomacy, especially when the management has already established a reputation for fair dealing, will remove the difficulties in making the change. And it is a change which will benefit all concerned.

Melting Pot or Dumping Ground?

ONE of the suggestions emerging from the discussions on immigration policies is that the quotas be fixed and the contract labor law repealed. The selection of immigrants then would be made largely by employers.

When contracting in a foreign country for labor, employers would be bound to invest appreciable sums in passage and expense money, and would choose their risks carefully. It seems clear that they would select the labor best equipped in knowledge, skill and health.

The plan suggested appears to be a simple solution of a serious problem, although it would require legislation and supervision. But so will any other satisfactory arrangement and this one seems to be pointed toward continuing America as a melting pot, but limiting its scope as a dumping ground.

Shop Equipment News

Fellows Full-Automatic Gear Grinder

A full-automatic involute gear grinder with some unusual features of design and operation is a recent product of the Fellows Gear Shaper Co., Springfield, Vt. The company has developed several types of involute grinders during the past 22 years and the machine illustrated in Fig. 1 is the cumulative result of this experience. All of the features found necessary for the production of accurate involutes are incorporated.

The grinder itself is used in conjunction with accurate reference gages and an involute testing instrument, so that the machine is one part of a complete system for the production of accurate involute tooth profiles. The basis for this procedure lies in the fact that standards of known accuracy must be established and means devised for keeping the work within the limits of these standards. This means the use of reference gages for every size of gear it is desired to grind, and measuring instruments of sufficient delicacy to detect the most minute errors in the finished product.

The grinding machine consists of two sections, one right-hand and one left-hand, as shown in Fig. 1, and is entirely automatic in operation. After setting up the machine it is only necessary for the operator to locate and clamp the gear on the work spindle and then pull a lever. The machine automatically takes care of the rolling action of the gear against the flat surface of the grinding wheel, indexes for each tooth, trues the flat face of the grinding wheel, and stops when the gear is completed. One, two or more cuts can be taken, provision being made to take care of this automatically.

All operating levers are located at the front of the machine and the base is made square, so that the machines can be set end to end with the maximum economy of floor space. The entire gear box and working members are automatically lubricated. Fig. 2 gives a rear view of the left-hand section of the machine.

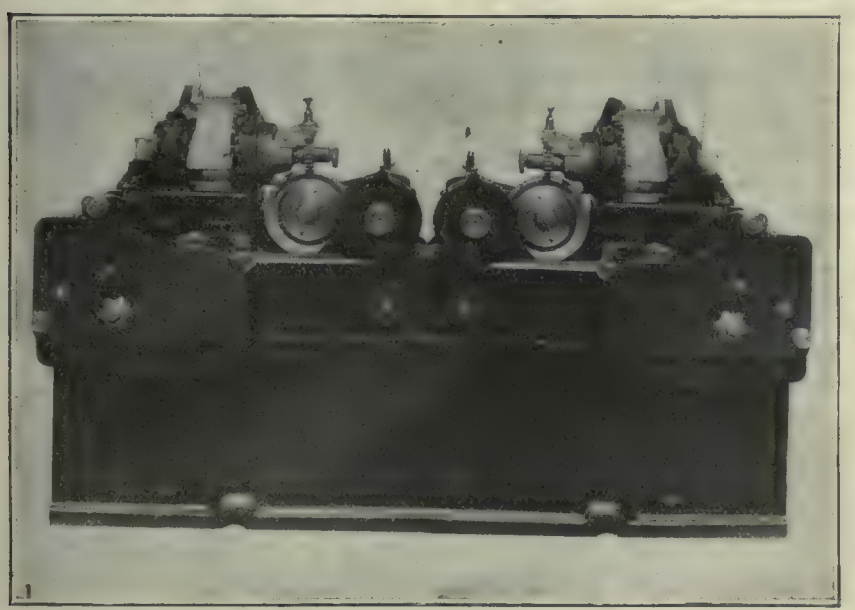
Reduced to its simplest elements, it will be noted that the machine consists of a base, carrying a grinding wheel head which is adjustable for different gear diameters, and a slide upon which is mounted a member known as the "rolling head." The rolling action of this head is controlled by a master involute tooth.

The rolling head is light in weight, being made from a heat-treated aluminum alloy casting, and is balanced to reduce the flywheel effect to a minimum. It oscillates on ball-bearing trunnions which are mounted on the slide, the latter being moved backward and forward by a barrel cam.

The index mechanism and the index plate are incorporated in the rolling head, and this mechanism is designed and constructed to accomplish the indexing of the work without shock in one-tenth of a second.

A master involute tooth is mounted on the outer end of the rolling head as shown in Fig. 3. This is a long involute gear tooth which contacts with an abutment made in the form of a long, straight-sided rack tooth. The master involute tooth, ground on a special machine, is accurate to within 0.0001 in., and both tooth and abutment are made from alloy steel, selected for good wearing qualities, hardened and ground. It is evident that the rolling contact of the master involute tooth upon its abutment resembles the action of a gear tooth upon a rack, and the proper action of the gear tooth with the rack surface of the grinding wheel is insured.

A fine adjustment for the abutment is provided, controlling the pressure angle of the gear tooth being ground. This adjustment is one of the important features of the machine since it gives control of the



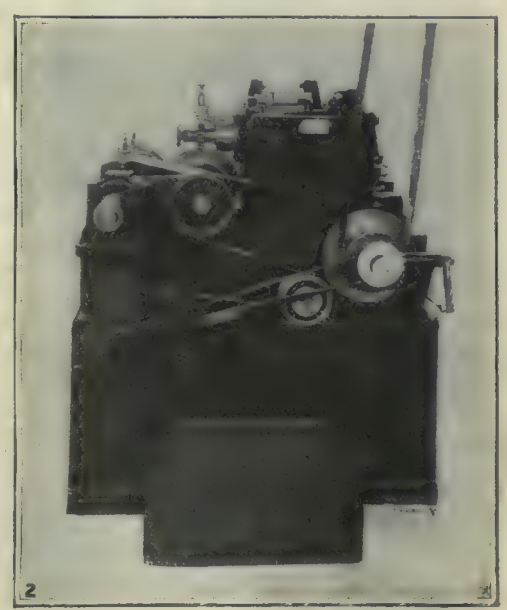


FIG. 1—FELLOWS FULL-AUTOMATIC GEAR GRINDER. FIG. 2—REAR VIEW OF FELLOWS GEAR GRINDER

accuracy of the finished product and brings it within the very close tolerance of the reference gage which has been adopted. In addition, the adjustment provides means for taking up any wear that may occur.

The diagrammatic view of the rolling head and its appurtenances, shown in Fig. 4, gives a clear idea of the action of the master involute tooth and shows also the method used to insure constant pressure of the work against the grinding wheel. Particular attention has been paid to this matter of pressure, since it is impossible to grind a perfect involute with a varying pressure between the work and the wheel, because the relative rolling action will not be positive and an inaccurately shaped tooth will result. A wire cable is fastened to the rolling head and carries at its other end a heavy weight. Removable portions of the weight are provided, so that the desired pressure of the master tooth upon its abutment can be maintained and, accordingly, the pressure between the work and the grinding wheel.

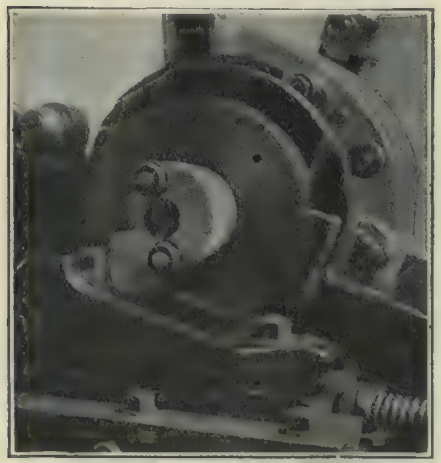


FIG. 3—MASTER INVOLUTE TOOTH ON FELLOWS GRINDER

The grinding wheel used in this machine is unusually small, and it is claimed that the smaller wheel has several advantages. First, the size of the machine is comparatively small and it can therefore be operated at considerable speed; second, an excessively large wheel necessitates a long work arbor with the work not rigidly supported; third, vibration is reduced through the use of lighter parts. It is also stated that greater uniformity of grinding wheel density can be secured in a wheel approximately 10 in. in diameter than is possible in a wheel of larger size.

The small wheel can also be trued faster than a larger one, and the truing device does this automatically. When the amount of dressing required is determined, the machine duplicates the operation, and it can be timed so that the wheel is trued up after the work has made one or more revolutions, as desired.

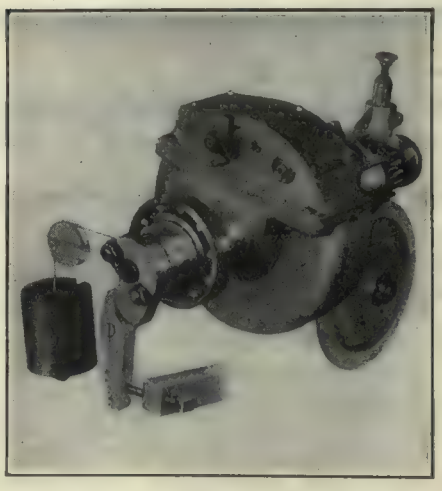


FIG. 4—DIAGRAMMATIC VIEW OF ROLLING HEAD MECHANISM

The machine is made in right- and left-hand sections as previously noted, each section grinding one face of the teeth. The rolling heads are removable and interchangeable in their entirety, so that no inaccuracies can creep in through the changing of arbors, index plates, master forms, etc. To remove the heads it is only necessary to take off the trunnion bearing caps, and the entire rolling head with its auxiliary mechanism can then be easily lifted out and replaced by another complete head.

As a means for checking and comparing the finished work with the established standard, the involute measuring instrument shown in Fig. 5 is used. This device consists of two cylinders representing the base circle of the gear to be measured and, concentric with these cylinders, the gear is mounted on an arbor as shown. The cylinders roll on hardened and ground steel surfaces and, located in exactly the same plane as these surfaces, a jewel contact point bears against the surface of the tooth to be measured.

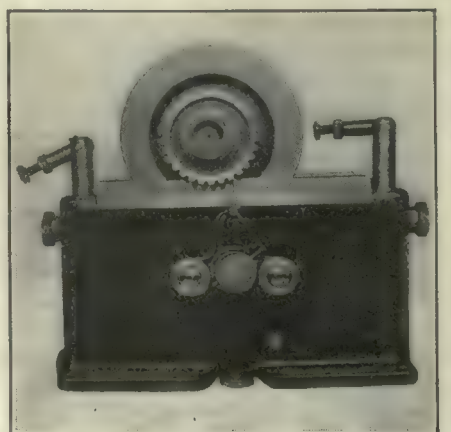
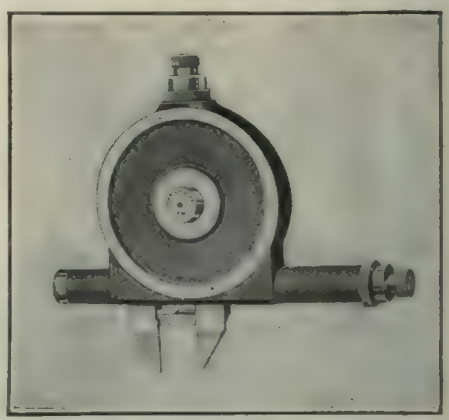


FIG. 5—FELLOWS INVOLUTE MEASURING INSTRUMENT

As the cylinders are rolled along the plane surface, any variation of the tooth curve form a perfect involute is shown by the pointer of the indicator, shown mounted at the front of the apparatus. The indicator shows variations as small as 0.0001 inch.

Zeiss Optical Gear Tooth Micrometer

An optical gear tooth micrometer manufactured by Carl Zeiss, Jena, Germany, is now being marketed in America by George Scherr, 143 Liberty St., New York, N. Y. The instrument is adapted to the direct reading of the chordal thickness of the tooth at the pitch line, and the addendum.



ZEISS OPTICAL GEAR TOOTH MICROMETER

To set the jaws the tool is held close to the eye and two clear scales, engraved on glass, are seen by looking through the small aperature at the center. One of the scales is disposed vertically and the other horizontally in the field.

The scales are moved by turning the micrometer screws until the tooth thickness at the pitch line is indicated on the horizontal scale and the addendum on the other. With the jaws thus set the teeth of a gear can be easily inspected.

The instrument is also useful for checking gear cutters, gages and forming tools. Its range is from 18 to 1½ diametral pitch, and it is graduated to read in thousandths of an inch. It is stated that readings to 0.0001 can be estimated. The weight of the device is about one pound.

Brown & Sharpe No. 34 Gear Hobbing Machine

A machine designed strictly for the single purpose of hobbing plain spur gears, and stripped of all mechanisms, adjustments and attachments that do not contribute directly to that end, is now being marketed by the Brown & Sharpe Mfg. Co., Providence, R. I.

As may be seen from Fig. 1, a front view of the machine, its design follows the general lines of the No. 44 spur and spiral gear hobbing machine, previously described on page 635, Vol. 59, of the *American Machinist*. Because of its limitations, however, it is more compact, more rigid, and its application of power is more direct.

Power is delivered to the machine by belt to the constant-speed, friction-drive pulley, seen in Fig. 2 at the rear of the machine. When the machine is equipped for motor drive, a spur gear is substituted for the pulley and the motor is mounted upon a bracket attached directly to the base.

Variation of the speed of rotation of the hob spindle is effected by means of change gears located on the front of the machine at the right and thus easily accessible. Through these gears the horizontal multi-splined shaft on the back of the machine, seen in Fig. 2, is driven, and this shaft transmits its motion to the hob spindle through worm and bevel gearing located within the housing below the balance wheel. The worm is carried upon separate bearings within the housing and moves lengthwise of the splined shaft as the carriage advances.

The hob carrier or carriage is made somewhat like the carriage of a lathe and is gibbed to ample bearing surfaces machined on the base. It is made in two parts, the upper part carrying the hob spindle and adapted to swivel to any angle up to 10 deg., in one direction only. A vernier, reading to 5 min., facilitates accurate settings. The amount of swivel must correspond to the helix angle of the hob in use and, as it is in but one direction, only right-hand hobs can be used. Because of the limitations in this respect practically all of the complicated spindle-driving mechanism of the helical and universal gear hobbing machine is eliminated, and a strong, direct drive is substituted.

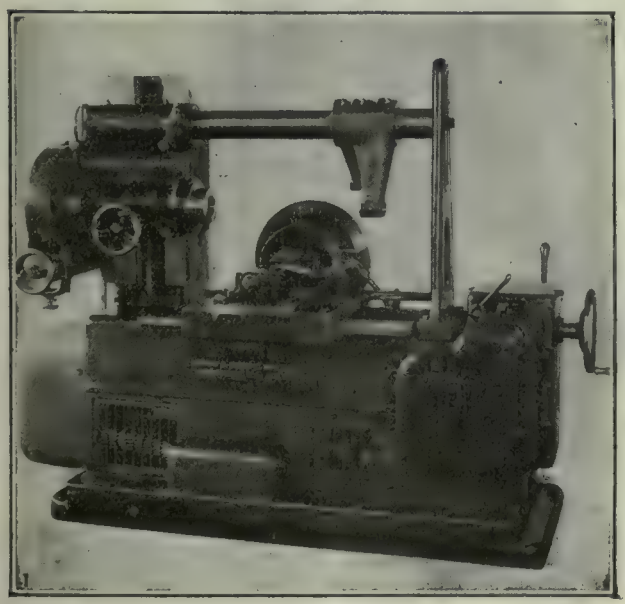
The swivel takes place about the center of a short vertical shaft which transmits the power from the worm upon the splined shaft to the bevel gear that drives the hob spindle. The partial rear view of the machine with the balance wheel removed, Fig. 3, shows the construction. The driven bevel gear is mounted upon an internally splined sleeve running in independent bearings. The hob spindle is located inside the sleeve and is driven by it.

This construction relieves the bevel gears from all deflecting strains that may be caused by possible springing of the hob spindle itself and allows them to perform their functions under conditions of maximum efficiency. It also provides for endwise movement of the hob spindle, in order to bring the hob to bear upon its work in different positions, so that advantage of the whole length of the hob may be taken at each grinding.

The hob spindle rotates in a substantial bearing, the housing of which is integral with the swivelling member of the carrier. This bearing is supplemented by a movable outboard bearing, so designed that the hob is supported on both sides, minimizing any tendency to spring or chatter. A balance wheel of unusual size contributes to the smooth action of the hob.

The work-carrying spindle is mounted in a head gibbed to slide vertically upon the face of a column, and is provided with an elevating screw having a micrometer dial for fine adjustments. The spindle rotates in bronze bearings of ample proportions. The front journal is tapered and the rear end of the spindle is fitted with a compensating device by means of which adjustment may be made for wear without disturbing the alignment of the index wheel. The spindle has a through hole $2\frac{1}{2}$ in. in diameter and the front end is made to take a No. 16 B & S taper shank. The spindle nose is fitted to receive faceplate or fixtures. A rigid overarm and brace furnish an outboard support for the work when it is carried upon an arbor.

The index wheel is a cast iron worm gear, hobbed in place upon its own spindle. It is driven by a hardened and ground steel worm mounted upon a sleeve at the bottom of an enclosing case, where it runs in oil. The mounting is so arranged that



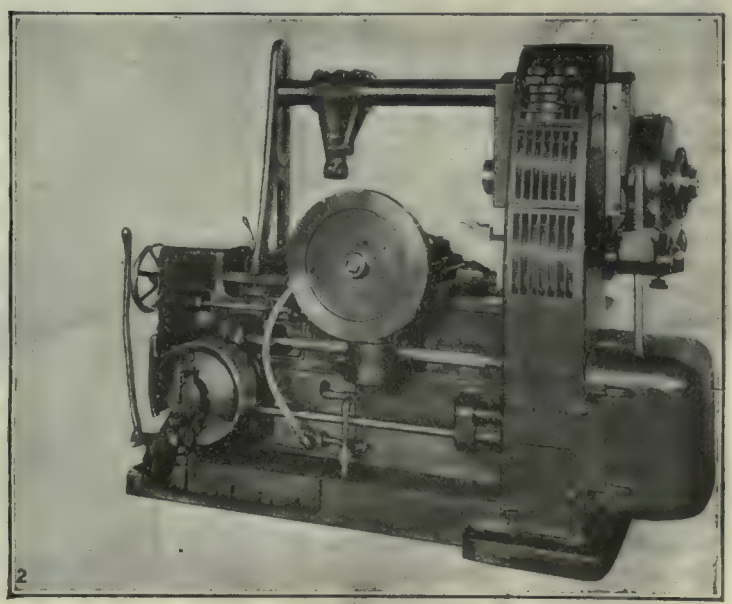


FIG. 1—BROWN & SHARPE NO. 34 SPUR GEAR HOBBING MACHINE. FIG. 2—REAR VIEW OF MACHINE

the worm may be dropped out of engagement with the wheel and the spindle turned rapidly by hand. The sleeve may also be disengaged from its shaft and the worm rotated by means of a small handwheel at the front of the machine.

The splined shaft at the rear of

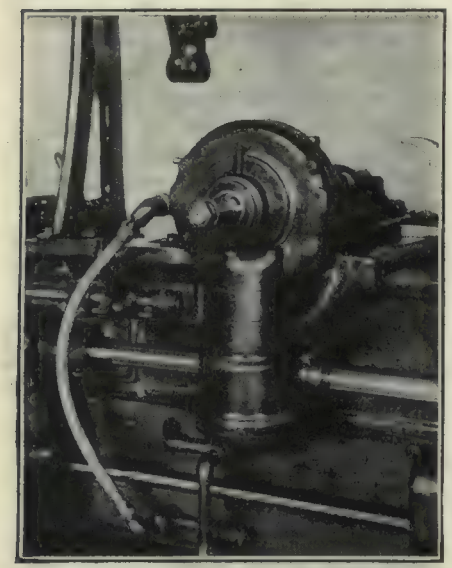


FIG. 3—HOB DRIVE CASING ON BROWN & SHARPE MACHINE

the machine extends through to the indexing end of the machine and there drives a small pinion. This pinion drives the worm of the index wheel, a change gear train providing means for varying the relative rate of rotation between the hob and work carrying spindles, in accordance with the characteristics of the gear being cut by the machine. A hinged case also covers this train when the machine is in service.

From one of the members of the above-mentioned train of gears a shaft extends to the opposite end of the machine and, through bevel gears and a transverse shaft, enters the gear box at that end of the base. A wormwheel in the gear box revolves freely upon the feed screw, but may be positively engaged by means of a clutch. It is driven by a worm that derives its motion from the last member of the feed change train.

A spur gear, also located in the gear box, is driven from the first shaft of the machine and rotates continuously, whether any other part of the machine is running or not. It turns freely upon the feed screw also, and may be engaged by a reverse movement of the clutch lever just mentioned. When so engaged the feed screw is rotated rapidly backward for the purpose of withdrawing the hob carrier, and the speed of withdrawal is constant, regardless of gear combinations. The feed screw may at any time be moved in either direction by means of the hand wheel upon its outer end.

From the same original shaft is driven an oil pump which delivers lubricant to the various bearings of the gear box. Cutting compound is delivered to the cutter by a separate pump from a tank within the base of the machine, and the drive for this pump is such that the pump stops when the hob spindle is idle.

The machine will cut plain spur gears of 4 diametral pitch in steel and 3 diametral pitch in cast iron, up to 18 in. in pitch diameter. Any number of teeth from 6 to 50 may be cut, and any number from 50 to 180 except prime numbers. Hobs up to 5 in. in diameter can be used. A rim rest is provided for use when cutting the larger sizes.

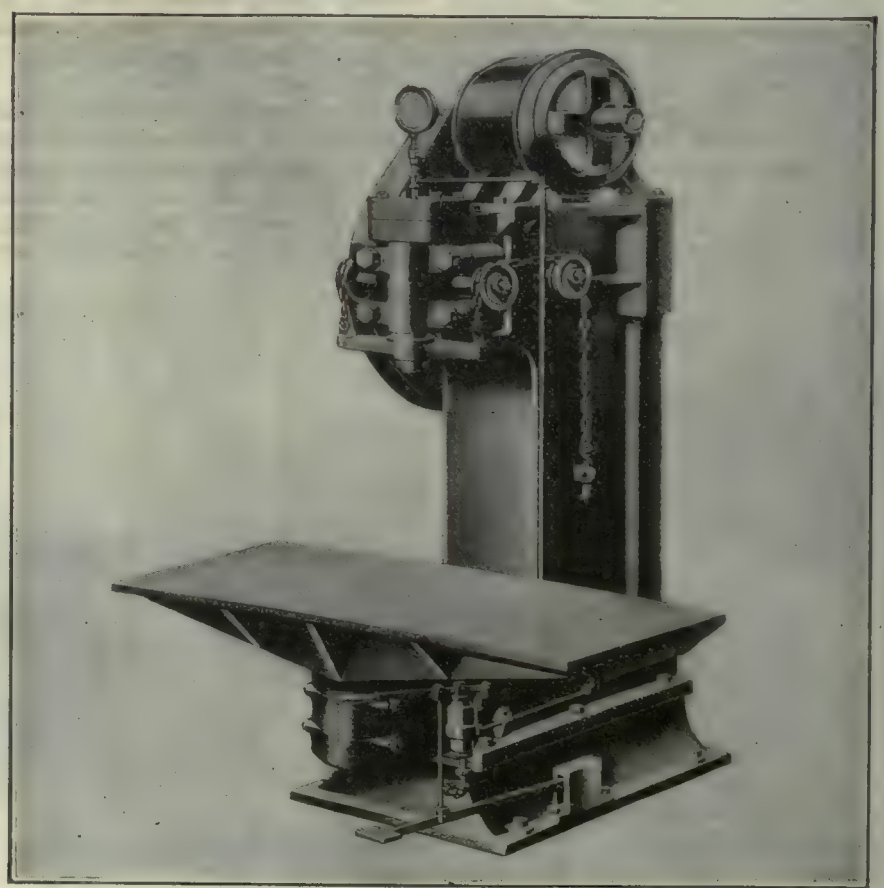
There are 10 speeds available for the hob spindle, ranging from 45 to 165 r.p.m. in geometric progression. Twelve rates of feed may be obtained, ranging from 0.025 in. to 0.153 in. per revolution of the work spindle. The machine occupies a floor space 50x103 in., and weighs approximately 6,000 pounds.

Watson-Stillman Hydraulic Press

The Watson-Stillman Co., 50 Church St., New York, N. Y., is now marketing a rapid-working hydraulic press for use in bending, straightening or forcing operations. Although the press is intended primarily for straightening camshafts, crankshafts and automobile front axles, it can be used for any work requiring pressures within its capacity.

The machine is a self-contained unit, requiring no auxiliary water or power supply, and is driven by a motor like any machine tool. It is quick acting and under absolute control by the operator through a valve, operated either by a hand lever or treadle. Both speed and pressure are controlled.

The pump is so arranged that the movement of the press ram through the idle portion of the stroke is rapid and the change from low to high pressure for the working part of the stroke is effected automatically. The whole table can be removed, leaving an open-jaw forcing press for general shop use in such operations as mandrel forcing,



WATSON-STILLMAN HYDRAULIC PRESS

broaching, force fitting and assembling.

The whole machine is substantially built and all working parts are inclosed by removable dirt guards. The frame is a steel casting and the copper-lined cylinder is bolted and keyed to it. The ram is made of high-carbon steel, and the cast-iron base serves as a reservoir for the pump.

The pump body is of bronze and the plungers are hardened tool steel, packed with hemp under bronze glands. All packings are accessible. The pump valves are of Monel metal and are the metallic-seated type.

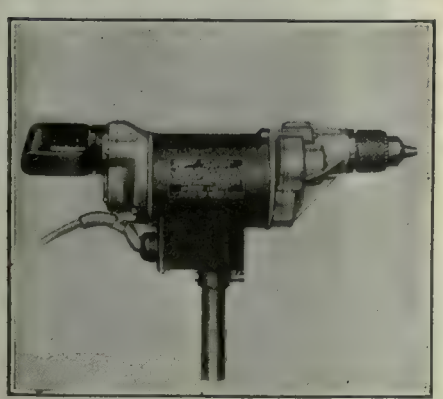
The ram has a positive stop to prevent overtravel and hydraulic pressure is used only for the pressure or downward stroke, the return being accomplished by means of a counterweight located inside the frame.

The press shown in the accompanying illustration is fitted with a slow-speed motor geared through a single reduction to the pump shaft, but a high-speed motor can be furnished with compound gearing. Spring-type centers can be furnished for holding work to be straightened, and these centers are adjustable for different lengths of work and table position.

Hisey 5/16-In. Side-Handle Drill

The Hisey-Wolf Machine Co., Cincinnati, Ohio, has recently placed on the market a side-handle electric drill of $\frac{5}{16}$-in. capacity.

The tool is equipped with a universal electric motor which will operate on 60-cycle alternating current or direct current. Motors to run at either of two speeds, 1,250 or 1,475 r.p.m., can be furnished, the higher speed machine being especially adapted for wood and metal drilling in auto body and car building work.



HISEY $\frac{5}{16}$-IN. SIDE-HANDLE DRILL

The tool is equipped with high-grade ball bearings throughout, and the gears are of steel, accurately machined and heat-treated. All bearings, gears and moving parts in the gear end of the machine are supplied with lubricant from the gear transmission case and the ball bearing on the top head is packed with grease.

The switch is conveniently located in the side handle, and a quick cable connector permits cable repairs and renewals without dismantling the machine. The usual cable and attachment plug are furnished, and a grinding wheel attachment with a $4\frac{1}{2}$-in. wheel can be supplied. The Jacobs chuck will hold straight round shank drills up to $\frac{5}{8}$ in. in diameter, and is standard equipment.

McLeod Sandblast Cabinet

A recent addition to the line of sandblast equipment manufactured by the McLeod Co., Cincinnati, Ohio, consists of an improved cabinet, fitted with a hand-operated revolving work table.

The machine is fitted with an injector type of nozzle to which are attached the air hose and sand hose, the latter being connected to a sand collector at the bottom of the sand hopper. From the collector the sand passes to the nozzle where it is mixed with the air and shot into the work at high speed.



McLEOD SANDBLAST CABINET

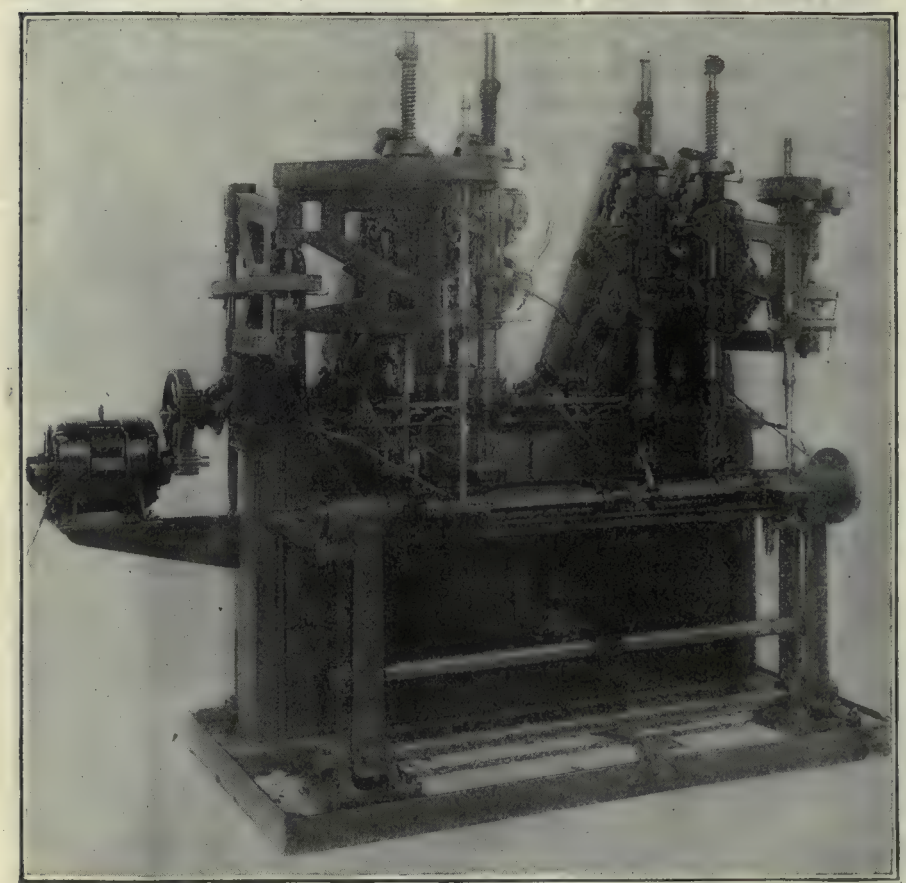
The cabinet is of heavy steel construction supported by angle iron braces. Through the slit rubber curtain, shown in the illustration at the front of the cabinet, the operator directs the nozzle on the work, guiding the work by looking through the screened opening above. The interior of the cabinet is lighted by two electric lamps.

The table is made of cast iron and is slotted, so that the unused sand falls into the hopper below, where it is reclaimed. The dust and spent sand is drawn off through the exhaust pipe at the top of the cabinet in the rear.

In the arrangement shown the castings are put in and taken out through the same opening, but the cabinet can be built with the opening at the other end and with half of the table extending outside. In such an apparatus the halves of the table are filled and cleaned alternately, allowing faster work by two operators.

Barnes Front Axle Drilling and Reaming Machine

The Barnes Drill Co., 814 Chestnut St., Rockford, Ill., has recently built a single-purpose machine for drilling and reaming automobile front axles. The machine consists essentially of a Barnes, 24-in., all-geared, gang drilling machine, previously described on page 466, Vol. 50, of the *American Machinist*, to which has been added a turn-over jig and auxiliary reaming apparatus.



BARNES FRONT AXLE DRILLING AND REAMING MACHINE

The arrangement of the machine is evident from the accompanying illustration. The four standard heads are adjustable laterally and these heads accomplish the drilling operations. Each one of the center pair is fitted with an auxiliary multiple-spindle head, so that the spring pad holes are drilled simultaneously at both ends of the axle. The two outer heads drill the king-pin holes, and all these drilling operations are done at the same time.

For reaming the king-pin holes, two radial heads are added to the machine and carry the reaming spindles. The reaming is done when the axle is in the outside position of the jig and while the drilling on another axle is being accomplished. The reamer goes through the hole in the opposite direction to the drill and, therefore, does not interfere with the drill bushing.

As soon as the reaming is finished the axle is removed and a new forging is clamped in the jig, the reaming and reloading being accomplished during the drilling operation in the opposite position.

The trunnions of the jig are mounted at the top ends of two heavy links, the other ends of the links being pivoted on a shaft near the base of the machine. These links allow the jig to be swung out bodily from the machine so that it will not interfere with the table as it turns over.

The swinging motion is actuated by an air cylinder, located on the machine base. Pressure on a pedal causes the cylinder to swing the jig outward, and after the jig is turned over, the cylinder draws it back again to the working position. It is said that the jig can be indexed in less than 10 seconds.

Quick, lateral adjustment of the jig is provided to bring the bushing guides to the centers of the bosses on the forging. The outer spindles are quickly brought to the centers of the bushings by the movement of a lever at the center of the machine.

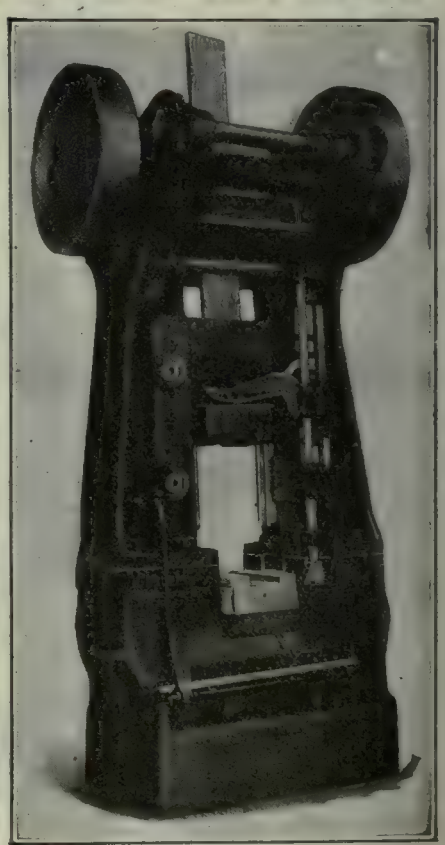
It is stated that these machines effect a doubling of production over the old methods, due to the saving of the reloading and reaming time.

Merrill Improved Board Drop Hammer

An improved design of board drop hammer is now being marketed by Merrill Bros., Maspeth, N. Y. These hammers are built in sizes ranging from 600-lb. to 5,000-lb. falling weight, and the essential features of the machine are shown in the accompanying illustration.

The upright frames are I-section steel castings, keyed and bolted to the top of the base. Four holding bolts are used and, in connection with the lifter construction and the tie rods at the top, tend to prevent any rocking of the uprights on the base. The side thrust from break-down work is taken by the keys and bolts of the fastening for the uprights in such a manner that failure at this point is almost impossible.

A feature of the machine is the



MERRILL IMPROVED BOARD DROP HAMMER

use of adjustable and reversible ram guides, fitted to the upright frames, and besides being reversible the guides have double Vs. The guide adjustment is simple and positive, and the guides can be dropped back into the uprights to allow the removal of the ram. By adjusting both the bottom and top guide wedges, the face of the ram can be squared up with the face of the shoe. When removed, the guides can be planed with comparative ease as they are but 5 ft. long on the largest hammers.

In the improved lifter mechanism, the arrangement of sliding boxes previously used is continued. To maintain the parallelism of the rolls, a compensating eccentric in one of the eccentric sleeves is provided, and the simple adjustment can be accomplished without removing any lifter parts. The hammer can be quickly adjusted to accommodate a very thick or very thin lifting board by changing the roll eccentric bushing.

The eccentric construction is such that when the friction bar falls, the rolls are practically locked, and this arrangement permits the use of a light friction bar, rolls the board more nearly straight, and prevents excessive wear near the pick-up point. The friction bar is made straight, with an eye at the upper end for attachment to the eccentric lever.

The roll releasing lever lifts the friction bar to its seat without shock or jar and permits as high speed as the lifting board will stand. The adjustment for length of stroke can be conveniently adjusted by the operator.

The clamp for holding the ram suspended is positively and easily operated by means of a special treadle. The clamps are placed under the rolls and are full-floating to conform to the position of the board. The complete clamp assembly can be removed without disturbing any parts of the lifter.

A simple and positive device has been provided to lock the treadle unless the operator places the foot upon a pad about 6 in. square. Unless a person is on the tripping pad, he can stand upon the treadle without tripping the ram. The pad can be adjusted to suit the operator, or can be entirely removed if it is desired to operate the machine in the usual way without taking advantage of the safety feature.

An adjustment for the die from front to back is accomplished by means of a taper insert in the shoe opposite the die key. This adjustment is positive and the die cannot get loose without the die keys coming out.

Garvin 3-Spindle Duplex Horizontal Drilling Machine

A recent addition to the line of machine tools manufactured by the Garvin Machine Co., Spring and Varick Sts., New York, N. Y., consists of a No. 1-S special 3-spindle, duplex, horizontal drilling machine. A front view of the machine is shown in the accompanying illustration, and it is designed for drilling, boring and reaming automobile steering knuckles.

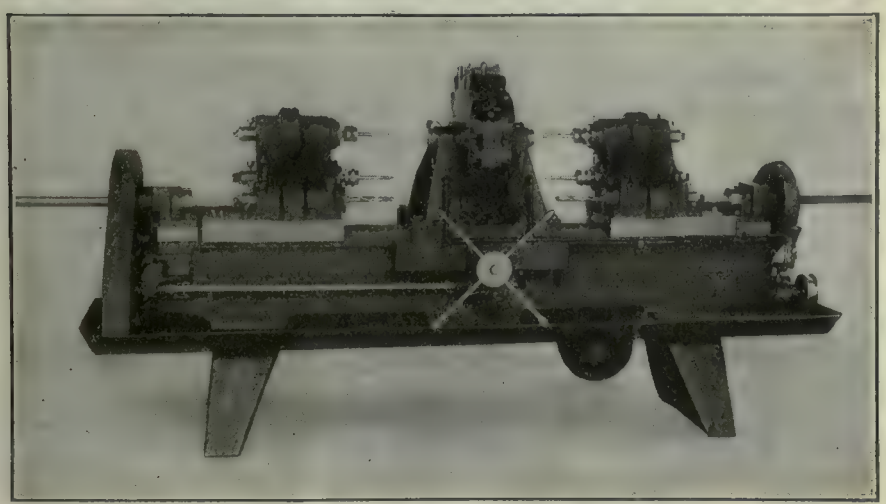
Two heads are arranged to slide longitudinally on the bed of the machine and each head carries three spindles. The work is held in a squirrel-cage fixture at the center and is indexed after each operation.

By means of the three spindles operations on three pieces are accomplished simultaneously. A ¾-in. hole is drilled in one, this hole is bored to 31/32 in. in diameter on the next, and finish reaming to ⅞ in. in diameter is done on the third.

The heads feed toward the work automatically, but are returned by the hand-operated pilot wheel at the front of the machine. The feed is thrown in as soon as the fixture is indexed, and it is said that the machine will finish one steering knuckle every 40 seconds.

Each head is driven independently by a 7½-hp. motor mounted on the machine at the rear. The power is transmitted through spur gears to the main driving shaft in the heads and all gears are protected by suitable guards. The work is flooded with cutting lubricant from a pump located at the right-hand end of the machine.

With the exception of the three-spindle heads and the squirrel-cage fixture, the machine is a standard product of the company, the addition of these parts making a high-production, single-purpose machine.



GARVIN 3-SPINDLE DUPLEX HORIZONTAL DRILLING MACHINE

Economy Cutters

The Economy Products Co., 50 Spring St., Newark, N. J., has recently placed on the market a line of high-speed steel cutters, especially adapted for cutting keyways, slots and oil grooves, facing, die slotting, the machining of flat-bottomed holes, and similar operations.



ECONOMY CUTTERS

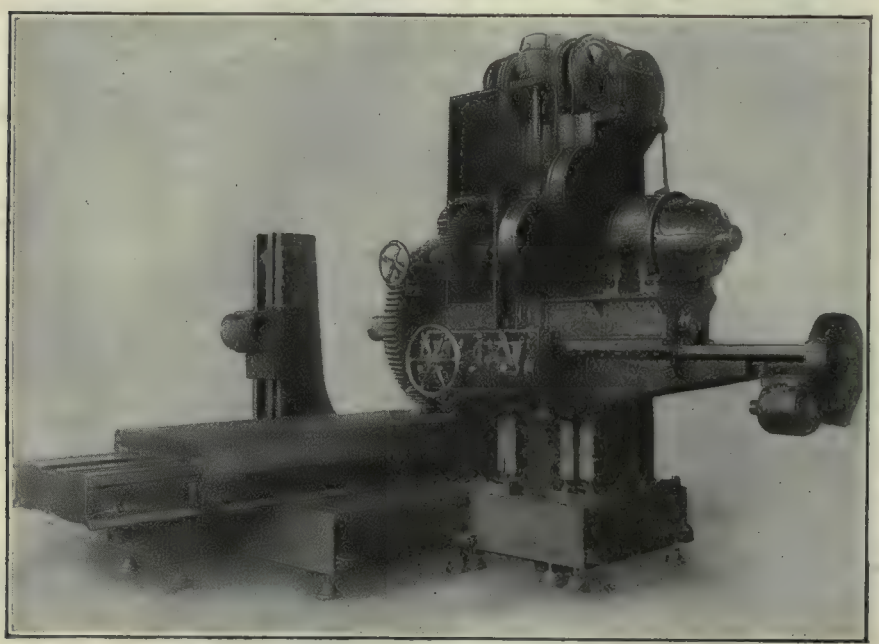
The feature of these cutters is the arrangement of the cutting edges as shown in the accompanying illustration. Two cutting edges are provided and the sharpening of the tool

is comparatively simple. Repeated grinding will not affect the diameter of the cutter. It is claimed that the design of the cutting teeth gives exceptionally free cutting action without in any manner imparing the accuracy of the surface produced.

These cutters are manufactured with straight shanks in diameters from ⅛ to ½ in. inclusive, and with taper shanks, from ⅝ to 1½ in. in diameter.

Beaman & Smith Horizontal Boring Machine

The machine shown in the accompanying illustration is now being marketed by the Beaman & Smith Co., Providence, R. I., and is adapted for drilling, boring, tapping and milling operations. It is a floor-type, horizontal-spindle machine and is built in five spindle sizes of which the largest is illustrated. The spindle diameters for the various sizes are 3, 3½, 4, 5, 6½ and 8 inches.



BEAMAN & SMITH HORIZONTAL BORING MACHINE

The outstanding features of the machine are the centralized control for all speeds, feeds and adjustments, and the mounting of the spindle-driving mechanism on the head. This latter arrangement reduces the torsional strain on the parts to a minimum, and applies the power comparatively close to the cutting points.

The feeding length of the 8-in. spindle is 4 ft., and the movement is accomplished in either direction by both hand and power. Rapid power traverse is also provided for quick adjustment. Eight feeds are available, ranging from 0.006 to 0.272 in. per revolution of spindle, in geometrical progression.

Ball bearings support the spindle end thrust, and wear adjustment is made by taper bronze boxes in each end of the quill. The quill is also mounted in taper bearings and carries the large driving gear. This cast-steel gear has a pitch diameter of 4 ft., and the teeth are 2 pitch.

This gear is driven from a motor mounted on the head, through gearing which gives a geometrical series of speeds for the spindle from 1¼ to 80 r.p.m. The position of the motor on the head permits the use of short shafts in the drive, with the attendant decrease in torsional strain.

The saddle is mounted on the column and is arranged to slide vertically on carefully machined ways. In addition to the binding bolts on the gibs, bolts are also provided for locking the saddle to the upright when heavy work is being done. The head is counterweighted, the weights being attached by wire cables running over pulleys at the top of the column.

The saddle has a length of travel of 44 in. on the column, and both hand and power feed, together with rapid power traverse, are provided. The power feed equipment for the saddle is furnished for milling operations.

The work table is 4 ft. wide and 10½ ft. long. It is provided with rapid power traverse and hand adjustment, and milling feeds can be furnished, if desired. The mechanism is mounted in ball bearings, so that the table is easily moved by hand, and the compactness of the apparatus allows the use of short shafts.

The bed for supporting the table is nearly twice as long as the table itself and is arranged to be adjusted along the platen by hand. A fine power adjustment can also be provided. This movement of the bed on the platen is provided for the purpose of bringing the work close to milling cutters or facing arms attached to the faceplate gear.

The outer support has adjustments to correspond to the spindle. Scales are placed in the column and on the table for alignment, and micrometer dials are provided for fine adjustments. The maximum distance between the faceplate gear and the outer support is 9 ft.

There are four motors on the machine; one for raising and lowering the head; one for driving the spindle; another for the quick power traverse of the spindle; and a fourth for operating the table.

Combination Taper Twist Drill-Reamer

A taper drill-reamer of unusual design has recently been placed on the market by the A. C. Bellefleur

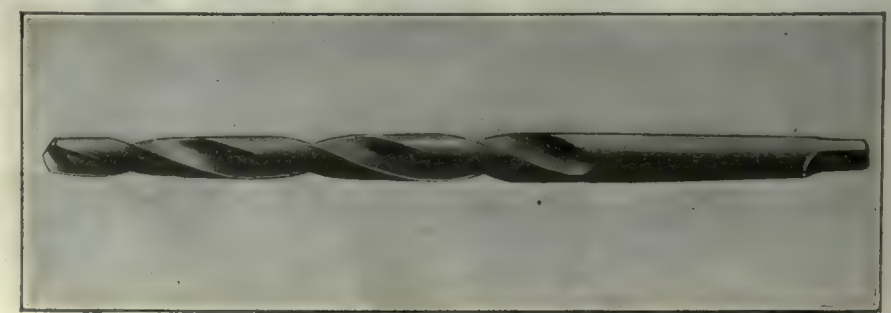


FIG. 1—COMBINATION TAPER TWIST DRILL-REAMER

& Son Co., 81 Hamilton St., New London, Conn.

The tool is designed to drill and ream taper holes in solid material and is illustrated in Fig. 1. As shown in Fig. 2 one edge of each flute of the tool is provided with cutting teeth which cut the taper and ream the hole. It is claimed that taper holes can be produced in the same manner that straight holes are made with an ordinary drill.

The standard taper is ¼ in. per ft., and both taper and straight shanks can be furnished. The maximum diameters of the tools range from 0.103 to 0.755 in. Special tapers, sizes and lengths can be furnished.

The advantage claimed for this drill-reamer is the saving of time by its use, one operation completing the drilling and reaming of a taper hole, while three are required when using the ordinary straight drill and reamer.

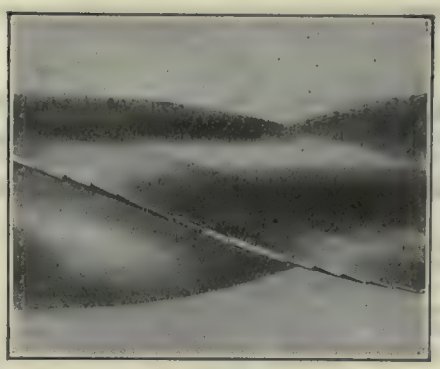
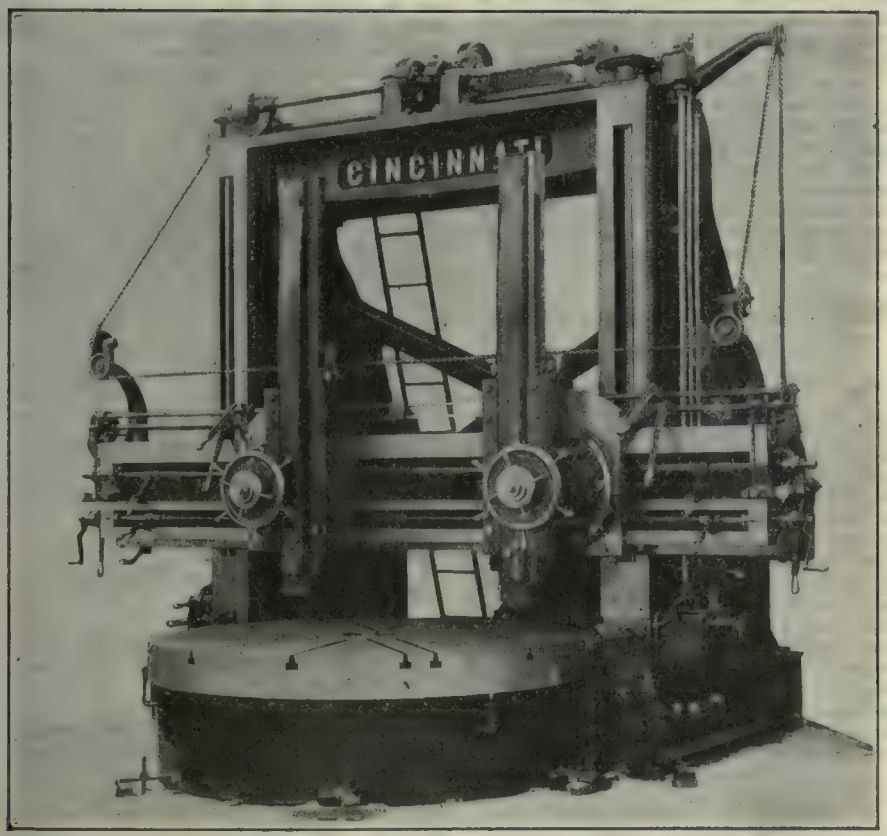


FIG. 2—CLOSE VIEW OF TOOL SHOWING REAMING TEETH

Cincinnati 8-Ft. Boring Mill

A recent product of the Cincinnati Planer Co., Cincinnati, Ohio, is a special 8-ft., massive, boring mill, in which many improvements in design have been incorporated.



CINCINNATI 8-FT. BORING MILL

A large bevel gear is bolted to the table and is driven by a pinion. The pinion is supported on both sides and is a separate unit from the gear box. The upper spindle bearing is made adjustable in order to compensate for wear.

The drive gear box provides four speed changes when a variable speed motor is used, a box which will give nine speeds being furnished when a constant speed motor is installed. All the gears are made of steel, the shafts are of high-carbon steel, and the bearings are bushed with bronze.

The motor is mounted on top of the gear box and is geared to the drive shaft. The speed change levers for changing the speed of the table are conveniently located at the side of the operator.

The housings, which are exceptionally high, are bolted to the base extensions. In addition they are doweled and tongued into the base at the bottom, and tied together at the top by a heavy box-section arch. This construction tends to eliminate vibration and a cross-brace is also used to add to the firmness of the housings.

The heads are of a special design. The handle wheels are equipped with a hand feed and lock, so that the operator can feed and lock without undue exertion. The rams are of extra length and the feeding racks are of steel and bolted to the rams. This construction allows replacement of the racks.

The feed and rapid traverse are controlled from the side of the head so that the control levers are within reach when using the head in the center of the table. Sensitive handles are provided to allow setting of tools.

The feeds are obtained through a gear box in which all gears are of steel. Eight feeds are available and the box has a vertical tumbler arrangement which automatically locks itself when placed in a correct position. The matter of centralized control has received particular attention, and the design of the machine is such that the operator can conveniently reach all the levers required to control any operation.

The rail is raised and lowered by an elevating device which is driven by positive clutches, and in which is a friction clutch incorporated for safety. When the rail is raised beyond its maximum height, an automatic stop automatically throws out the clutch.

Copy of Patent Laws for Japan

Through arrangements with the Secretary of the Interior, a complete set of the Official Gazettes of the Patent Office containing all patents issued by the United States Government will be furnished to Japan.

Destruction of a magnificent new Patent Office completed by the Japanese government in January, 1923, by the earthquake with the loss of all the files of patents issued by foreign governments, including the United States, led to a request for a new set of records by the Japanese Ambassador at Washington.

The plans of the Japanese government provide for the immediate construction and operation of a new Patent Office.

News Section

Architects Approve Brown Plan

The American Institute of Architects, it is announced, will join with the Federated American Engineering Societies and other allied organizations in a nationwide movement to bring about the reorganization of the Department of the Interior as provided in the Brown Plan, which was approved by the late President Harding.

Milton B. Medary, Jr., of Philadelphia and Thomas R. Kimball of Omaha have been appointed to represent the Institute at the Public Works Conference to be held under the auspices of the Engineering Federation in Washington on Jan. 9. The question of public works was described as one of the most vital before the Institute, which took a leading part in the effort started several years ago to eliminate waste in the Federal Government through reorganizing departments and bureaus. More than 200 organizations, including representation from contractors, will send delegates to the Washington conference.

The plan supported by the Institute and the engineering societies carries out to a greater or less extent the recommendations previously made by these bodies. Practically all the construction work now scattered through some thirty or more departments and bureaus is to be combined in a new bureau of Public Works under the Interior Department.

If this plan is approved by Congress, the work of the Supervising Architect's office will be transferred to the Interior Department and come under the Division of Public Works.

Gives Information on Apprenticeship

An encyclopedia of information on the subject of apprenticeship in the United States is now available in the Bulletin on Apprentice Education that has just been issued by the Federal Board for Vocational Education.

New methods of apprentice training have been made necessary by the introduction of large scale production in industry, the Bulletin shows. During the last fifteen years, we have witnessed the development of the class room method of apprentice education to supplement job experience. Such education has arisen, either in the form of vocational training in the public schools, or through corporation schools under the auspices of employers, or through classes controlled by the trade unions.

The most surprising progress has been made along the lines of part-time apprentice training classes organized by the public schools, according to the Bulletin. Such training dates from the passage of the Federal Vocational Education Act in 1917. At the close of the fiscal year 1921-22, a total of 265,494 pupils were enrolled in such continuation classes. The Bulletin believes that the public school is destined to fill a rôle of increasing importance in apprentice education, since it supplies a neutral training agency, acceptable to both capital and labor.

Three S.A.E. Events in January

The Society of Automotive Engineers is calling attention to the three big events that it will hold during January. Contrary to the custom of previous years, the annual meeting of the society will not be held in New York City during automobile show week, but in Detroit, Jan. 22 to 25, during the Detroit show week. Detroit is described as the geographical center of the society membership and the heart of the automotive industry. On Jan. 23 will be the S.A.E. Carnival which promises to be unique, extraordinary, unusual and several other things. It will be held in Detroit.

The annual dinner of the society will be held as usual in New York City during automobile show week. The Hotel Astor has been chosen and Jan. 10 is the date that has been decided upon. The society urges all members to secure reservations as soon as possible so that there may be no annoyances or difficulties at the last moment.

Slight Decrease Shown in Employment

The Department of Labor reports that an analysis of industrial employment conditions in United States, based on information gathered in 65 industrial centers from 1,428 firms, each usually employing 500 or more workers, for the month ending Nov. 30, 1923, showed a small reduction in total numbers employed, amounting to 0.5, or one-half of 1 per cent of the total number employed by these firms on Oct. 31. Two of the outstanding factors responsible for this decrease were temporary curtailment of employment in practically all large railroad centers during the month of November, and the suspension for a short period of activities in iron and steel.

Burgess Nomination Is Approved

The presidential nomination of George K. Burgess to be director of the Bureau of Standards was confirmed by the Senate on Dec. 18. The Senate also confirmed the nomination of C. L'H. Ruggles to be assistant to the Chief of Ordnance with the rank of Brigadier General and of John W. Joyes to be assistant to the Chief of Ordnance with the rank of Brigadier General, and of Samuel McRoberts and John R. Delafield to be Brigadier Generals O.R.C.

Industrial Museum Meeting Held

A meeting of the organizing committee of the National Museum of Engineering and Industry was held in the council room of the A.S.M.E. in New York City on Dec. 20 with an excellent attendance. Acting Secretary H. F. J. Porter presided.

The active work looking toward the formation of this museum had its beginning in 1918 in the efforts of the Delameter Iron Works Veterans, the Marine Architects and Naval Engineers, and the Society of Swedish Engineers who later honored John Ericsson by erecting four tablets at various parts in New York and Brooklyn as was chronicled at the time.

It is expected that the four large engineering societies will endorse the movement in the near future. Funds are in sight for the establishment of such a museum with branches in all important industrial cities.

Committees were appointed on organization and plan, publicity, finance and membership. Among those suggested for the various committees are: Organization and Plan—E. M. Herr, Thomas W. Lamont, Robert W. de Forrest, Gerard Swope, Frank A. Waldron, J. E. Sague, Willis E. Hall, L. C. Marburg and E. S. Matthews. Publicity—George Iles, W. W. Macon, Fred H. Colvin, Henry G. Leach, A. A. Hopkins, James Creese, Prof. Holland Thompson and Luis Jackson. Finance—Mortimer L. Schiff, Julius Rosenwald, George E. Roberts, Edward N. Hurley, Irving T. Bush, Owen D. Young, W. R. Warner and George D. Pratt. Membership—Charles Piez, Howard Elliott, D. S. Simpson, A. J. Poole, George F. Kunz, Bion J. Arnold, George I. Lockwood, Samuel Vauclain and W. W. Atterbury.

The Machinery Market in Italy

Recent changes in the exchange situation in Europe have had important influences on the machinery market in Italy, according to a report dated Nov. 3, from H. R. MacLean, Commercial Attaché, Rome. The collapse of the mark and other difficulties surrounding the German machinery manufacturers have caused the Germans to submit their quotations in the Italian market in United States dollars or British pounds sterling, with the result that German prices are now above the Italian level, and Italian machinery manufacturers have thus secured an increased volume of business.

American machine-tool manufacturers still find business difficult because of competition from Italian and other manufacturers. At present Swedish prices appear to be particularly low, production costs in that country being light.

Detroit Preparing for Coming Year

With the holiday season at hand, Detroit's manufacturing plants are going through their annual counting up of assets preparatory to beginning the year 1924 with capacity production.

Leaders in the machine tool industry declare that the outlook for the next year is brighter than they have known in some time. This year is pointed to as being the closest approximation to a normal year that the industry has experienced in some time. The immediate pre-war years, the war years, and those following were featured by periodic rises and falls, with abnormal conditions that mitigated against the chance for a normal business.

Reviews of this year are based upon the fact that 1923 was a normal year, and forecasts presume that 1924 will be another such year.

The automobile plants are counting up their assets, now of record total, and their executives are casting an interested and confident eye toward 1924 and the national automobile shows, the first of which opens in New York on Jan. 5.

Surprising are the employment figures for the week as announced by the Detroit Employers' Association. The figures show 219,155 employed this week, an increase of 2,025 over the 217,130 of last week. Employers point to these figures as furnishing sufficient indication of what may be expected with the beginning of 1924.

Changes in executive personnel throughout the automobile industry during the last six weeks provide an additional ground for the assertion that "keen competition" will be felt 100 per cent next year. Executives are attempting to bolster up their departments wherever possible in order to meet the competition from other producers in the same price fields.

The general belief that consolidations of motor companies are inevitable is leading to strenuous efforts on the part of every manufacturer to be in a strategic position if such consolidations take place.

Building statistics continue to break all records, and with important announcements of other factory additions ready to be made within the near future.

Overland Production Increased

Willys-Overland plans to produce $250,000,000 worth of automobiles during 1924. President John N. Willys announced that, according to contracts already on file with practically all of the Willys-Overland branches, distributors and dealers throughout the world, Willys-Overland production will have to exceed 300,000 cars to take care of the apparent demand.

As the initial step toward the fulfillment of these orders, Mr. Willys has further announced a curtailment of the annual inventory period, which began Dec. 17. In previous years this work has always taken until after the holidays, but this year instructions have been issued that the work must be speeded up so that the wheels of production will be turning again by Jan. 1.

During 1923 Willys-Overland's production amounted to more than 200,000 cars, doubling last year's output. With the 1924 demand anticipated, Mr. Willys has been in constant conference with the factory organization regarding plans that will permit a resumption of activities following the curtailed inventory period on a much greater scale than ever attempted previously.

News of Washington Activities

By Paul Wooton

With the approach of the first of the year, attention in the coal industry is turning to the new wage agreement. While the United Mine Workers have had little to say as to what demands they will make, it is very apparent that they are not particularly belligerent. With 76,000,000 tons of coal above ground; with 10,000,000 tons more at the head of the lakes than in any other year and with half the union mines down thus early in the Winter, there is certain to be less insistence on increased operating expenditures. Such expenditures could do nothing more than close the mines and divert further business to the non-union fields.

There is a tendency to compare the existing situation with that which preceded the last strike. There are some resemblances but, in the main, the situation is importantly different. The inclination of the market is in the same direction, but it has not gone so far. The state of general business is much better. Between 10,000,000 and 11,000,000 tons of coal are being produced weekly, whereas production during the corresponding period preceding the last strike was running some 3,000,000 tons lower. Relations between operators and mine workers are nothing like as strained as they were then. There is not the same tendency to cut wages in the non-union field.

While the demands of the mine workers cannot be forecasted, it is apparent that the differences which will arise at the forthcoming wage conference will not be of the same pronounced character as were those preceding the present agreement. The consensus of opinion is that there will be no strike and that the conferences will not be the occasion for any great amount of uncertainty among coal consumers.

Japanese Orders

Orders aggregating $200,000,000 have been placed in this country by the Japanese since the earthquake. The great bulk of all orders placed by Japan has come to the United States. While a portion of this business reflects Japan's appreciation for the aid extended by this country at the time of the disaster, it is thought to have been influenced mainly by the willingness of American manufacturers to quote pre-disaster prices. In other countries bids reflected the sharp advance in materials which came with the anticipation of the Japanese demand.

Despite the large orders that have come to this country, it is recognized that no permanent value grows out of destruction. The effect of the Japanese earthquake will be felt over a long period in its having reduced the consuming power of the people of that Empire.

American Trucks Favored in Japan

The recent disaster in Tokyo and Yokohama has resulted in a marked stimulation of business in automobiles, especially trucks, according to Commercial Attaché, J. F. Abbott, who is at present on leave in this country. American manufacturers, however, should not build their hopes too high on the initial orders that have been received. The Japanese are inveterate speculators, and the suspension of the duty on trucks until April has naturally led to an attempt to stock up. On the other hand, the experience of the past few years with the lighter European cars has convinced the Japanese consumer of the ultimate economy and superiority of American cars, and the market is bound to expand steadily. It is limited not only by the very poor character of rural highways, which restricts trucking at present to the large cities, very few in number, but as well by the very high operating cost of trucks that still permits effective competition on the part of handcarts.

Gain Shown in Week's Car Loading

Loadings of revenue freight for the week ended Dec. 8 totaled 913,774 cars, an increase of 4,600 cars over the corresponding week of 1922, according to the figures of the American Railway Association. This also was an increase of 78,478 cars over the previous week, when there was a sharp decline, due to the Thanksgiving holiday.

The Western district again led with an increase of 5⅝ per cent over the corresponding week of last year, while the Eastern district reported a 3 per cent increase and the Southern district 1 per cent.

The loadings of Dec. 8 bring the total for the year to 47,422,760 cars, as compared with 40,797,973 cars in the same period of 1922, and 37,401,923 cars in 1921.

Merchandise and miscellaneous loadings, generally considered the criterion of business conditions throughout the country, showed a decided gain. With a total of 227,038 cars, merchandise shipments were 18,841 greater than in the same week of 1922.

Cost of Living Takes Slight Rise

The cost of living in the United States on Nov. 15, 1923 had increased seven-tenths of one per cent over the level of Oct. 15, 1923 as shown by figures just collected by the National Industrial Conference Board in a comprehensive survey of conditions the country over. The increase since last July was 2.1 per cent. In the month from Oct. 15, 1923 to Nov. 15, 1923, there were increases in the average cost of food and sundries. Average rents advanced, but the cost of clothing, coal, gas and electricity were lower. Between July, 1920, when the peak of the rise in the cost of living since 1914 was reached, and November, 1923, the cost of living decreased 19.2 per cent. The increase since July, 1914 was 65.3 per cent.

Cleveland Makes Elaborate Plans for Increased Business

Little new machine tool business is now expected for domestic uses until after Jan. 1, and a general going over at local plants now is in order, both mechanically and commercially.

These plans are being made to keep pace with the better prospects in industry generally, in spite of the re-adjustment that seems at hand. For example, not a little faith is placed in the reports that have been seeping into this market in the last few days relative to the possibility of Akron, only 30 miles distant becoming the airplane, as well as the American Zeppelin center of the country. These rumors are based upon the negotiations of financial interests identified with the Goodyear Tire & Rubber Co. to acquire the Curtiss patents and plant at Dayton and to remove the plant to Akron. The Zeppelin plant is expected to start operating early in 1924. This is the second report coming to general manufacturing circles here recently, and bears the earmarks of probability since some Goodyear executives have admitted they, too, have learned of the move, something that did not exist before this time.

Meanwhile the automobile industry in Cleveland and nearby cities in placing orders for raw materials in fairly liberal quantity, though here also the new business is tempered by the belief that steel materials will be lower. In the main the larger producing automotive factors are apparently going ahead with their early 1924 program.

In this connection, a favorable reflection in new railroad business is seen, with the possibility of more new rolling stock to be added by the various carriers serving this district in the transportation of new automobiles during the first two months of 1924. Shippers in the Great Lakes region are shaping their plans to provide some 26,000 cars in January and 30,000 cars in February for this purpose alone.

A specific instance is cited by President Chandler, of the Chandler Motor Car Co. of Cleveland, which already is preparing to place orders for new material with which to build additional quantities of its product during the first quarter of the new year. Reports gathered by this firm alone indicate that its sales organization is working now for an outlet in excess of the same period a year ago in Chandler cars.

While no hint as to the addition of new equipment is heard, the need for machinery with which to improve its present rolling stock by the Nickel Plate road offers encouragement also. During the three months beginning Sept. 1, this road cut approximately in half its unserviceable engines and made a like reduction in unserviceable cars. A similar gain is shown by the Chesapeake and Ohio R.R., both moves being largely to expedite the increase in Fall freight traffic.

Some Sales Made in New York

Some sales of single tools were consummated during the week in the New York market, the orders coming from unexpected sources. According to the reports, several general industrials needing a few new tools have been waiting until this time when things were quiet before making the purchases, and this week closed on enough small orders to make a fairly good showing for several of the larger dealers. In addition to this, here and there were the reports of sales to railroads, but nothing of importance nor of significance, in as much as most railroad buying will go over until after the new year.

Nothing has resulted from the automotive field in several weeks, but inquiries are said to be coming into the New York market from this source and spirited buying is anticipated after the year has been started.

In the used tool field some little encouragement was found in the Southern sales consummated in the New York market. There were also some sales made to Philadelphia industries in the Metropolitan district. Some complaint was expressed by dealers on their inability to pick up reasonably tools in good condition.

Many of the dealers in the East are taking advantage of the December lull to take inventory and to add up the profits and losses for the year 1923. Stocks are found to be low in warehouses in nearly every case and, except for standard lines, very few machines can be found awaiting buyers. The stocking-up process will commence during the middle of January, according to the dealers.

Export business is better, according to authorities in that line, and the month of December has kept up remarkably well after November which was a particularly good month.

Cincinnati Reports Good Month

There is an encouraging tone to business in the machine tool industry of Cincinnati, despite the fact that the usual seasonal decline due to the Chirstmas holidays is at hand. While it cannot be said that the machine tool houses are doing a big business, the orders that have been coming in are holding production up to a level that promises well for the future. The machine tool industry in Cincinnati, taken as a whole, has experienced a far better year during 1923 than during 1922. While the volume of orders received in the first six months of 1923 was greater than in the last half of the year, the past three months have seen a more active market than the same period of last year. Some plants say that their orders for November were ahead of those for October and that the first weeks of December were on a par with last month. Others report that the latter part of November saw a drop in their output and that December business has been slightly below that of October and November. A general survey of the market, however, will show that November production rivalled that of October, while the first two weeks of December were most encouraging with sufficient orders coming in to keep plants operating on about the same scale as they did through November.

The morale of the industry is better than it was a short time ago. There is a distinct note of encouragement in the way that machine tool men talk. One of the largest plants in the city states that its business this month has been ahead of November. Others report that the condition of the market is very good when the season of the year is borne in mind.

Many Inquiries

Many Cincinnati manufacturers report that their inquiries have been numerous. Buying of machne tools by the automobile manufacturers has fallen off to some extent, but is still of large enough proportions to be a considerable factor in the present market. It is unlikely that there will be much active purchasing by the automobile industry until after the first of the year. Railroads have not been in the market to any appreciable extent lately, but it is thought that there will be some good business placed by railroads possibly before the end of the month.

Planer manufacturers state that their volume of business has held up practically to the same level as during October and November. They are optimistic and say that a healthy number of inquiries are being received daily while orders are satisfactory. The orders for planers are not coming from any particular source, but the industrial field in general is buying in fair quantities. Orders for milling machines and lathes have decreased somewhat in the past two weeks and it is not likely that there will be any change in the market for these two products until after the opening of the new year.

Orders for electrical tools have maintained a good standard in the past two weeks. The electrical tool houses in Cincinnati have been kept busy all through the Fall season, while the early days of the present month showed no decline in activities. The approach of the holidays, however, is being felt and business will slacken up until after the first of the year. Conveying machinery houses are still producing at a normal rate and report that they have many orders on hand to keep their plants running on a full time schedule. There has been but little change in the woodworking machinery plants where production has been exceedingly heavy for the last two months.

Business Improves in Philadelphia

Dealers in small tools in Philadelphia reported business conditions more satisfactory this month than is usual in December. Those engaged in this line of the trade find a number of small shops purchasing their equipment in anticipation of an increase in the volume of business after Jan. 1.

There has been a demand for single lathes and drills for small shops. Business has shown a marked improvement in December over November and October.

Philadelphia manufacturers of gears also report a satisfactory business. The

orders are well distributed and inquiries are coming to manufacturers in normal volume. There was nothing in this line to indicate a lull in the immediate future.

Manufacturers of woodworking machinery report a falling off in their production. This is seasonal and was expected, manufacturers and dealers said. They are awaiting general business developments which will indicate whether next year's building activities are to be as great as those of 1923. Inquiries are being received which leave a hopeful feeling.

Pennsylvania is on the threshold of a great development in the construction of electric power equipment. Eleven large stations are under construction and will be finished by the end of 1925. Eight of the new stations will be operated by steam and three by water power. The largest of these installations will be at the foot of Erie Ave., where the Philadelphia Electric Co. will build a plant having an initial capacity of 200,000 kw. which will ultimately reach 600,000 kw.

A general trend away from the restricted buying that has been the rule for a few months in the machinery and machine tool line is noted by some of the largest manufacturers. Many industries which heretofore have withheld purchasing until new orders were in sight now plan to reverse their former policy and buying on a considerably larger scale is anticipated.

News of European Iron Markets

Since the Armistice, Commercial Attache C. L. Jones cables the Commerce Department, French pig iron output for the month amounted to 514,230 metric tons and raw steel 476,696 tons. Each show an increase of approximately 7 per cent over the figures for September, or 482,000 tons and 446,000 tons. The figures are also about 25,000 tons above the previous record months of the year and increase the monthly average to 419,900 tons of pig iron and 395,900 tons of raw steel for the first 10 months of 1923. Of the total French output for the month of October, Lorraine contributed 181,841 tons of pig iron and 150,537 tons of raw steel.

Austrian Iron and Steel Production

The October production of iron ore in Austria, according to the latest report from the Alpine Montangesellschaft—the leading unit of the Austrian industry—was 128,421 metric tons; pig iron, 25,271 tons; steel ingots, 32,247 tons; and rolled products, 20,282 tons. These compare respectively with the September production of 114,000 tons; 29,000 tons; 31,000 tons; and 22,000 tons; and with the monthly averages for the first 9 months of 1923, or 99,119 tons; 29,493 tons; 26,218 tons; and 19,114 tons. While the German demand for Austrian iron has ceased, other inquiries received brought the unfilled orders up to 36,496 tons, compared with 39,000 tons at the end of September, and the monthly average for this year of 33,811 tons. Prices of bar and hoop iron showed a slight increase, pig and rolled products were reduced, while structural iron remained unchanged.

South Enjoys Excellent Business with Bright Prospects Ahead

Though machine tool sales in the Southeastern territory are substantially on the same basis as they were two weeks ago, dealers in Atlanta and other important distributing centers of the district are growing more optimistic daily over the 1924 outlook. Inquiries for tools and equipment that will develop into orders during the early part of the coming year are considerably larger than they were at this time a year ago, with the principal activity still being shown by the railroad companies in the various Southeastern states, and a marked improvement in inquiries from the textile industries over the whole South. There are also signs of increasing activity on the part of the smaller machine shops in districts where agricultural conditions are satisfactory, and this source is expected to develop a fairly good volume of machine tool business during the next three or four months as the smaller shops have been doing comparatively little buying since early Fall and must shortly be in the market again to some extent at least.

Inquiries from the railroad companies are for heavier tools, largely for general shop equipment, and indicate that the railroads are contemplating some rather extensive purchases within the next few months for information, prices, etc., are being asked for on a large amount of such equipment. One company, in fact, has sent out inquiries for equipment amounting to considerably more than $100,000, and, it is understood, this same company is expecting to invest around a quarter of a million by the middle of the year. Therefore, dealers of the Southeast are giving considerable of their attention to this field at the present time.

The textile industries, more or less inactive for the past five or six weeks due to the uncertainty of cotton goods prices because of rapidly increasing cotton prices, are dispatching inquiries on a fairly active basis again, and dealers are looking for this field to develop a good volume of machine tool business during the first half of the coming year. The cotton situation is more stable than it has been for several weeks, and there is a certainty of active operation by the textile industries for some months.

Total sales in December will be about the same as they were in November, according to present indications, which will make the month about 10 to 12 per cent better than December of last season.

Another field expected to prove a good one in the next few months is the automotive service field, as stations in the South have been doing more business during the past three or four months and are showing a tendency to return some of the profits to the business in the purchase of equipment. Inquiries from this field are quite a bit more active than at this time last year, and many of these inquiries are expected to develop into orders after Jan. 1, 1924.

Regarded as a whole, the outlook is entirely satisfactory, with nearly all dealers optimistic. The early part of 1923 developed an excellent volume of machine tool business in the South, but most dealers state present indications portend an even better business during the early part of the coming business year.

Quiet Week in the Chicago Market

Machine tool dealers in the Chicago district had a comparatively quiet week and do not look for any material change until Jan. 1. Some of the industrials and a number of railroads are expected to do considerable buying.

The Atchison, Topeka & Santa Fe Ry. has entered the market for a 20-in.x10-ft. engine lathe. The Chicago, Burlington & Quincy R.R. is reported to have purchased a 40-in. car wheel borer. The Illinois Central R.R. has placed an order for a 800-lb. steam hammer with the Illinois Steel Co. The Norfolk & Western R.R. has purchased about 25 tools. The Minneapolis & St. Louis R.R. has entered the market for three engine lathes. The Union Pacific R.R. is inquiring for five engine lathes, three bushing presses, one link grinder, three upright drill presses, two 42-in. boring mills and three sensitive drills.

The Pettibone-Mulliken Co., Chicago, has purchased four radial drills, three tool grinders, eight engine lathes and three 28-in. shapers.

The Board of Education, Chicago, has purchased ten 12-in.x5-ft. motor driven lathes, one 10-ft. power brake, one 16-in. back geared crank shaper and a 20-in. tool grinder.

Railroads are coming into the market for cars and other equipment and indications are that activity from this important source will continue. The Standard Steel Car Co. has taken an order for 500 box cars for the Ann Arbor R.R. The Sinclair Refining Co. has purchased 18 standard gage tank cars from the Kopler Industrial Car & Equipment Co. Bids were taken by the Southern Pacific R.R. for about 10,000 cars.

The output of the leading steel interest in Chicago is around 80 per cent of capacity. Nineteen of twenty-seven blast furnaces are active, and it is possible that more will be added before the turn of the year. Operations of the leading independent continue to hover around the 75 per cent mark.

Safety Meeting Held in Baltimore

With more than 800 superintendents, foremen and others representing Baltimore's machine shops and other industrial plants on hand, the Baltimore Safety Council opened its series of safety conferences for foremen on Dec. 14. The speaker of the evening was John A. Oartel, director of safety for the Carnegie Steel Co., Pittsburgh, who spoke on how to obtain 100 per cent safety in industries.

The Industrial Review

What the year has yielded and some predictions for next year's production

TOTALS for the year 1923 in the machine tool industry are generally estimated as being from twenty-five to thirty per cent ahead of last year, and in nearly every part of the United States reports show that business is steadier this December than it was last December or the year before that. "War stocks" have almost entirely disappeared from the market, industries that use a large number of tools in a year are in a better position to buy them, production figures show an expansion that is natural and healthy and in no way related to wartime inflation, and prospects for the coming year are uncommonly bright.

The month of December proved to be a dull one with little buying in any of the markets of the United States. But the month of December is not expected to show big returns or substantial gains so, while it may frankly be said that business was poor, it can as frankly be stated that there is no disappointment. By comparison with last year, business is better in two ways. The actual number of orders is greater and the number of inquiries is far in excess of December, 1922 It must be confessed that hopes are built rather high by the machine tool builders and dealers when they view the possibilities of next year. Predictions say that automobile production will be greater, railroad buying will be as good as this year, exporting—including Japan—should prove very good, textile making is due for better times, and general industrials are all on the list of improvements for the coming year.

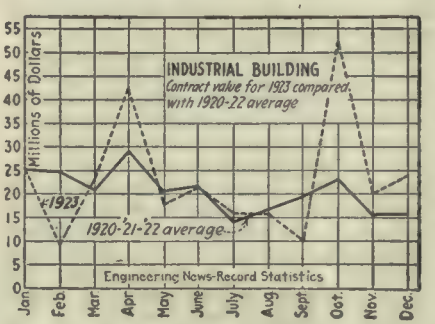
Recent reports from the various centers of the United States show that decided improvement has taken place in the Buffalo territory, Chicago has been able to sell some railroad requirements, Milwaukee machine tool builders are dividing their time between a fair volume of production and inventory, Cincinnati and Minneapolis have no complaint considering the season, Philadelphia, New York and Cleveland report a falling off in sales, but a gain in inquiries, Pittsburgh has been fairly steady, and New England is still "spotty."

Electrical Field.

According to reports received from the leading electrical market centers of the United States, there is an increasing unevenness of conditions as the year end approaches, and the present trend toward quickening of retail distribution and slackening of demand in most primary channels is a familiar occurrence in all commodity lines. Orders in the manufacturing and jobbing houses are largely deferred as attention is diverted to inventory taking, and the fact that increased operations have developed with many electrical manufacturing companies merely illustrates the contrasts which still mark the situation.

Holiday buying, of course, continues to take almost the entire attention of the trade, although there is much activity in the wire, lamp, wiring devices and motor markets. In New England the state of business is described by saying that retail buying is accelerated and is combined with a healthy demand for wiring supplies. In that section buying by distributors is confined chiefly to maintaining a flow of material for immediate uses as inventories among jobbers are being kept low. Buying in New York's holiday market shows great increases, and reports from the retail trade claim that sales are more diversified than ever before. Several large pole orders in the Eastern territory are reported.

Although the decrease in motor business which started in October is continuing, the total volume of sales during the last quarter of the year is considerably above that of 1922, according to several motor manufacturers in different parts of the country. Manufacturers are not viewing the decline with much alarm, since they realize that the exceptionally good sales rate during the Spring and Summer months could not keep up indefinitely. This condition not only delayed deliveries but imposed serious problems of production and financing upon manufacturers, some of whom possibly had not calculated the requirements for such a rush of business. The present let-up has allowed them to catch their breath and improve their shipments. However, the present volume of business is of such wide diversity that manufacturers are reporting increases in sales during the last quarter of 1923, ranging between 50 and 75 per cent higher than during the same period in 1922.



The outlook for 1924 among manufacturers is that a closer holding together of prices will characterize the market. During 1923 most manufacturers ironed out their prices to a fairly constant competitive basis. One company felt that it might expect 25 per cent greater business during 1923 if Secretary Mellon's tax reduction was accepted, and if conditions in the industrial field did not again become chaotic.

Electric Railways Expenditures

It would appear that the prediction made early in the current year that electric railways would spend $240,000,000 during 1923 in new plant and equipment will be more than realized. The application of the money has been fairly evenly divided on the basis of the needs of the various departments, but the bulk of the money has, of course, gone into track and track work. In this connection manufacturers report a demand exceedingly heavy for track material and supplies including tools used in work of this kind. One manufacturer of welding apparatus reports material sold to him from 5,500 to 6,000 joints by one company. In fact more miles of track are known to have been reconstructed during 1923 than in any previous year in the history of the industry. Orders for cars have also been unusually heavy both for replacements and in the form of additional equipment. This, of course, means in time added shop facilities, with the necessary quota of new tools.

At the inception of the increase in fares throughout the country, the tendency was toward decreased riding, but statistics show that traffic is fast returning with the result that increased earnings are available to be ploughed back into the railway properties in the form of improvements.

Industrial Expansion

Always interesting are the building statistics and predictions. *Engineering News-Record* has estimated that during the past year there has been a total building expenditure of $6,000,000,000 as compared with an expenditure in 1922 of $4,500,000,000. This publication predicts total expenditures of five billion dollars for the coming year provided that the cost of construction goes no higher. If there is a drop of as little as five per cent in costs another year equal to 1923 may be expected.

Industrial expansion during the past year caused expenditures of $500,000,000 as compared with $400,000,000 during 1922, and indications are at the present that the program for the coming year will be about equal to that of 1922. This is also on the same proviso that there is no drop in the present high costs of construction. Lower costs will mean more expansion and hence better business for the machine tool builders.

Industrial building during the year and a comparison with an average for the past three years will be found in the chart on this page.

German Textile Machinery Exports Decline

Exports of textile machinery from Germany during the past year have decreased to such an extent that during July, 1923, they amounted to only approximately 17 per cent of such shipments during the corresponding period in 1922, according to a report dated Oct. 26, from Consul M. K. Moorhead, of Stuttgart. The greatest recession was noted in finishing machines, looms, and knitting machinery.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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FOR SOME reason the markets lack the titillation that we associate with the Chritmas season. They are resilient but not buoyant and, while business is generally described as satisfactory, there is an absence of the stimulating excitement that is usually felt when "times are good" in the United States.

An explanation of the near lethargy that prevails is difficult. Perhaps it is due to the preachments of those who believe in what they call "the business cycle." They have been so repetitious in asserting that we could avert contraction by avoiding expansion that they may have chilled enterprise and initiative.

But it must be admitted that some clouds are now visible that were not to be seen a week ago. One is the decline in the French franc, which sold at 5.12½ last Thursday. This is the lowest price of all time. It reflects a belated recognition of the magnitude of the French debt, which has been increased by 203 billion francs since the armistice and now exceeds 430 billion francs. To this must be added the paper money in circulation, amounting to 37 billion francs. At its par in gold the total of 467 billion francs is the equivalent of over 90 billion dollars.

The estimated national wealth of France at the outbreak of the war, as given in the U. S. Statistical Abstract, was but $58,398,000,000, and there are few who believe that the French can ever pay their present debt in gold unless they collect a large part of it from Germany. It is therefore natural that the value of French obligations should decline as the hope of any recovery from Germany fades.

As a further reduction in the purchasing power of Europe would probably follow if the franc became as worthless as the mark, there are some who now predict an early lessening in the export demand for our surplus production. This prediction seems logical and caution is justifiable, but our trade with France is not large and its loss would not seriously affect us if the rest of the world continued to buy here.

The predicament of the British Government is also causing some uneasiness among those who are looking abroad for trouble. The Baldwin ministry is politically impotent and there is a probability that the labor party will come into power. This contingency alarms those who fear what is called radicalism and overlook the historical fact that responsibility generally makes men conservative.

And finally there is the deadlock in our own Congress at Washington. The success of what is called the anti-railroad group in opposing Senator Cummins' election as chairman of the Interstate Commerce Commission is construed as inimical to the roads, and the reluctance of the House to consider any measure of tax reduction unless the soldiers' bonus is also provided for, dispirits those who have become persuaded that lower taxes would be a panacea for all our ills.

There is no doubt that lower taxes are desirable, but Secretary Mellon's proposal contemplates a reduction of hardly more than $3.00 per capita. If we don't get it we can probably struggle along under the present schedule for some time yet without serious distress.

"The steel industry, the automobile industry, the electrical manufacturers and the fabricators of copper and brass are all busier than usual at this time of the year. The holiday trade is enormous. The jobbing business is good, and even the oil companies are more cheerful now that they seem to have production under control. The list of corporations declaring extra dividends is a long one. Railroad earnings are holding up wonderfully well."

But none of the troubles thus borrowed from the future has as yet been delivered. When they arrive they may prove to be less serious than they seem, for that is often the way with troubles. Meantime there can be no doubt about the present prosperity of the 111 million people who compose the population of the United States or the 10 millions who are our neighbors in Canada. Nearly everyone who is willing to work is employed and, while there are some inequalities between consumption and production, they are being gradually adjusted.

One such adjustment is being made by a reduction in our Winter wheat acreage. The Department of Agriculture says that the area planted will be 5,759,000 acres, or 12.6 per cent less than last year. If this estimate is correct the farmers may get more for their wheat despite the present bearishness of the grain trade.

In cotton a converse adjustment will have to be made if the world's needs are to be supplied, and there are some who predict that next year's cotton acreage will be the largest on record. This possibility has led to more or less speculative liquidation in the cotton market and it remains to be seen whether the mill demand will be sufficiently persistent to hold prices at the present level or advance them further. But despite the threatened curtailment of which there is now some evidence, there is little doubt that all the cotton that can be had will be wanted. There is, however, a question as to whether it will be bought intermittently or precipitately.

The steel industry, the automobile industry, the electrical manufacturers and the fabricators of copper and brass are all busier than usual at this time of the year. The holiday trade is enormous. The jobbing business is good, and even the oil companies are more cheerful now that they seem to have production under control.

The list of corporations declaring extra dividends is a long one. Railroad earnings are holding up wonderfully and if the stock market reflected the past and present instead of trying to discount the future it would probably be higher than it is. Those who believe that it is barometric insist that its apathy portends a slackening of business activity in the near future, but this assumption implies that those who trade on the Stock Exchange are more clairvoyant than the other business men of the country. This may have been the case in the past but times have changed.

The weekly statement of the Federal Reserve Banks shows a reserve ratio of 75.7 per cent as compared with 75.3 per cent a week ago. Gold holdings are smaller by $24,000,000.

Gold imports for the week are known to have been large and the reduction in the amount held by the Federal Reserve Banks reflects the efforts that are being made to camouflage the superabundance of our gold supply by putting it into circulation. The wisdom of this policy is doubtful for the time may come when the banks will want the gold back and be unable to get it. Meanwhile 90 day money can be borrowed at 3⅜ per cent in London, while it costs at least 5 per cent in New York, and Great Britain is getting much of the world's financing that would be done here if our interest rates permitted.

Pierce-Arrow Improves Its Finances

The Pierce-Arrow Motor Car Co. has announced that its bank loans have been reduced by one million dollars since the re-organization of the company under direction of Myron E. Forbes, about a year ago. Outstanding bank loans of the company are now $2,500,000. After making the payment of $1,000,000, the company had a cash balance of $1,822,333.

The Sudden "Prosperity" of France

With currency inflation exports increase and work is speeded up—No danger expected for some time to come from this condition—France as a machine tool market

BY A PARIS CORRESPONDENT

THE SLOW but steady depreciation of the French franc over the past year on the exchanges of New York, London, Geneva, Amsterdam, etc., is beginning to be noticeable in the quickening of French industries and in the rapidly growing demand from abroad for French products.

The dollar which a year ago stood at approximately 12 francs has for some time past risen until it is now quoted at 18 to 19 francs, while the pound sterling has similarly risen during the past twelve months from 42 to 80 francs. While during this interval the cost of living and the cost of labor have also increased, the increase has been proportionately small. The tendency has therefore been strong to create a favorable market for French manufactured goods in those countries whose currency has maintained its par in the face of the falling value of the franc.

With the pound sterling at 80 francs, instead of the pre-war rate of 25 francs, the French are beginning to find in England a particularly favorable market, not alone for motor cars and articles of luxury in which France has always specialized, but in necessities as well. A correspondent writing to the *London Times* recently called attention to the fact that the textile mills of northern France would during the next three months send to England piece goods valued at £1,200,000 or, at present exchange rates, 96,000,000 francs. This is only one of the points that go to make clear the present agitation in England in favor of a protective tariff and the growing fear of France as a formidable trade rival of British industries. For, if France can successfully send piece goods to England, French mills can likewise compete with British mills in the world markets that were formerly controlled by Bradford.

French Steel Situation

Another evidence of British uneasiness over the budding prosperity of French industries was given in a recent number of the *London Times* by a correspondent who stated that "with abundance of raw materials, the largest blast furnaces and the most modern steel mills in Europe, the French iron and steel trusts can flood every market in the world; not only with manufactured steel, but also with machinery of all kinds. The French can drive British steel and metallurgical products out of every neutral market and swamp our home markets."

That these statements are not exaggerated is proved by the fact that American manufacturing establishments that have built and developed branch factories in France now report that on the basis of the present exchange value of the franc they can produce more cheaply in their French factories than in America, England or in any other country where they operate plants. One large concern is now supplying the South American market from its French factory, this trade having in the past been handled by its English factory. The head of another American factory located in France recently stated that the French factory can now produce in France its full line of products with the cost of manufacture greatly below that prevailing in the home factory and that, in consequence, the policy of the company will hereafter favor a rapid and extensive development of the French plant.

Economic Conditions

In the light of this situation, it may seriously be questioned whether the depreciation of the franc that has taken place since last year has really been so bad for France as foreign politicians and economists would have the world believe. The depreciation has largely been coincident with the occupation of the Ruhr and with the internal troubles of Germany and has therefore been regarded by many as having its roots in purely political soil. Whatever the real cause may be, there is no doubt of its direct beneficial effect on the industrial situation in France and if a sudden substantial improvement should not take place in the exchange value of French currency there is a strong likelihood that the French workingman will continue to have a full dinner pail for a long time to come and that this same dinner pail will be the cause of not a small amount of envy and anxiety in some of the other European countries.

The demand for machine tools continues active and the process of utilization of surplus machines left over from the war is becoming more rapid. A number of factories have large programs for the purchase of machinery that will be realized during the next three or four months and already efforts are being made in England, where unemployment is still a serious factor, to purchase good second-hand machinery. It is reported that the Renault Automobile Works, of Billancourt, near Paris, has placed an order with a local lathe maker for one hundred 16-in. engine lathes and is building in its own shops fifty grinding machines. It is also reported that André Citroën, the maker of the Citroën car, has added to his equipment 65 Potter & Johnston automatics. There is also a rumor abroad to the effect that Citroën will install an assembly plant in England for the purpose of assembling cars from parts brought from France and for making the bodies. Citroën cars are finding favor among the British motoring public, their attractive lines and low gasoline consumption appealing to modest purses. In France it is thought likely that an effort will be made in England to double the present import duties on motor cars and thus to interfere with the present important shipments of French cars to that country.

Paris is now commemorating the fiftieth anniversary of the French Society of Physics by a fine exposition of wireless and physics in the Grand Salon on the Avenue des Champs Elysées where the automobile show is annually held. This exposition takes the place this year of the aviation exhibition.

This exposition, the first of its kind to be held in France, was made possible by the generosity of 82 exhibitors who combined to assure the promoters a guarantee fund of one million francs. The patrons, in addition to M. Millerand, President of the Republic, and M. Poincaré, Prime Minister, comprise all the Ministers, as well as many of the foremost engineers and scientists of France.

The categories of exhibits include: experimental physics, wireless telegraphy and telephony, vacuum tubes, telegraphy, telephony, signalling, various applications of electricity, electro - chemistry, electric cables, porcelain, glass, insulators, optics, photography, cinematography, lighting, heat, metallurgy, acoustics, measuring instruments, etc. Among the exhibitors, who are numerous, one of the most important is the Western Electric Co., which through its French subsidiary, Le Matériel Téléphonique, has an exceptionally fine display of wireless receiving and sending sets, automatic telephone installations, measuring instruments, etc. This company is introducing into France its new automatic telephone exchange system and other products and is meeting with such marked success that its existing factory in Paris is to be greatly extended to care for the rapidly growing demand for its specialties.

In general, it is to be regretted that there are not other American exhibits aside from that of the Western Electric Co. and it is to be hoped that when this exposition is repeated, as it no doubt will be in coming years, representative American firms will be found among the exhibitors, for France is a market that cannot long be disregarded by progressive American companies.

Ford Completing Plant at Copenhagen

By next spring the Ford Motor Co. will have completed an immense new factory at Copenhagen, Denmark, which will be one of the finest in Europe, introducing in that part of the world new standards in design and operation.

The growth of the Copenhagen assembly plant, since its opening in June, 1919, has been remarkable, and it is now the second largest factory among the foreign companies, first place being held by the plant at Manchester.

A total of 13 countries are served by Copenhagen. These include Denmark, Iceland, Faroe Islands, Sweden, Norway, Finland, Free State of Dansig, Esthonia, Latvia, Lithuania, Poland, Ukrane, and Germany.

What the Future Holds for England

Improvement in the automobile and motorcycle business with hopes for the railroad and shipbuilding industries—Many exhibitions to be staged next year

BY OUR LONDON CORRESPONDENT

OF LATE, signs have been more promising and, apart from the upsetting influence of a general election, the effect of which it is too early to estimate, it is thought that the improvement is likely to continue. Despite a rising tendency, the official cost-of-living figures remain stationary and the registered unemployed are still somewhat below the 1¼ million mark. The latest available returns of overseas' trading, indicate marked advances, those for October being on a decidedly higher level, as regards both imports and exports, than for the average of the past six months. In fact the imports were of greater value than for any month since the beginning of 1921 and, leaving out last May, this can also be claimed for the exports. It is almost the same when the figures of re-exports, that is exports of foreign and colonial merchandise, are compared, these having been beaten in the same period only by the figures of last April and May.

Reference has been made in these columns to the improvement in the motor vehicle trade, where the export side is steadily expanding. Imports of passenger cars recently made a sudden upward move. Next year's trading in motor cycles and in bicycles is thought likely to be as favorable as in the year which is now closing, and manufacturers are working to a corresponding program. Machine tool men keep in mind the fact that the motor industry, with some exceptions, shows a maintained improvement, at least as regards the lighter passenger vehicles, where prices have been again reduced, and it is hoped that the commercial vehicle section, which from several causes has been greatly depressed, will at last emerge from its troubles. Private firms that manufacture locomotives are still badly in need of work, but the railways have again commenced to ask for quotations, and the shops directly connected with the lines have a full program. Many orders, too, have been given out for wagons, coaches, etc.

Shipyard Employment

The condition of the shipbuilding industry has long been unsatisfactory. In some part at least this has been due to a trade dispute on terms of employment which has involved a lockout of some 10,000 men who, being unployed demand a higher standard of 50,000 other men. After many negotiations, the dispute has been settled and in the interval of seven months a fair number of orders have accumulated, insuring that many of the men—not all—will soon return to profitable employment. But in any case the industry is suffering from lack of orders. A change is coming over marine engineering practice and the newer engines employed demand a higher standard of machining than has been usual. Here then, it is pointed out, sooner or later will be a market for the machine tool industry.

As regards the latter there is no material change, though it must be said that machine tool firms as a whole are no worse off for work than they have been for a considerable period. In some quarters, in fact, an improvement can be claimed and stocks that have accumulated have been sold off. There is still the handicap of the second-hand machine tool. From manufacturing firms that are closing down and going out of business a steady flow of sales arises, with which the manufacturer and the ordinary merchant have to compete quite often without success. Once again the Machine Tool Trades Association has waited on the parliamentary heads of the Board of Trade to urge protection from German competition, and the assertion is being generally made that German tools have been rushed into the country by reason of the exchange position. The Safeguarding of Industries Act, as regards Part II at least, lapses next Summer, and the continued applications of the association named have been regularly unsuccessful. It is quite probable, in fact, that they have acted in a manner that accentuates the trouble. Learning that the association is going to press for protection, merchants consider the time advisable for buying, even if, as is probably the case, the tools have to be put away until the market improves. Many complaints have been made for a long period regarding German competition, and it is not to be denied that German tools have been brought into Great Britain. But they are not being put to use, at least as regards the large proportion. They remain in stores, and only in a few instances has the writer been able to find that German tools of any size have been acquired by engineering firms for immediate installation in the shops.

> "Reference has been made to the improvement in the motor vehicle trade, where the export side is steadily expanding. Imports of passenger cars recently made a sudden upward move. Next year's trading in motor cycles and bicycles is thought likely to be as favorable as in the year that is now closing, and manufacturers are working to a corresponding program."

The machine tool industry will of course hold its exhibition next year, and members of the association have applied for some 70 per cent of the floor space available. Next year, in fact, the engineer is likely in certain respects to suffer from a surfeit of exhibitions. The British Industries Fair, to be held in Birmingham in May, will of course include engineering exhibits. Then the engineering trades will make a big display for six months at Wembley, just outside London, in connection with the British Empire Exhibition. This is costing more than ten million pounds to produce. In each of these cases it may be anticipated that a few machine tools will be shown, but not a large number, the association named debarring its members from participation, in favor of its own exhibition to be held at the end of September.

Indiana Foundrymen's Conference

The Engineering Extension Service of Purdue University announces the second annual conference of Indiana foundrymen which is to be held at Purdue University on Jan. 17 and 18. This conference will be of interest to manufacturers using foundry products as well as foundrymen. No effort is being spared to secure men of national reputation along foundry lines to lead in the discussion of foundry problems and a very interesting program is assured.

A similar meeting held last year resulted in the formation of the Indiana Foundrymens' Association and the first annual meeting of this association will be held in connection with this conference.

Announce Conference on Fuel Economy

A conference has been arranged at the Engineers' Club of Philadelphia, 1317 Spruce St., for Jan. 15 at which time the subject, "Economy in the Use of Fuel," will be discussed. Three sessions have been arranged for the day. The treatment of the subject is to be confined strictly to economy, avoiding the commercial phase of competitive fuel-saving devices. The electrification of railroads, fuel-saving ideas for public utilities, and the economy of domestic fuel will be the general topics taken up. There will be several papers presented by engineers who have specialized in this subject.

Ford Plant Reported for Buffalo

It is reported unofficially at Buffalo, N. Y., that final arrangements are being made for the acquisition by the Ford Motor Car Co. of land along the River Road as the site for a new Buffalo assembling plant to cost $5,000,000. The new building would turn out 1,000 cars a day and employ 2,000 men.

The site of this plant gives dockage facilities on the Niagara river and when completed Mr. Ford would use a fleet of boats to bring materials to Buffalo from Detroit, thus practically eliminating railway transportation.

Personals

D. DEVRIES, a director of R. S. Stokvis & Zonen, Rotterdam, Holland, with an American office at 17 Battery Place, has returned to Europe after a month's business trip in the United States.

JOHN CETRULE of the Triplex Machine Tool Co., 50 Church St., New York City, has been appointed sales manager for the New York district for the Oesterlein Machine Co., Cincinnati, Ohio.

F. S. WHITMAN, president of the Belvidere Screw Machine Co., Belvidere, Ill., has resigned due to ill health.

CARL A. JOHNSON, president of the Gisholt Machine Co., Madison, Wis., has been re-elected for the second time president of the Wisconsin Manufacturers' Association.

HUGH MCLEOD of the Porter Machine Co. plant in Hatfield, Mass., has acquired the buildings and waterpower rights of the old Shattuck gun factory near there and proposes to use it for the manufacture of some of the agricultural tools formerly made by the Belcher & Taylor Co. at Chicopee Falls, patents and patterns for which were bought recently when the last-named plant was dismantled.

OSCAR H. FOGG has resigned as secretary-manager of the American Gas Association. He will become president and general manager of the Baltimore Gas Appliance & Manufacturing Co., Baltimore, Md.

LEDIE I. LAUGHLIN, a director of the Jones & Laughlin Steel Corp., of Pittsburgh, has been appointed district sales manager of the corporation at Buffalo to succeed C. S. BRADLEY, who was recently made manager of hot rolled sales at Pittsburgh.

Business Items

The Davis Machine Tool Co., Rochester, N. Y., announces that it has disposed of its business relating to keyseating machines to the Davis Keyseater Co., Rochester, N. Y.

The Calorizing Co., Pittsburgh, Pa., has acquired the exclusive sales rights for Hybnickel, the heat treating alloy perfected by Victor Hybinette. The product will henceforth be known as Calite and Mr. Hybinette will be associated with the company in a consulting capacity.

The Whyte Motor Products Co., manufacturer of the Whyte motor-control, which is moving to Muskegon Heights, Mich., from Chicago, expects to begin production by Jan. 1, according to John Whyte, company manager. The machinery has been transferred from Chicago and is now being installed in Muskegon Heights in the building formerly occupied by the Michigan Washing Machine Co.

The L. S. Starrett Co., Athol, Mass., announces a bonus, payable soon after Jan. 1, in additional wages or salary amounting to from 4 to 10 per cent of the amount paid an employee during six months ending Dec. 31, the percentage being determined by the individual's length of service.

The Motor Wheel Corp., of Lansing, Mich., is erecting a $70,000 addition to its gear plant, so the old factory may be used for production only, to meet the increasing demands for its pressed steel wheels.

The Reo Motor Car Co. of Lansing, Mich., has purchased the plant of the Duplex Truck Co. for the consideration of $200,000, it was announced this week by officials of the concern. The property of the truck company will be taken over by the Reo company Jan. 1, 1923.

The new Jewett plant, Detroit, has been completed and turned over to the Paige-Detroit Motor Car Co. by the contractors. The plant is the last word in automobile factories, according to both the architect and the construction engineer.

The Atchison, Topeka & Santa Fe Ry. is reported to have completed plans for enlargements of its shops at Emporia, Kan. A power house, machine shops and other structures will be added.

The Pennsylvania Railway is planning the construction of a one-story car shop at Camden, N. J., to replace a portion of the plant destroyed by fire some time ago.

The Illinois Central R.R. has prepared preliminary plans for the construction of new locomotive shops, engine house and oil station at Sioux City, Iowa.

The Standard Structural Steel Co., 239 Homestead Ave., Hartford, Conn., has moved into quarters at 1014 Weathersfield Ave. It has taken over the factory constructed for the Hartford Iron Works, a modern brick and steel factory, where the company will have increased facilities.

The Plimpton Lift Truck Corp. has been formed at Stamford, Conn., to manufacture industrial and factory trucks. Capital in the enterprise amounts to $100,000. The incorporators are: Bernard E. Scriven and William J. Young.

Work is to be started at an early date on the new plant for the Pressed Metal Co., Campbell St., Providence, R. I. This new industry, recently formed and incorporated by Darius Goff, Frank J. Powers, and D. W. Flint, Cranston, R. I., will manufacture auto parts. It is stated the new plant will cost $100,000 to build, and $400,000 to equip.

Obituary

S. W. JENCKES, president of the Engineering and Machine Works, St. Catherines, Ontario, Can., died recently at St. Petersburg, Florida, where he had gone to spend the Winter. He was for many years president and general manager of the Jenckes Machine Co., Sherbrooke, Quebec.

FRANCIS E. MYERS, head of the F. E. Myers & Brother Co., pump manufacturer, of Ashland, Ohio, died suddenly in that city.

Catalogs Wanted

Marki es Barta, Temesvar, Roumania, request that makers of the following classes of machines send their catalogs to them at the address given above.

(1) Machines for bending or forming chain links, preparatory to welding. The wire to be made into links is from No. 12 to No. 000 Brown & Sharpe Gage (2.2 to 10.2 millimeters).

(2) Wire-drawing machines with two drums for the sizes of wire given above.

(3) Electric welding machines for chains.

(4) Motor plows up to 20 horsepower.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Mining machinery, tools and implements. Algiers, Algeria. Purchase. Reference No. 8548.

Road-making machines for concrete roads. Copenhagen, Denmark. Purchase and agency. Reference No. 8534.

Woodworking machines, strap saws, and planing and shaping machines. Revel, Esthonia. Agency. Reference No. 8568.

Tools, pneumatic, special tools and machines, and cement-ware machinery. Christiania, Norway. Purchase and agency. Reference No. 8552.

Forthcoming Meetings

American Engineering Council. Annual Meeting. Shoreham Hotel, Washington, D. C., Jan. 8 to 11. L. W. Wallace, Executive Secretary, 24 Jackson Place, Washington, D. C.

American Society for Steel Treating. Winter sectional meeting. Hotel Seneca, Rochester, N. Y., Jan. 31 and Feb. 1. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

Society of Automotive Engineers. Annual meeting, Jan. 22 to 25, at the General Motors Building, Detroit, Mich. Coker F. Clarkson, 29 W. 39th St., secretary.

American Gear Manufacturers Association. Spring Meeting, April 28, 29 and 30, 1924. Lafayette Hotel, Buffalo, N. Y.

Society of Industrial Engineers. Eleventh annual convention. Buffalo, N. Y. April 30, May 1 and 2. Headquarters, 608 S. Dearborn St., Chicago, George C. Dent, executive secretary.

Southern Supply & Machinery Dealers Association, National Supply & Machinery Dealers Association, and American Supply & Machinery Manufacturers Association. Triple convention, May 19, 20 and 21, 1924, Hotel Cleveland, Cleveland, Ohio. F. D. Mitchell, secretary-treasurer, 1819 Broadway, New York City.

Foreign Trade Council. Eleventh annual convention at Boston, June 4, 5 and 6. O. K. Davis, India House, Hanover Square, New York City, secretary.

The General Committee of Dividion V, Mechanical of the American Railway Association. Convention and exhibits. Atlantic City, June 11-18, 1924. V. R. Hawthorne, secretary, 431 S. Dearborn St., Chicago, Ill.

Railway Supply Manufacturers Association. Exhibit. Atlantic City, June 11-18, 1924.

The Lyons Fair. Lyons, France. March 3 to 17, 1924. Information furnished by Emile Garden, 50 Church St., New York City.

New and Enlarged Shops

Machine Tools Wanted

Ill., Chicago — Chicago, Indianapolis & Louisville R.R., 608 South Dearborn St., J. H. Liebenthal, Purch. Agt.—18 in. x 10 ft. lathe.

Kan., Pittsburg—De Sappe Motor Co., 218 South Bway., A. DeSappe, Purch. Agt.—keyseater and milling machine for motor repairs.

Mass., Charlestown (Boston P. O.)—E. A. Gillett & Sons, 286 Rutherford Ave. (manufacturer of carriages)—equipment for addition to machine and woodworking shop.

Mich., Detroit—Dept. Purchases & Supplies, 700 Marquette Bldg., G. J. Finn, Comr.—one turret lathe for street railway shop.

Mo., Carthage—J. Smith, 5th and Main Sts.—post drill and small lathe for general repairs.

Mo., Joplin—Williams Garage, 2nd and Wall Sts., E. L. Williams, Purch. Agt.—electric drill.

Mo., Kansas City—C. Foster, 3215 Chestnut Ave.—bench lathe for machine shop.

N. Y., Brooklyn—Albert Pipe Supply Co., Berry and North 13th Sts.—pipe threading machine and 3-phase motor connection friction saw.

N. Y., Buffalo—J. Flander, 233 South Division St.—heavy stamping press.

N. Y., Buffalo—E. Hammond, 221 Forrest Ave.—equipment for garage repair shop.

O., Columbus—A. E. Lind, 22 East Walnut St.—24 in. lathe, drill press, etc., for garage and repair shop.

O., Toledo—West Toledo Plumbing & Heating Co., Central St. and Upton Ave., B. C. O'Connell, Purch. Agt.—shop equipment and tools.

Pa., Wilkes-Barre—A. W. Grebe, Carey Ave.—tools and equipment for proposed garage.

Tex., Eastland—J. Simmons, Box 42 (machine shop)—pipe threading machine up to 15½ in. pipe.

Tex., Houston—The Shop, Box 1495—portable forge and electric drill press.

Tex., San Angelo—The Machine Shop, 609 South Oak St.—drill press and threading machine, up to and including 6 in. pipe.

Tex., Tyler—St. Louis Southwestern Ry. Co., F. C. Warren, Genl. Store Keeper—shop tools and plant machinery for the repair of motive power equipment.

Wis., Fort Atkinson—R. D. Royce—machine shop equipment, including drill press and lathe.

Wis., Milwaukee — Milwaukee Paint & Varnish Wks., 1523 Holton St.—medium size electric drilling machine.

Wis., Milwaukee — F. Schneeberg, 946 38th St.—lathe, drill press and emery grinder for automobile repairs.

Que., Montreal—J. B. Baillargeon, 415 St. Denis St.—complete equipment, including gasoline tank and pump for garage.

Que., Montreal—H. Burke, 104 Carriere St.—drill press for garage.

Que., Montreal—A. Cardinal, 540 Amherst St.—tools, emery wheel and other equipment for automobile repair shop.

Que., Montreal—E. G. Horne, 813 New Birks Bldg.—complete equipment for garage and automobile repair shop.

Que., Montreal—I. Kennedy, 501 Seigneurs St.—tools, vise, press, etc., for garage.

Que., Montreal—E. Martel, 506 Harbour St.—drill press and chain hoist for garage.

Que., Montreal—J. O'Brien, 107 Garnier St.—machinery and equipment for automobile repair shop.

Que., Montreal—Y. Rioux, 13 Grant St.—hand tools and drill press for garage.

Que., Montreal—I. H. Seguin, 588 Dorchester St.—tools and equipment for garage.

Que., Montreal—C. Sicotte, 415 Ontario St., E.—air compressor, lathe, etc., for garage.

Que., Rimouski—J. A. Brillant—automobile repair tools.

Que., St. Flavien—T. Daigle—equipment for garage and repair shop.

Que., St. Romuald d'Etchemin—G. Robitaille, 33 Fabrique St.—lathe for garage.

Que., Westmount—G. Deacey, 27 Hillside Ave.—press, files and hand tools for automobile repair shop.

Machinery Wanted

Calif., San Francisco—Natl. Paper Products Co., 1789 Montgomery St., and Zellerbach Paper Co., 534 Battery St.—equipment for proposed plant at Los Angeles.

Ill., Elgin—C. J. Moody, 159 Grove St. (cabinet maker)—6 to 8 x 30 in. planer.

Ind., Hammond—F. Kraus & Son, 488 Holman St.—complete woodworking machinery.

Ky., Fleming—Neon Ice & Ice Cream Co.—refrigerating equipment for 10 ton ice plant.

Me., Biddeford—Diamond Match Co.—machinery for addition to plant for the manufacture of sash, doors, mouldings, etc.

Mass., Allston (Boston, P. O.)—Griffith, Keiver & Co., 124 Western Ave.—machinery, including large and medium size band and circular saws, planer, matcher, sander, belting, pulleys, shafting, etc., for proposed woodworking shop.

Mass., Boston—Union Spinning & Plating Co., 67 Sudbury St.—air compressor, tank, pump, air hose, 25 hp. motor and lacquer spraying nozzle (used).

Mass., Cambridge—Viscol Co., 200 1st St.—Universal printing press, 14 x 22 in., Gally or Colt preferred (used).

Mass., East Boston (Boston P. O.)—Boston Sand & Gravel Co., 33 Condor St.—crane and coal hoist, steam operated preferred, also belt conveyor.

Mass., Roxbury (Boston, P. O.)—F. G. Whitaker, 180 Harrison Ave.—light woodworking machinery and small tools for shop.

Mich., Iron Mountain—Model Bakery, A. Rocheleau, Purch. Agt. — motor driven mixers, sifters, etc., also mechanical oven.

Mo., St. Louis — Brock Motor Car Co., 4418 Olive St.—air compressor, medium size, for garage.

Mo., St. Louis—J. Seidel Lumber Co., 2200 South Kingshighway—welding outfit.

Mo., St. Louis—The Tinshop, 6406 Grand Ave.—42 in. shears and tinner's brake.

N. Y., Ballston Spa—Ballston Knit Glove Co., Inc., W. Bellefeld, Mgr.—knitting machines for cotton gloves for addition to factory.

N. Y., Binghampton—W. H. Yager Co., Water and Henry Sts.—equipment for proposed warehouse.

N. Y., Buffalo—P. Simini, 53 Peach St.—equipment for bakery.

N. Y., Ellicottville—Fitzpatrick & Weller—machinery for novelty factory, to replace that which was destroyed by fire.

N. Y., Granville—H. G. Williams Slate Co.—one roll crusher for reducing slate from primary jaw crushers to granules size for screens.

O., Akron—Bd. of County Comrs., S. Porter, Clk., Court House—receiving bids until Jan. 2 for refrigerating plant in Children's Bldg., at the Springfield Lake Sanitorium.

O., Columbus—Dept. of Finance, J. P. Brennan, Supt. of Purchase, Room 75 State House—receiving bids until Jan. 11 for laundry equipment for state hospitals, here, at Massillon and at Athens; Longview Hospital, Cincinnati; also for Institution for Feeble Minded at Orient.

O., Martins Ferry—W. Heil, 1st St.—packing plant, cold storage and refrigeration equipment.

Okla., Tulsa—Clipson Cleaning & Dying Co., 915 South Main St., P. C. Clipson, Purch. Agt. — equipment for proposed laundry.

Pa., Greensburg—Railway & Industrial Eng. Co.—5 ton, 30 ft. span, overhead crane.

Pa., New Castle—Blair Strip Steel Co.—cranes for proposed plant.

Pa., Pittsburgh—A. M. Byers Co., 235 Water St. (pipe), A. Stauffer, Purch. Agt.—one locomotive crane for Girard, O.

Pa., Pittston—Pittston Press, 25-29 Market St. (newspaper), W. Hughes, Purch. Agt.—complete equipment and presses to replace fire loss.

Tex., Denton—W. M. Jagol Co.—15 x 24 in. jaw rock crusher.

Tex., Harlingen—Rangerville Gin Co.—machinery for cotton gin, capacity 50 bales per day.

Tex., Houston—Battery Shop, R. R. 2, Box 43C, D. A. Parsons, Proprietor—battery rectifier and complete charging outfit.

Wis., Manitowoc — Grimm Aluminum Casting Co., foot of 21st St.—casting machines.

Wis., Manitowoc — A. Schroeder, c/o Courthouse—heavy duty rock crushing machinery.

Wis., Milwaukee—H. Landauer, 137 8th St.—chain hoist and electric drill for garage.

Wis., Milwaukee—I. C. Lyman, 93 Michigan St.—conveying machinery for proposed $100,000 grain elevator.

Wis., Milwaukee — Manegold Mfg. Co., 3015 Highland Blvd., W. H. Manegold, Purch. Agt. — equipment, including woodworking machinery, for the manufacture of automobile body fittings.

Wis., Milwaukee — Milwaukee Woodwork Mfg. Co., 3320 Fond du Lac Ave.—additional woodworking machinery, including sander.

Wis., Portage—J. T. Henton (quarry)—rock crushing machinery, motor or gasoline engine driven.

Ont., Alexandria—C. Lacombe—bandsaw.

Ont., Maxville—H. J. Fraser—press and other equipment for repair and blacksmith shop.

Ont., Sault Ste. Marie—Dam Creek Lumber Co., Ltd., S. F. Postal, Evart, Mich., Purch. Agt.—saw and shingle mill equipment.

Ont., South River—Natl. Veneer & Lumber Co., Ltd.—woodworking equipment.

Ont., Williamsburg—P. E. Beckstead—equipment for blacksmith shop.

Que., Mont Joli—Rouleau, Ltd.—foundry machinery for expansion program.

Que., Montreal—E. Bessette, 540 Labreque St.—foundry equipment.

Que., Montreal—J. Christin & Cie., Ltd., 21 St. Julie St. (ginger ale, etc.)—bottling machinery and equipment.

Que., Montreal—Deforse & Co., 7 Hermine St.—circular saw, 4 ft. table.

Que., Montreal—L. De Jean, 492 Lagauchetiere St., W. (welding)—grinder.

Que., Montreal—Dubois & Co., Ltd., 62 St. Urbain St.—sash and door machines.

Que., Montreal—O. Foisy, 31 St. Catherine St., E.—equipment for job printing shop.

Que., Montreal—F. Goyer, 335 Davidson St.—tools and equipment for blacksmith shop.

Que., Montreal—H. Houle, 155 Vinet St.—pony job printing press (used).

Que., Montreal—J. Natovitch, 1219 St. Dominique St.—blacksmith shop equipment.

Que., Montreal—N. Poirier, 591 Marie Anne St., E. (cabinet maker)—wood lathe.

Que., Montreal—Red Star Refineries, Ltd., Canadian Cement Bldg.—machinery and equipment for oil refinery at Montreal East.

Que., Montreal—G. Rochon, 1148 Bellechane St., E.—equipment for saw and planing mill.

Que., Ste. Croix—Lotbruiere Wood Mfg. Co., J. C. Auger, owner — woodworking equipment, including molder.

Que., St. David de Levis—A. Begin—job printing press.

Que., St. Leon le Grand—D. Marin—sawmill equipment.

Que., St. Laurent—E. Gohier, 48 De l'Eglise St. (lumber)—ripsaw and bandsaw.

Que., St. Mathieu—E. Dionne—resaw, planer and bandsaw.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Pig-iron market very quiet. No. 2 foundry iron quoted as low as $20@$21 per ton at Birmingham. Iron and steel scrap buying active; prices tending upward. Tin plate demand fairly good; mills operating at 96 per cent of capacity. Fabricated structural steel prices still firm at $2.50 for plates and shapes and $2.40 per 100 lb. for bars, f.o.b. Pittsburgh.

Advances—Galvanized steel sheets advanced 5c. per 100 lb. at Pittsburgh mill. Copper demand better. Lead market strong; scarcity of metal; price up ¼c. per lb. in week. Zinc market tending upward; price rose 7½c. per 100 lb. in New York warehouses. Antimony ½c. per lb. higher than week ago.

Declines—Machine oil down about 0.7c. per gal. in certain grades; advance expected in Pennsylvania grades.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.05
Northern Basic	24.00
Southern Ohio No. 2	24.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	28.00
BIRMINGHAM	
No. 2 Foundry	22.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.25
Virginia No. 2	28.17
Basic	24.00
Grey Forge	24.00
CHICAGO	
No. 2 Foundry local	24.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	27.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.77
Basic	25.77
Bessemer	26.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.75
Cleveland	4.75
Cincinnati	5.00@7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh	New York	Cleveland	Chicago
No. 10	2.90@3.00	4.34	3.75	4.00
No. 12	3.00@3.10	4.39	3.80	4.05
No. 14	3.10@3.20	4.44	3.85	4.10
No. 16	3.30@3.40	4.54	3.95	4.20
Black				
Nos. 17 and 21	3.70	4.30@4.55	4.45	4.70
Nos. 22 and 24	3.75	4.35@4.60	4.50	4.70
Nos. 25 and 26	3.80	4.40@4.65	4.55	4.75
No. 28	3.85	4.50@4.75	4.65	4.85
Galvanized				
Nos. 10 and 11	3.90@4.00	4.50@4.80	4.70	4.85
Nos. 12 and 14	4.00@4.10	4.60@4.90	4.80	4.95
Nos. 17 and 21	4.30@4.40	4.90@5.20	5.10	5.24
Nos. 22 and 24	4.45@4.55	5.05@5.35	5.25	5.40
No. 26	4.60@4.70	5.20@5.45	5.50	5.55
No. 28	4.90@5.00	5.50@5.75	5.80	5.85

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4%; class A, plus 23%. Cast iron, standard sizes, 34% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0,17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.20
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.70
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	8.35
Floor plates	5.80	5.66	5.80
Cold drawn shafting or screw	4.40	3.90	4.30
Cold drawn flats, squares	4.90	4.40	4.80
Structural shapes (base)	3.64	3.46	3.30
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.10@3.15 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			13.87½
Tin, 5-ton lots, New York			47.50
Lead (up to carlots), St. Louis	7.75	New York	8.37½
Zinc (up to carlots), St. Louis	6.20@6.25	New York	6.67½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.20	27.00	28.50
Antimony (Chinese), ton spot	10.25	10.50	10.25
Copper sheets, base	21.00	21.00@21.25	23.00
Copper wire, base	16.25	19.00	16.25
Copper bars, base	20.00	22.50	19.50
Copper tubing, base	23.50	27.25	23.00
Brass sheets, base	17.75	22.00	18.75
Brass tubing, base	22.00	27.00	20.50
Brass rods, base	15.50	18.00	15.75
Brass wire, base	18.25	22.00	....
Zinc sheets (casks)	10.25	10.45	....
Solder (½ and ½), (case lots)	33.75	31.75	30.00
Babbitt metal (83% tin)	52.00	59.50	48@52
Babbitt metal (35% tin)	25.00	18.50	22@25
Nickel (ingot and shot)	29.00	....	....
Nickel (electrolytic)	32.00	....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00

Shop Materials and Supplies

METALS—Continued

Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.75	11.00	11.50
Copper, heavy, and wire	10.75	10.50	10.75
Copper, light, and bottoms	9.50	8.75	9.75
Lead, heavy	5.75	5.25	6.00
Lead, tea	4.75	4.00	5.00
Brass, heavy, yellow	7.00		7.25
Brass, heavy, red	8.75	9.25	9.00
Brass, light	6.25	5.00	6.25
No. 1 yellow brass turnings	7.00	5.75	6.75
Zinc	3.75	2.75	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$25.10	$22.85	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.40	18.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	13.00	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.11@0.14	$0.15	$0.14
Cotton waste, colored, per lb.	.09@.14	.12	.10½
Wiping cloths, 13¼x13¼, per lb	9.00	36.00 per M	.16
Wiping cloths, 13¼x20½, per lb.		52.00 per M	.16
Sal soda, per 100 lb.	2.40	2.25	2.65
Roll sulphur, per 100 lb.	3.60	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.95	1.00	.94
Lard cutting oil, 25% lard, per gal.	.55	.50	.67½
Lard oil, pure, per gal, 2 to 5 bbl. lots	.76	.73	.71
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.29	.35	.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq. in., per ply:			
Medium grade	30–10%	30–10%	30–10%
Heavy grade	20–5–2½	30%	20–5–2½%
Rubber and duck:			
First grade	50–10–5%	50–10%	40–10%
Second grade	60–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton		4.00@4.40
Coke, prompt foundry, Connellsville	per net ton		5.25@6.50
White lead, dry or in oil	100 lb. kegs	New York, 14.00	
Red lead, dry	100 lb. kegs	New York, 14.00	
Red lead, in oil	100 lb. kegs	New York, 15.50	

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0354	$0.0354	$0.0304
Cold finished shafting	per lb.	0.044	0.0465	0.039
Brass rods	per lb	0.155	0.1475	0.17
Solder (½ and ½)	per lb.	0.3375	0.31	0.275
Cotton waste	per lb.	.11@.14	.10@.13	.09@.11½
Washers, cast iron (¼ in.)	per 100 lb.	6.50	6.50	6.00
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.02
Lard cutting oil	per gal.	0.55	0.55	0.50
Machine oil	per gal.	0.29	0.297	0.33
Belting, leather, medium	off list	30–10%	30–10%	30–10%
Machine bolts up to 1x30 in.	off list	45%	40–10%	40%

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	45%	60%	50–5%
1½ and 1½x3 in. up to 12 in	15%	50–5%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	30%	$3.50 net	.....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	35%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65–5%
Lag screws, coach screws	45%	.....	60–5%
Square and hex. head cap screws	60%	70%	70–10%
Carriage bolts, up to 1 in.x30 in.	35%	50%	50–5%
Bolt ends, with hot pressed nuts	45%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 9/16 and smaller	65%	.....	.....
Semi-finished nuts, ⅝ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$4.00
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	4.00
Washers, round plate, per 100 lb. Off list	1.50	4.00	4.00
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.50	3.50
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.50	3.50
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.50	3.50
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.50	3.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	50%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.00	$3.60	$3.75
Cone heads, ditto (net)	5.20	3.80	3.85
1⅛ to 2-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.35	.....	0.15
½ in. diameter *EXTRA*	0.75	.....	0.50
1 in. long, and shorter *EXTRA*	0.75	.....	0.50
Longer than 5 in. *EXTRA*	0.50	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.45	.....	$3.70 base

Metal Working Shops

Ark., Hot Springs—M. J. Henderson, c/o Arkansas Trust Co., 621 Central St., will build a 3 story, 110 x 159 ft. garage. Estimated cost $50,000.

Calif., Alhambra — The Amer. Liquid Meter Co., 405 West Rose Rd., San Gabriel, plans to build a plant for the manufacture of measuring apparatus, here. Cost will exceed $75,000.

Calif., Corcoran — The Corcoran Union High School Dist. awarded the contract for the construction of a 1 story addition to manual training shops. Estimated cost $6,500.

Calif., Emeryville — Cozzens-Ball Inc., 48th St. and San Pablo Ave., Oakland, is having plans prepared for the construction of a 1 story garage on San Pablo Ave., here. Estimated cost $85,000. F. Soderberg, 276 Perkins St., Oakland, Archt.

Calif., Glendale (Los Angeles P. O.)—Tanner & Hall, 237 South Brand St., Buick Agents, awarded the contract for the construction of a 1 story, 75 x 156 ft. garage on Maple and Brand Sts.

Calif., Hanford — The Hanford Union High School Dist. is having plans prepared for the construction of a 1 story shops building, including automotive department, battery room, machine shops, etc. Estimated cost $30,000. Coates & Traver, Rowell Bldg., Fresno, Archts.

Calif., Hayward — Dohner & Galbraith, 1036 A St., plans to build a 1 story garage and automobile sales room. Estimated cost $40,000.

Calif., Long Beach—The Ocean View Garage, 34 Locust St., awarded the contract for the construction of a 1 story, 120 x 170 ft. garage on American Ave. and 20th St.

Calif., Los Angeles—M. A. Bresee, 941 Bon Brae St., awarded the contract for the construction of a 1 story, 60 x 150 ft. garage on Bronson Ave.

Calif., Los Angeles—R. C. Durant, 10910 East 14th St., Oakland, A. G. Waddell, 346 Hanover St., Oakland, et al., plan to build a factory for the manufacture of transmissions for Star motor cars, here. Estimated cost, including machinery, $2,500,000.

Calif., Los Angeles — The Hoyt Heater Co., 2838 East 2nd St., manufacturer of heaters, furnaces, etc., is having plans prepared for the construction of a 1 story, 70 x 200 ft. factory on Santa Fe Ave. Estimated cost $40,000. Walker & Eisen, Pacific Finance Bldg., Los Angeles, Archts.

Calif., Los Angeles—The Peerless Auto Agency, 1620 South Figueroa St., is having plans prepared for the construction of a 2 story, 114 x 150 ft. garage and salesroom on Gordon St. M. Swasey, Hibernian Bldg., Los Angeles, Archt.

Calif., Los Angeles—Retzer Bros., 1200 East 7th St., awarded the contract for the construction of a 1 story, 110 x 160 ft. garage on Pasadena Ave.

Calif., Oakland — R. McGahie & S. P. Palmer, Mills Bldg., awarded the contract for the construction of a 1 story garage on Piedmont Ave. Estimated cost $42,000.

Calif., Oakland—The Telegraph Ave. Corp., c/o M. I. Diggs, Archt., 19th St. and Telegraph Ave., has had preliminary plans prepared for the construction of a garage. Estimated cost $150,000.

Calif., Sacramento—The W. P. Fuller Co., 10th and R Sts., is having plans prepared for the construction of first unit of 2 story plant consisting of a warehouse and workshop, to replace the one which was destroyed by fire. Estimated cost $50,000. E. C. Hemmings & L. Stark, Ochsner Bldg., Sacramento, Archts.

Calif., San Francisco—The Amer. Can Co., Mills Bldg., awarded the contract for the construction of a garage and oil storage building on 20th and Illinois Sts. Estimated cost $42,000.

Calif., San Francisco—Lawson & Drucker, 450 Hayes St., are having plans prepared for the construction of a 2 story plumbing and heating shop on Tehana St. Estimated cost $40,000. Private plans.

Calif., San Francisco—J. Pasqualetti, 785 Market St., awarded the contract for the construction of a 2 story garage on Ocean Ave. Estimated cost $45,000.

Calif., San Francisco—J. Pelaprat, 202 14th St., plans to build a 1 story, 50 x 275 ft. garage on 18th St. near Sanchez St. Estimated cost $42,000.

Calif., San Francisco—A. Potter, c/o A. J. Fabre, Archt., 110 Sutter St., awarded the contract for the construction of a 2 story machine shop on Folsom St. near 9th St. Estimated cost $10,000.

Calif., Santa Monica—H. Malian, 1232 11th St., awarded the contract for the construction of a 1 story garage on Santa Monica Blvd. Cost will exceed $45,000.

Conn., Wallingford — The International Silver Co., Center St., awarded the contract for the construction of three 1 story, 45 x 125 ft. factory buildings. Estimated cost $60,000.

Conn., Waterbury—The Waterbury Rolling Mills, Inc., Watertown Ave., manufacturer of sheet brass, awarded the contract for the construction of a 1 story factory. Estimated cost $50,000.

Ill., Chicago—L. Bromberg, 1252 North Oakley St., will build a 1 story, 103 x 250 ft. automobile sales room and service station at 3250-56 Milwaukee Ave. Estimated cost $100,000. Noted Sept. 20.

Ill., Chicago—D. S. Klafter, Archt., 64 West Randolph St., is receiving bids for the construction of a 1 story, 150 x 150 ft. automobile service building and garage on Lawrence and Ridgeway Sts. for A. Natlin, c/o Architect. Estimated cost $75,000.

Ill., Chicago—The W. E. Garage Co., c/o Halperin & Braun, Archts., 19 South La Salle St., awarded the contract for the construction of a 2 story, 96 x 125 ft. garage at 1830-38 West Madison Et. Estimated cost $90,000.

Ill., Chicago — The J. J. Wright Motor Co., 353 East 55th St., awarded the contract for the construction of a 1 story, 105 x 180 ft. automobile service station and garage near Princeton and 55th Sts. Estimated cost $70,000.

Ind., Angola — The Standard Body Co. plans to build an addition to its automobile body plant. Estimated cost $200,000.

Ind., Bloomington — N. Hill is having plans prepared for the construction of a 2 story, 70 x 132 ft. garage. Estimated cost $50,000. J. L. Nichols, Bloomington, Archt.

Ind., Indianapolis — L. B. Millikin, 501 North Delaware St., awarded the contract for the construction of a 1 story, 97 x 107 ft. garage on 21st St. Estimated cost $50,000. Noted Dec. 6.

Ia., Sioux City—F. H. Clark, 609 Pierce St., awarded the contract for the construction of a 2 story, 100 x 150 ft. garage and filling station on 5th and Jennings Sts. Estimated cost $51,790.

Ky., Paducah—The Shelton Bros. Fdry. Co. plans to build a 1 story foundry for the manufacture of steam boat machinery. Estimated cost $40,000.

Mass., Charlestown (Boston P. O.)—E. A. Gillett & Sons, 286 Rutherford Ave., manufacturer of carriages, awarded the contract for the construction of a 1 story, 50 x 170 ft. machine and woodworking shop. Estimated cost $28,000. The owner also plans to build a 50 x 130 ft. addition.

Mass., Millbury—The New England High Carbon Wire Co. plans to build an addition to machine shop.

Mass., Worcester—H. Mandell, 33 Derby St., is having plans prepared for the construction of two 2 story, 60 x 125 ft. machine repair shops on Foster St. Estimated cost $60,000. H. L. Meacham 571 Main St., Archt.

Mo., St. Louis—The Warren Steel Casting Co., 3400 Maury Ave., awarded the contract for the construction of a 1 story, 60 x 200 ft. steel foundry. Estimated cost $60,000. Noted Nov. 29.

N. J., Camden—The Pennsylvania R.R., E. F. McClintock, master carpenter, Pennsylvania Offices, will receive bids until Dec. 26 for the construction of a 1 story, 86 x 150 ft. machine shop on Clinton St. Estimated cost $75,000. W. H. Cookman, Broad St. Sta., Phila., Pa., Archt.

N. J., Camden — The Standard Tank & Seat Co., 314 North Front St., manufacturer of plumbing supplies, awarded the contract for the construction of a 3 story, 44 x 54 ft. factory. Estimated cost $20,000.

N. Y., Yonkers — J. J. Hayes, Proctor Bldg., will build a 2 story, 100 x 100 ft. garage. Estimated cost $50,000.

N. C., Ashville—The Overland-Knight Co., Inc., is having plans prepared for the construction of a 4 story garage to contain 100,000 sq.ft. of floor space. Estimated cost $300,000. Smith & Carrier, Ashville, Archts.

O., Cleveland—The Curtiss-Ambler Realty Co., Arcade Bldg., is having plans prepared for the construction of a 1 story (ultimately 2 story), 60 x 160 ft. factory and garage at 2324 Prospect Ave. Estimated cost $50,000. W. E. Ambler, Pres. H. K. Ferguson Co., 4900 Euclid Ave., Archts. Auto Electrical Maintenance Co., c/o H. E. Page, Treas., 943 Chester Ave., lessee.

O., Cleveland—The P. A. Geier Co., 540 East 105th St., manufacturer of vacuum cleaners, awarded the contract for the construction of a 4 story, 80 x 240 ft. factory. Estimated cost $300,000.

O., Cleveland—A. P. Jones, 304 Alhambra Theatre Bldg., has had plans prepared for the construction of a 1 story, 70 x 70 ft. garage on East 71st St. and Cedar Ave. Estimated cost $40,000. Private plans.

O., Cleveland—G. Margolin, 2496 Derbyshire Rd., Cleveland Heights, is having plans prepared for the construction of a 2 story garage on Chester Ave., here. Estimated cost $60,000. M. Weis, 617 Union Bldg., Cleveland, Archt.

O., Cleveland—C. F. Neuberger, c/o Statler Hotel, is having plans prepared for the construction of a 1 and 4 story garage on a 60 x 90 ft. site at 1905 Prospect Ave. Estimated cost $100,000. A. F. Janowitz, 811 Prospect Ave., Cleveland, Archt.

O., Cleveland—The Peerless Motor Car Co., 2555 East 93rd St., awarded the contract for the construction of a 1 story, 96 x 196 ft. addition to its factory. Estimated cost $45,000.

O., Columbus—The Belt-Franklin Co., 224 East Gay St., plans to build a 3 story, 62 x 187 ft. garage and salesroom on East Broad St. Estimated cost $150,000. Engineer or architect not announced.

O., Uhrichsville—The Federal Collieries Co., Leader-News Bldg., Cleveland, manufacturer of sewer pipe, is building a 3 story, 112 x 286 ft. factory, a 48 x 80 ft. machine shop and a 42 x 82 ft. boiler room, here. Estimated cost $250,000. H. H. Felsmans, Secy.

Pennsylvania—The Bethlehem Steel Co., Bethlehem, plans a construction program to include construction of clay mixing and ladle house for blast furnaces; installation of coke screening system for three Franklin furnaces; coal spillage elevator at Rosendale coke plant; changes and additions to steel car plant, Franklin. W. M. Tobias, Genl. Purch. Agt.

Pa., Holmesburg (Phila. P. O.) — The Electric Development & Machine Co., Shellmere and Edmunds Sts., awarded the contract for the construction of a 1 story, 84 x 432 ft. machine shop. Estimated cost $75,000.

R. I., Pawtucket—The New England Machine & Electric Co., 31 Bayley St., awarded the contract for the construction of a 1 story, 75 x 120 ft. machine shop. Estimated cost $25,000.

Tenn., Knoxville—The Day-Evans Iron Wks., Inc., plans to build a 1 story, 75 x 160 ft. foundry for the manufacture of mine cars.

Tenn., Memphis—I. Landrum is building a 1 story, 60 x 85 ft. shop at 338-342 Adams Ave. Estimated cost $12,000. Southern Mchy. & Fdry. Co., lessee.

Tex., Fort Worth—The Gabert Auto Wks., Throckmorton St., awarded the contract for the construction of a 2 story, 110 x 200 ft. garage. Estimated cost $50,000.

Tex., San Antonio—E. Friedrich, 802 East Commerce St., will build a 140 x 230 ft. factory for the manufacture of show cases, restaurant refrigerating systems, etc., on Paso Hondo St. Estimated cost $40,000.

W. Va., Williamson—The Universal Motor Corp. awarded the contract for the construction of a 1 story, 90 x 150 ft. garage. Estimated cost $40,000.

Wis., Clintonville—A. O. Haase is having plans prepared for the construction of a 2 story, 30 x 50 ft. garage and repair shop. Estimated cost $45,000. Private plans.

Wis., Lakemills — The Overland Garage Co., c/o O. W. Farmer, Mgr., awarded the contract for the construction of a 1 story, 50 x 70 ft. garage. Estimated cost $40,000.

Wis., Madison — The Madison Medical Assn., c/o R. S. Ingersoll, Lakeside St., will build a 2 story, 45 x 100 ft. garage, etc. Estimated cost $50,000. Noted Nov. 1.

Wis., Milwaukee — The Yunker-Hansen Sales Co., 6516 Greenfield Ave., awarded the contract for the construction of a 1 story, 40 x 120 ft. garage. Estimated cost $40,000.

Wis., Wausau—The Wausau Parts Mfg. Co., c/o W. A. Schoefield, Mgr., plans to build a 2 story, 60 x 90 ft. factory for the manufacture of automotive equipment. Estimated cost $50,000. Engineer or architect not selected.

N. B., St. Stephen—The Hollingsworth & Whitney Co., 185 Devonshire St., Boston, Mass., is having plans prepared for the construction of a paper and pulp plant, including machine shop, etc., on the St. Croix River, here. Estimated cost $300,000. Private plans.

Ont., Wiarton—W. McCrabb plans to rebuild garage and repair shop which was destroyed by fire. Estimated cost $40,000.

Que., Outremont — The Bernard Ave. Garage Co. is having plans prepared for the construction of a 90 x 167 ft. garage on Bernard and De L'Epee Sts. Estimated cost $250,000. Perfrault & Godbois, 2100 Park Ave., Montreal, Archts.

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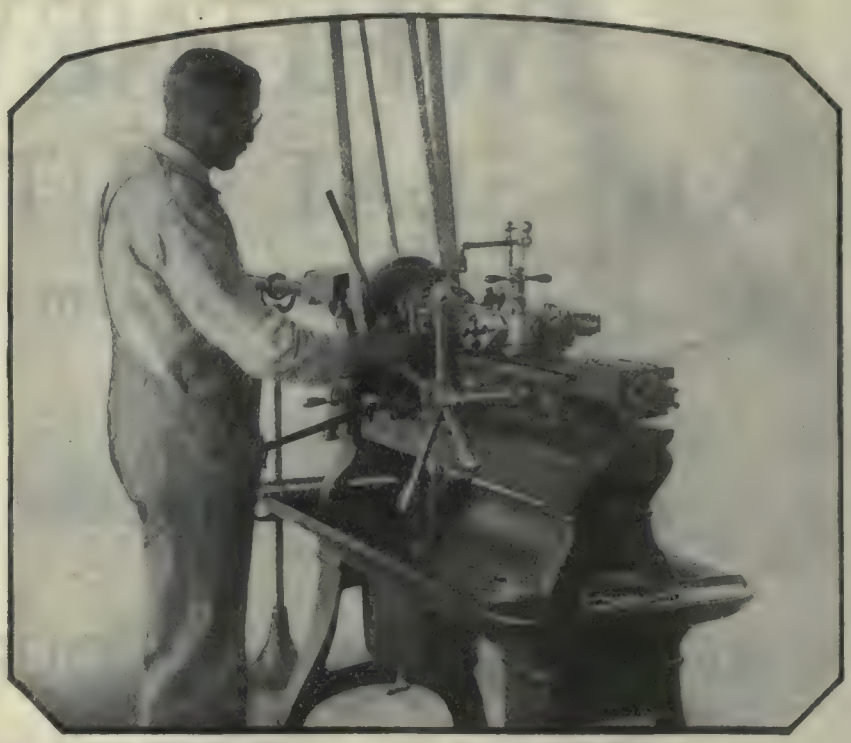
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To insure accuracy in the finished work, a vertical taper bolt rigidly locks the turret as each tool swings into position. This bolt, located near the edge of the turret and below the tool, accurately aligns each turret hole with the spindle.

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Use Brown & Sharpe Depth Gauge No. 600 on Screw Machine Work

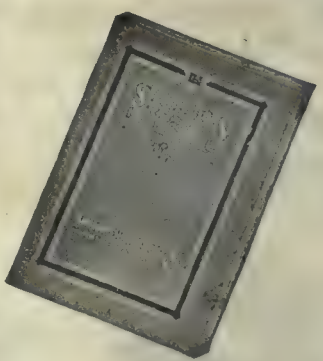
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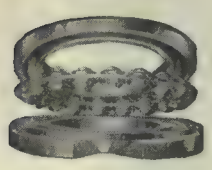
Double-acting thrust bearing, flat seats (grooved races) 2100-F Series



Single-acting thrust bearing, flat seats (grooved races) 1100-F Series



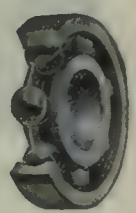
Single-acting, self-aligning thrust bearing 1100 Series



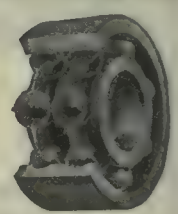
Single-acting, self-aligning thrust bearing, leveling washer. 1100-U Series



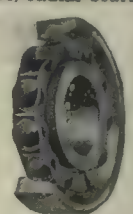
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Double-row, deep-groove Standard type, radial bearing



Angular contact bearing, combination radial and thrust



Double-row, maximum type, radial bearing



Single-row, maximum type, radial bearing

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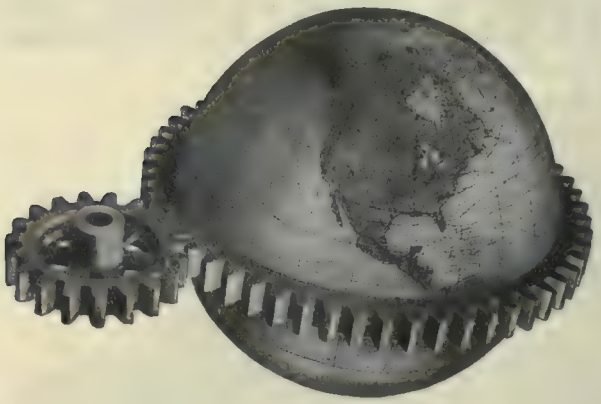
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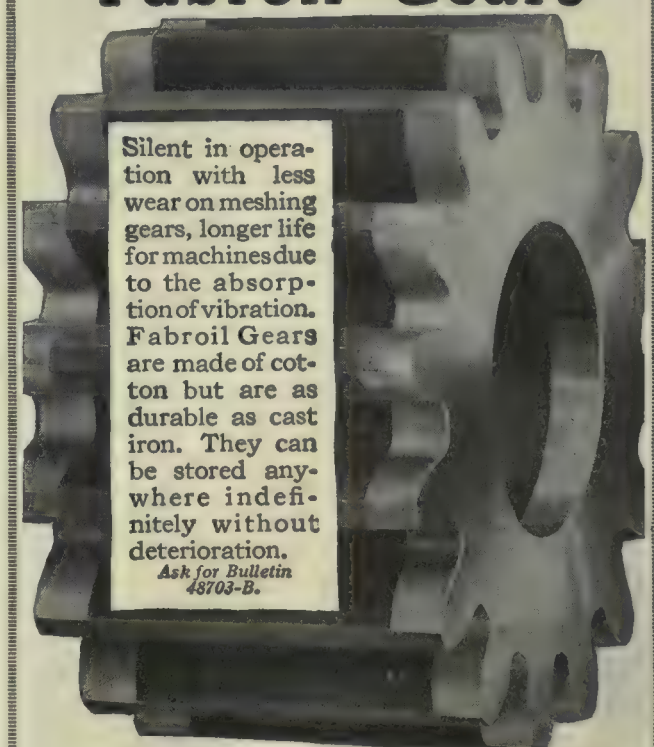
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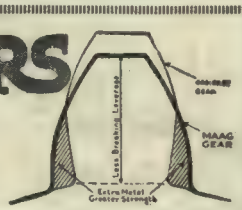
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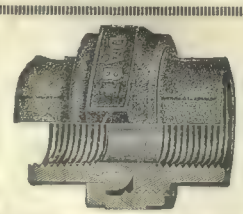
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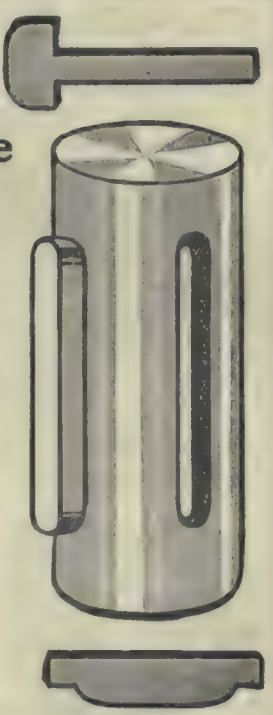
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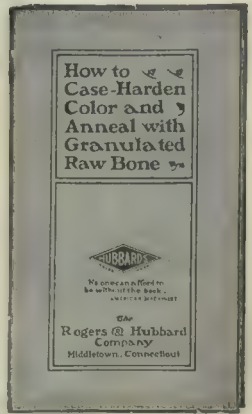
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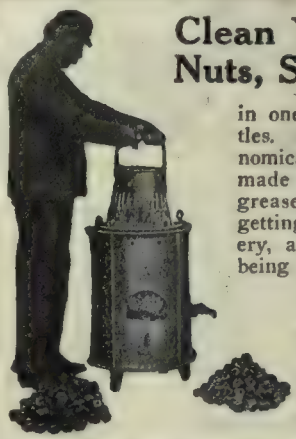
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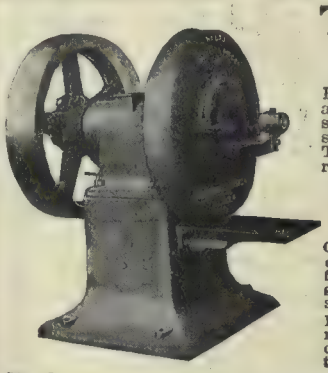


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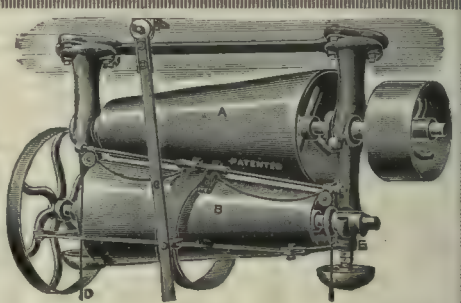
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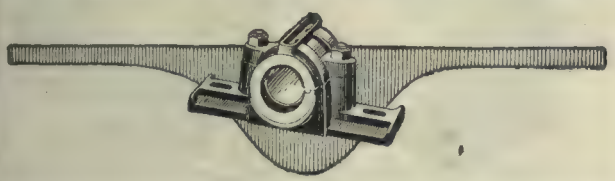


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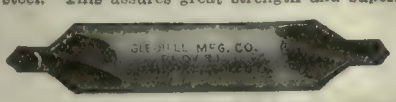


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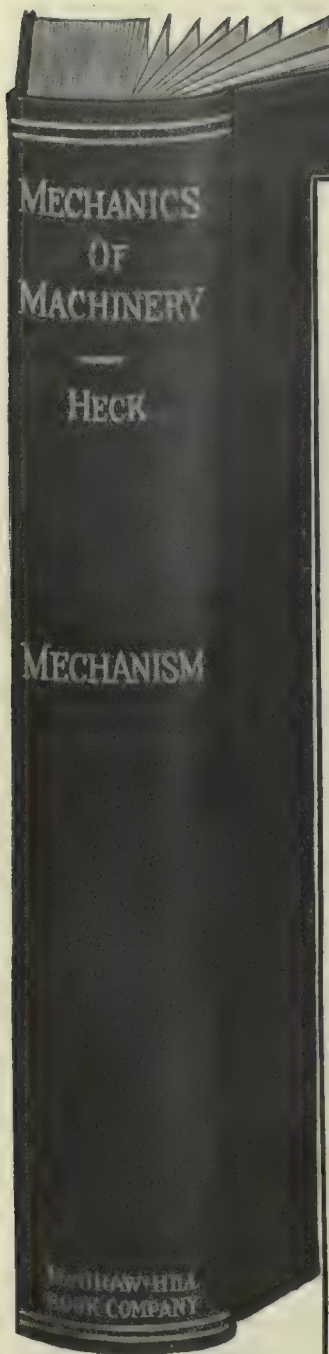
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Rutgers College

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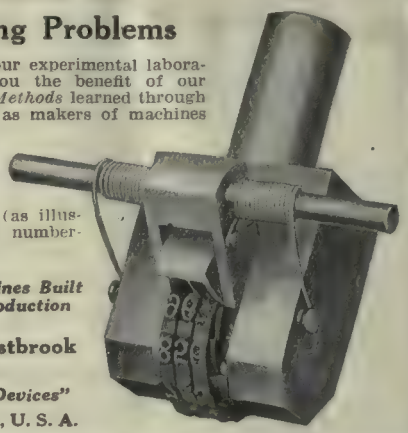
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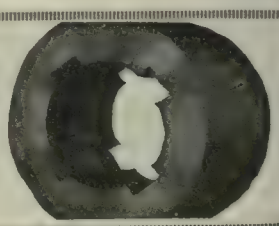
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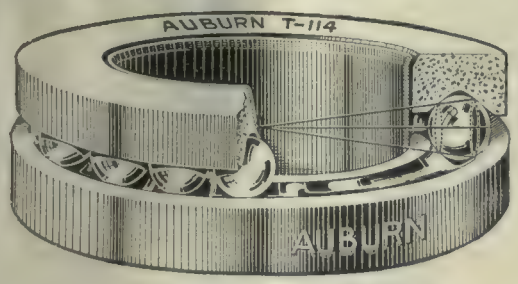
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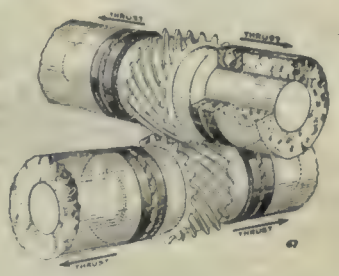
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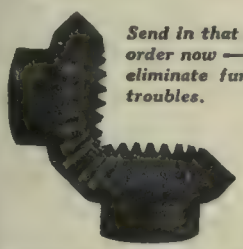
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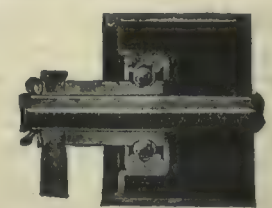
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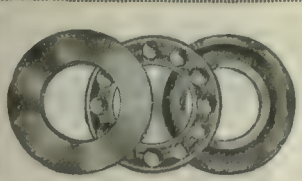
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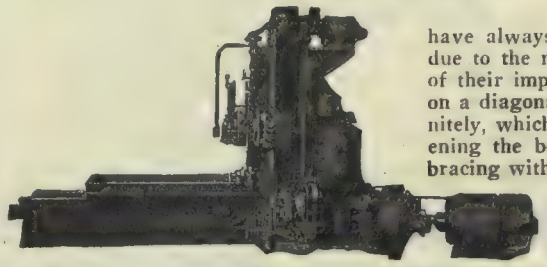


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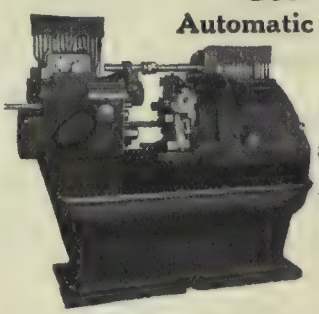
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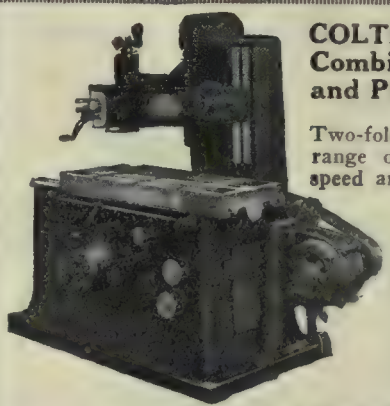
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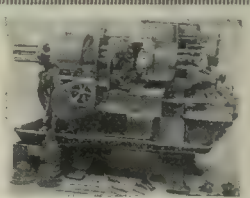
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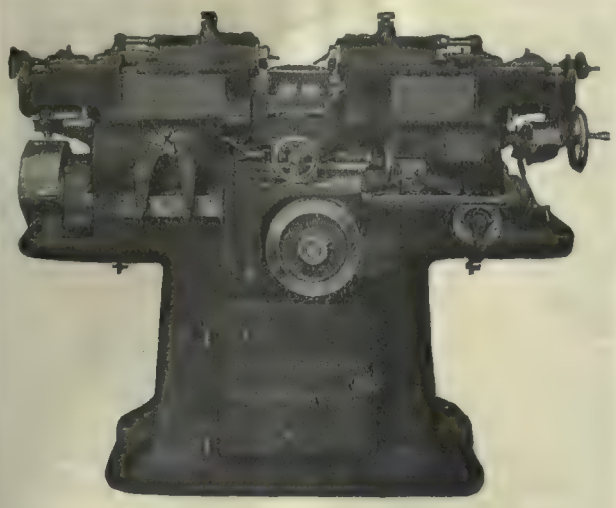
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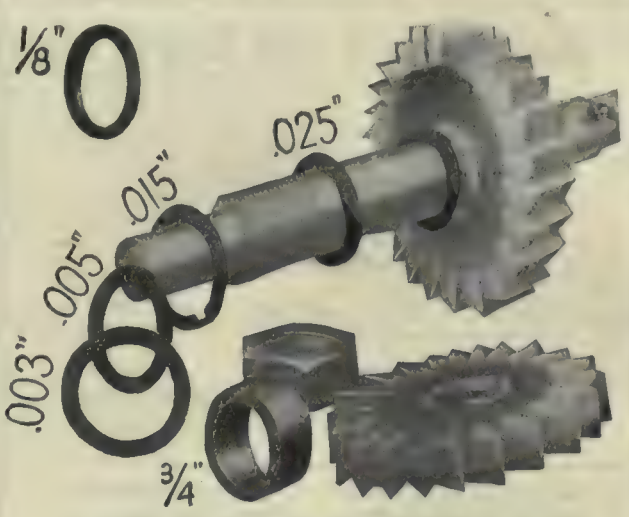
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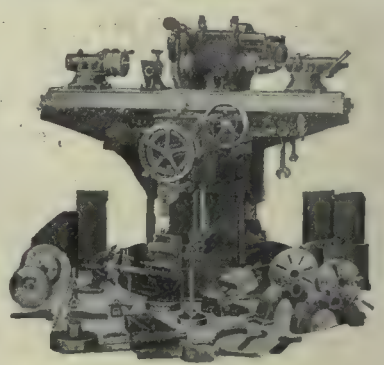
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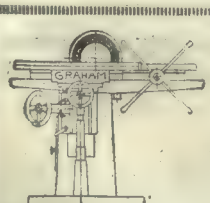
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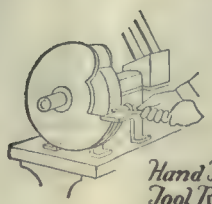
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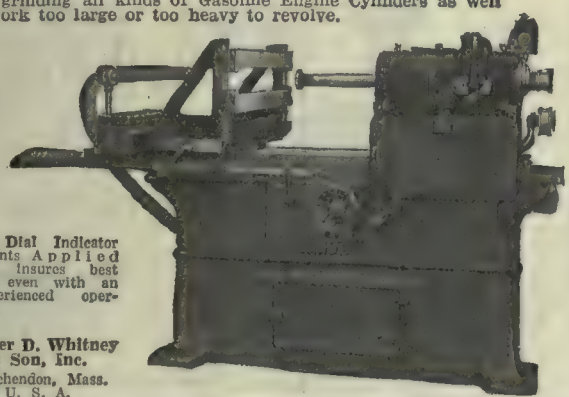


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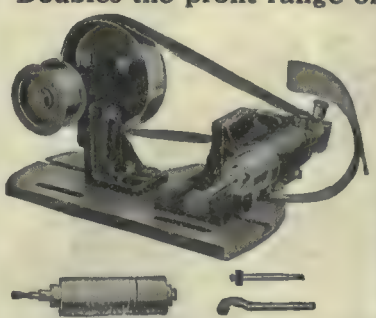


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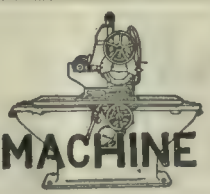
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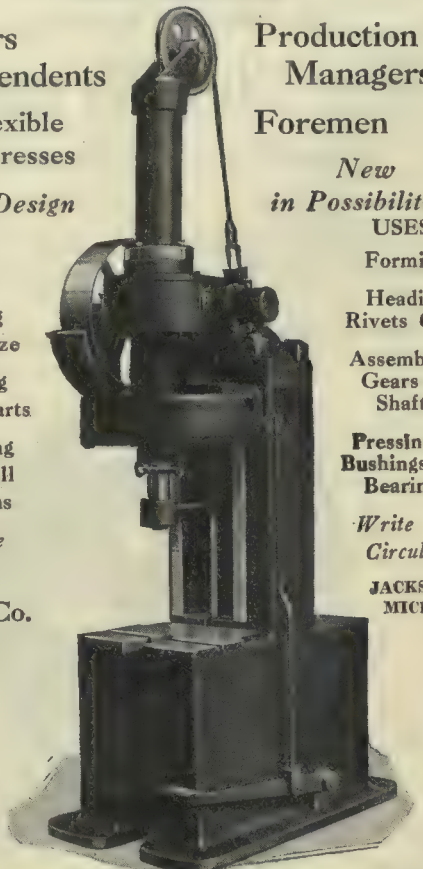
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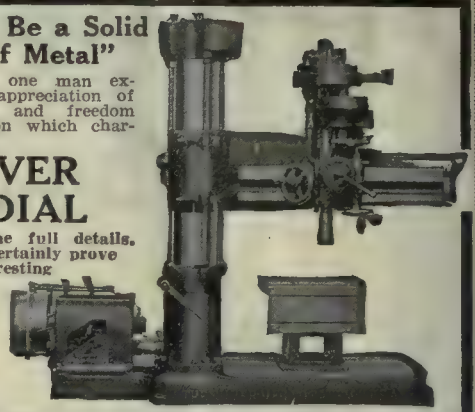
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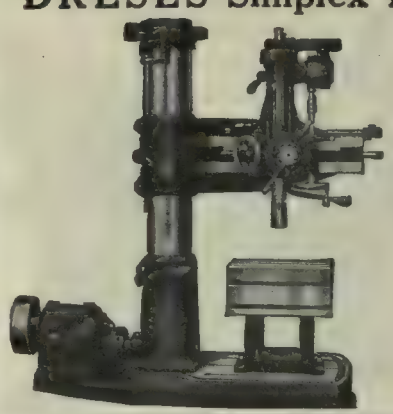
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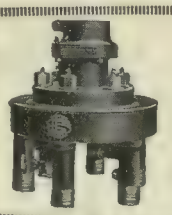


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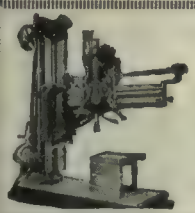
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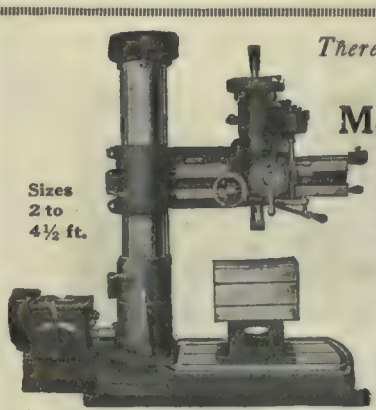
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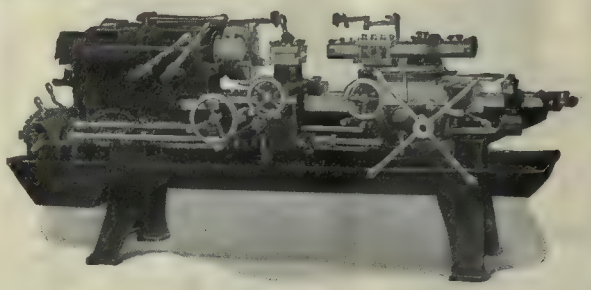
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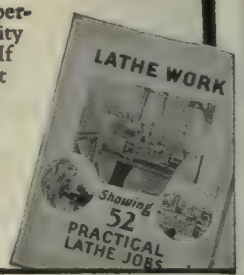
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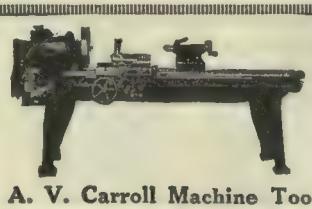
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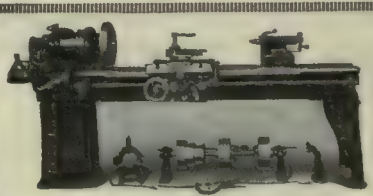


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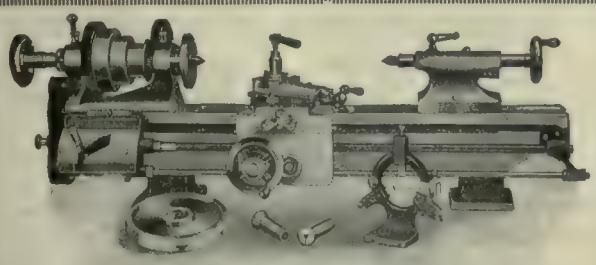
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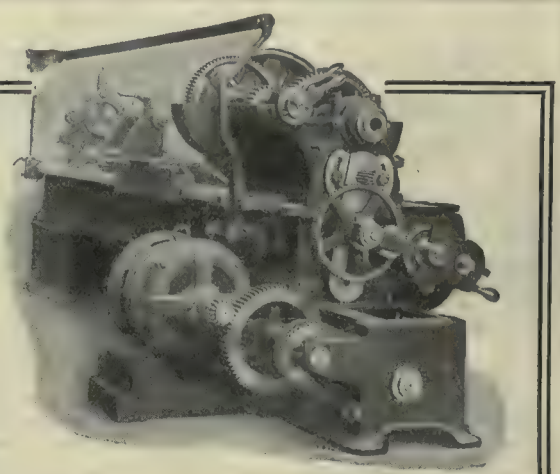
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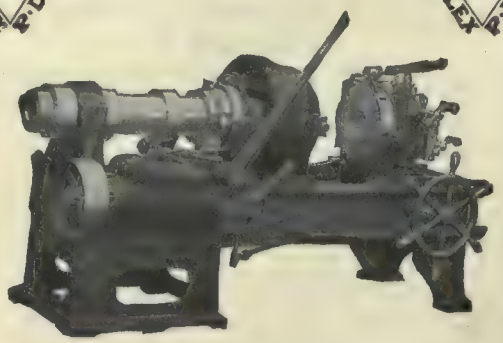
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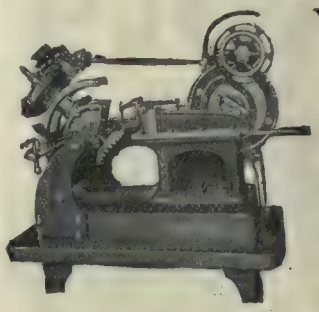
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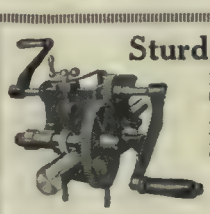
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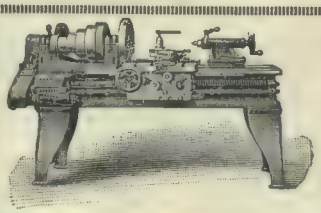
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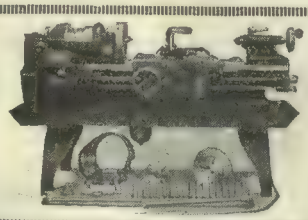


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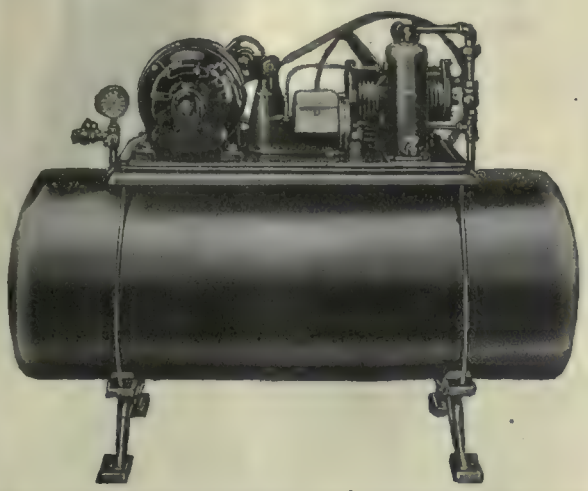
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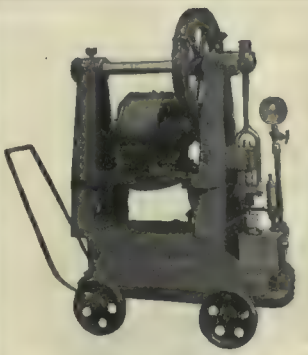
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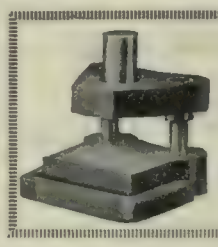
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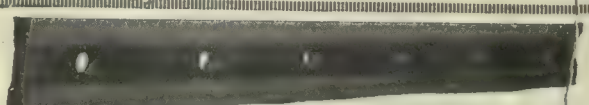


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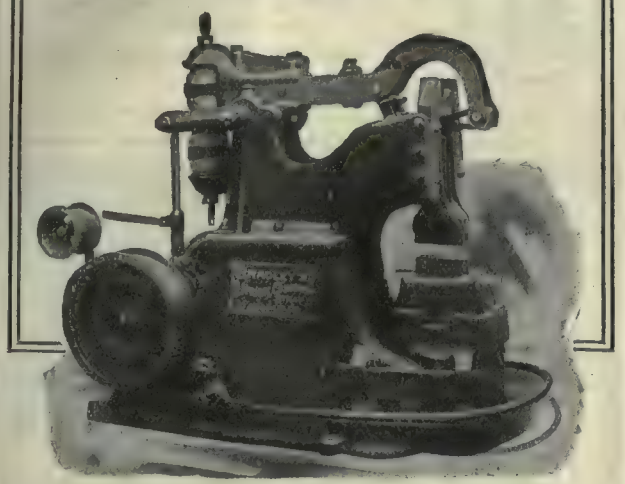
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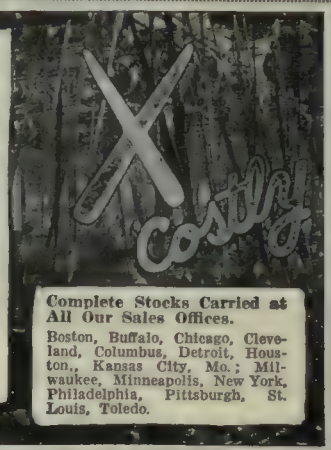
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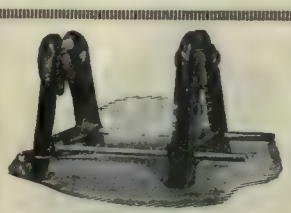


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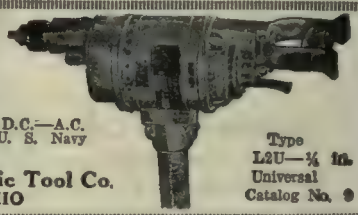
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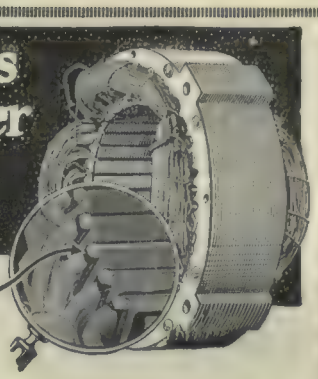
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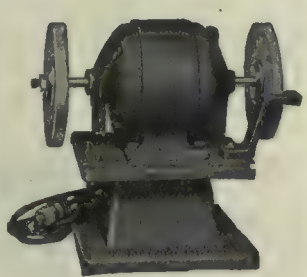
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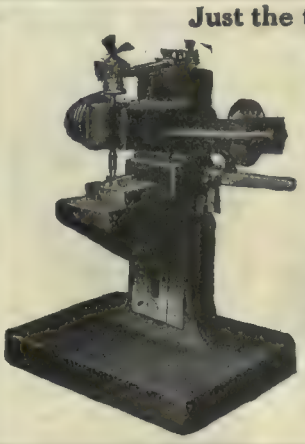
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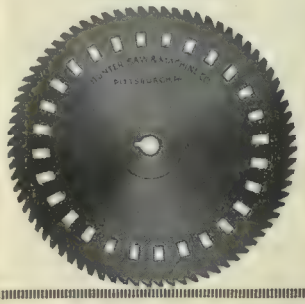
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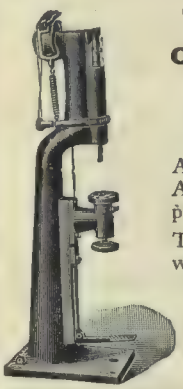




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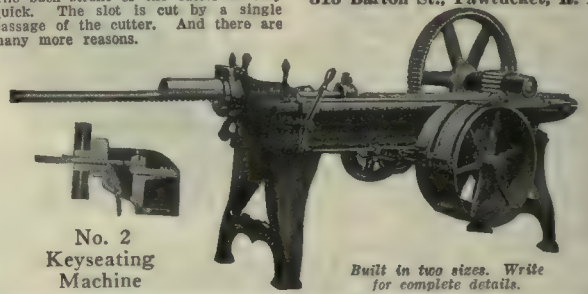
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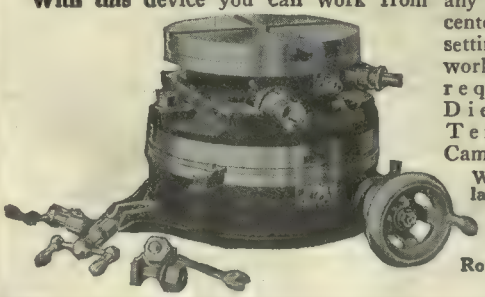
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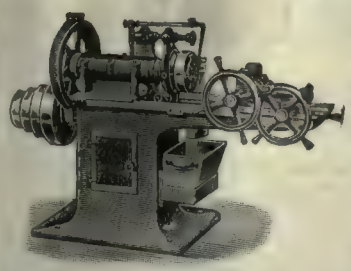
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Notice the big, roomy work table.

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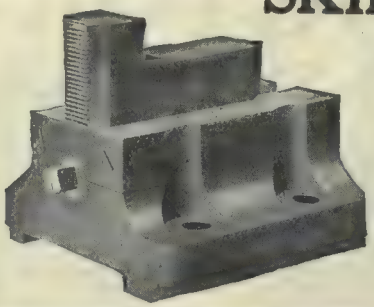
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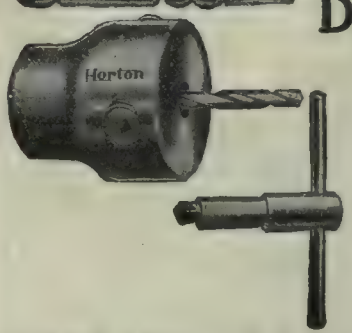
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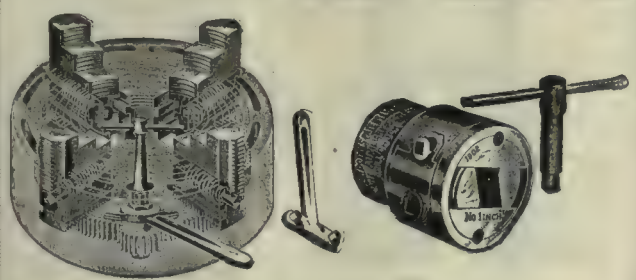
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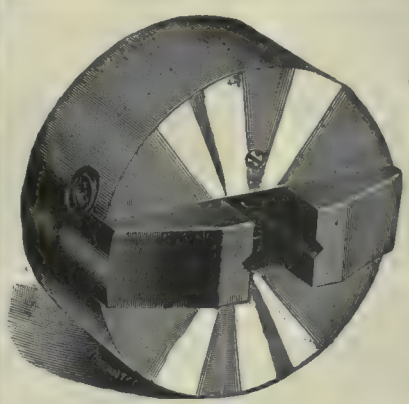
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Especially Good for Roughing and Finishing Taps, Running Solid Dies Up Against a Shoulder, etc.

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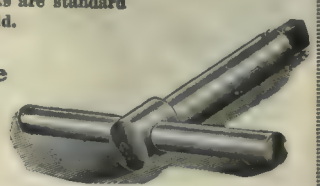
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The Ney "Positive Grip" replaces eighteen ordinary collets

The six, interchangeable one-piece spring tempered jaws of the NEY "POSITIVE GRIP" COLLET CHUCK, covers the range of eighteen ordinary collets.

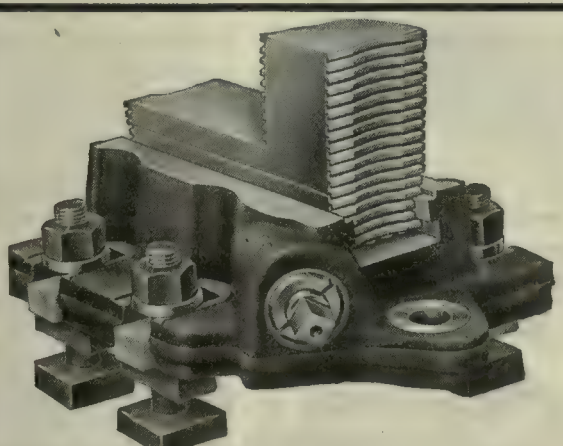
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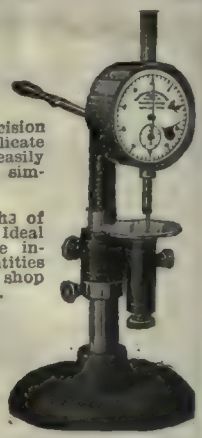
Randall & Stickney
Indicators and Gauges



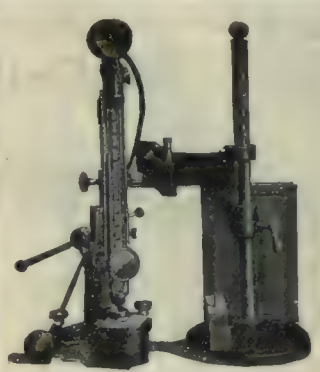
for every kind of precision measurements on duplicate parts. Quickly and easily applied. Unsurpassed in simplicity and durability.

Calibrated in thousandths of an inch or metric scale. Ideal for the rapid, accurate inspection of large quantities of work. No modern shop should be without them.

Write us today.



Randall & Stickney
Waltham, Mass., U. S. A.



International Standard Scleroscope (Hardness Tester)

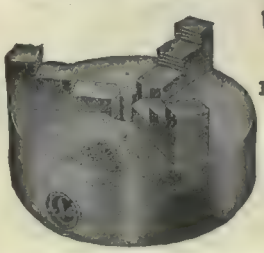
The Scleroscope

is now used in hundreds of plants for its accuracy in hardness testing. It is direct reading and can readily be operated by anyone. Ranges from softest metals to hardest steels without adjustment. It is invaluable in ordering materials to specifications. The free booklet will interest you.

The Shore Instrument & Mfg. Company
Van Wyck Ave. and Carrl St.
Jamaica, N. Y.

We Make Nothing But Chucks

Union Chucks are always "up to the minute." Our entire efforts are devoted to the development of chucks and every dollar expended in a Union assures ample returns in service. Correct design and proper materials give Union Chucks the stamina to stand hard usage.



Union Manufacturing Co.
26 Cortlandt St., N. Y.
New Britain, Conn., U. S. A.
Makers of a Complete Line of Chucks



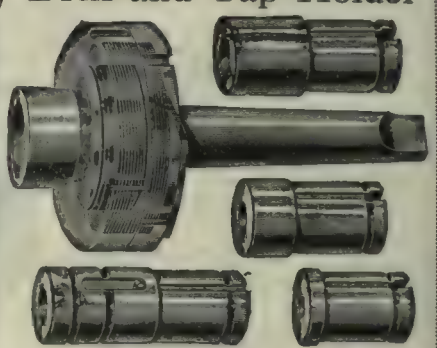
Our Catalog shows full line. Send for your copy.

The Safety Drill and Tap Holder

is the only attachment for the purpose that gives universal satisfaction and is Unequaled for Efficiency, Convenience, Rapidity, Accuracy and Simplicity.

Can be furnished with special sockets with friction set to carry one or two sizes of taps, useful if sizes are constantly changing.

Nothing to *break* or get out of *order*. Made in 4 sizes covering, from 0 to 2½ in diameter.



The Beaman & Smith Co., Providence, R. I., U. S. A.
Builders of Boring and Milling Machines, and Special Machines for such Purposes Constructed.

Almond PRODUCTS

Geared Drill Chucks
Standard Drill Chucks
Independent Lathe Chucks
Geared Scroll Lathe Chucks
Combination Lathe Chucks
Right Angle Transmission
Flexible Steel Tubing
Flexible Arms
Micrometers
Fine Mechanical Tools

Illustrative Descriptive Bulletins Mailed Upon Request

T. R. *Almond* Mfg. Co., Ashburnham, Mass.



Model B (Five wheels)
Model B-6 (Six wheels)

MODEL B GEAR COUNTER
will give you your accurate production. Tested 20,000 per hour.

Send for circular

R. A. HART MFG. CO., 191 WILSON COURT BATTLE CREEK, MICH.

RAPID *Slip Drill CHUCK*
Drives Straight and True
Cannot Injure the Collet

American Equipment Company, Detroit

CHUCK WITH AIR

The Lavoie Air Chucks are very simple in construction and are easy to operate. The grip is absolutely certain, as is the release. Made in seven types with six styles of jaws.

Write for particulars.

FRONTIER CHUCK & TOOL COMPANY
34 Letchworth St., Buffalo, N. Y.



ALLEN Safety Set Screws

30% Extra Strength over broached hollow screws—the only other kind made. By a patented process we increase the density of the steel around the socket-holes, so that even the smaller sizes will stand all the strain the best made wrench can apply. The Allen process makes deep, perfectly-formed socket-holes—**no chips in the bottom.** The entire length of the ALLEN is utilized either for solid metal at the point, or depth of socket for the wrench. All sizes in stock from ¼ in.; to 1½ in.; any length, point or thread. Also Pipe Plugs Socket Head Cap Screws. Tap Extensions and Tire Wrenches—Allen process. **Complete descriptive catalogue on request.**

THE ALLEN MFG. CO. 129 SHELDON ST. HARTFORD, CONN

SMOOTH-KUT

The only helical flure EXPANSION REAMER ever produced.



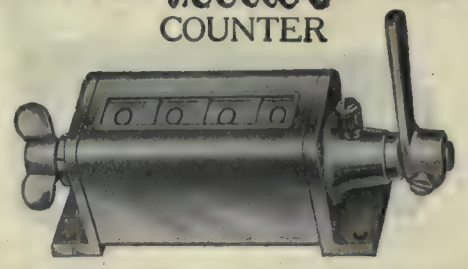
The greatest EXPANSION REAMER ever produced. 1924 is a SMOOTH-KUT year. This tool is sold under absolute guarantee as the greatest EXPANSION REAMER *ever placed on the market.*

MILLERSBURG REAMER & TOOL CO.
MILLERSBURG, PA.

Summed Up in the Production-Report

Hold the yardstick on your machine's *usefulness.* Get the measure of its value as a *producer.* Gauge the skill of your operating methods, and the energy of the operator where this is a factor. You'll have a report on them all—automatically—from a

Veeder COUNTER



The large Set-Back Revolution Counter above records the output of any machine where a shaft-revolution indicates an operation. Sets back to zero from any figure by turning knob once 'round. Supplied with from four to ten figure-wheels, as required. Price, with four figures as illustrated, $10.00—subject to discount. Equipped with lock and keys to prevent tampering with the record, $2.00 extra (*Cut ½ size.*)

Write for the 80-page counter booklet.

THE VEEDER MFG. CO.

51 Sargeant Street Hartford, Conn.

Eliminate the "Cut and Try" Method!



In your shop with a Boston Universal Angle Plate. Set-up time is non-profit time. This tool eliminates the making of costly jigs and fixtures.

UNIVERSAL Angle Plate

Converts a Plain Machine into a Universal. Equally good on tool or production work. Any angle instantly available — Vernier graduations insure utmost precision. Heavy and rigid.

Let us tell you more about them.

Boston Scale & Machine Company
100 Ruggles St., Boston, Mass.

Here's "automatic" skill

This Model D Federal Dial Indicator

is more accurate and more economical than "human" skill. The dial is graduated in .0005 in., making it easy to detect errors of .00025 in. or less. It is designed particularly to withstand the strenuous conditions of regular shop service.

Let us send you the bulletin showing the complete Federal Line.



Model D *Pat. applied for*

Federal Products Corporation
Providence, R. I., U. S. A.



COWLES CUTTERS
FOR
INCREASED PRODUCTION
DURABILITY and ACCURACY
COWLES TOOL COMPANY
Cleveland, Ohio
Cutter Designers and Manufacturers

TAYLOR-NEWBOLD SAWS
and
MILLING CUTTERS

The Tabor Manufacturing Company
Philadelphia, Pa.

TRADE MARK DELTA

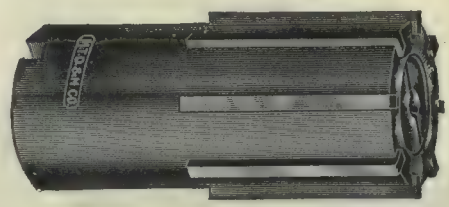
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HIGHEST GRADE FILE MADE. THE FILE YOU WILL EVENTUALLY USE

DELTA FILE WORKS, Philadelphia

FILES OF QUALITY

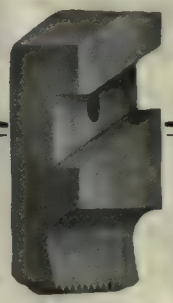
Blind Holes Can Be Reamed *with* "MORSE" One Lock Reamers



They can be adjusted from 1/64 inch to 5/64 inch, according to size. The adjustment is quick and positive, and the work done is accurate. Made with either Carbon or High Speed blades.

THE GENUINE MORSE DRILLS ENCIRCLE THE GLOBE

MORSE
TWIST DRILL & MACHINE CO.
NEW BEDFORD, MASS., U.S.A.



Why H & G *Dieheads Always* Produce

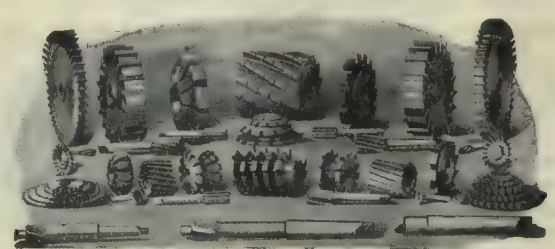
1. Chasers are hobbed. Hobbed chasers fit the screw as a nut fits the lead screw. This is the only correct method by which accurate results can be secured.
2. H & G chasers are hobbed with Hanson Hobs. Hanson Hobs are finished after hardening, accurate in lead and thread form and perfect in finish—all of which is reproduced in the threads cut by H & G chasers.
3. The chasers are supported in the diehead by cams directly over the cutting point and cannot give under the strain of cutting.
4. The entire body and all parts of H & G Dieheads are hardened and accurately ground. Chaser slots are tested with go and no-go gauges having less than one-thousandth difference.

New 96-page Catalog

This new miniature catalog contains much valuable information relative to thread cutting in addition to a complete description of H & G Dieheads which are adaptable to all machines.

THE EASTERN MACHINE SCREW CORPORATION
22-42 Barclay Street, New Haven, Conn.
Die Heads That Revolutionized Threading

H&G



NATIONAL CLEVELAND
"Extra Service" Tools
Milling Cutters, Spur and Worm Gear Hobs, Reamers, Interchangeable Counterbores, Special Tools.

The National Tool Co., Cleveland, Ohio
New York, 126 Chambers St.; Philadelphia, 1215 Filbert St.; Chicago, 26 S. Jefferson St.; Detroit, 400 Marquette Bldg.; Pittsburgh, 910 May Bldg.; Cincinnati, 141 E. 4th St.; Buffalo, N. Y., 844 Ellicott Sq.; Atlanta, Ga., 34 So. Forsyth St.



NESTOR (metal) File Handle

The Nestor File Handle is a light steel stamping, formed to fit the hand. The positive wedge grip fits any file up to 8-in. size.

Grips tightly—no danger of injury from sharp tangs—yet can be easily removed—they never have to be discarded.

So moderately priced that every factory using small files can afford to have a handle for every file.

Try them out in your own shop. Send $1.00 for a trial order of 36. Interesting discounts to Dealers.

Nestor Manufacturing Company
40 W. 13th Street, New York City

TAPS and DIES

REGISTERED TRADE-MARK C

The Famous "Carpenter Quality"
The Choice of Experts—make it yours!
J. M. Carpenter Tap and Die Company
Oldest Tap and Die Makers in America
Pawtucket Rhode Island

TWIST DRILLS, CUTTERS, REAMERS AND SPECIAL TOOLS
NATIONAL
TWIST DRILL & TOOL CO.
DETROIT, U.S.A.

BUCKEYE

Twist Drills, Reamers and Special Tools
THE BUCKEYE TWIST DRILL CO., ALLIANCE, O.
Chicago Office, 542 West Washington Blvd.

A slight tap on the locking wedge will positively lock a

LOVEJOY
Inserted Cutter Tool



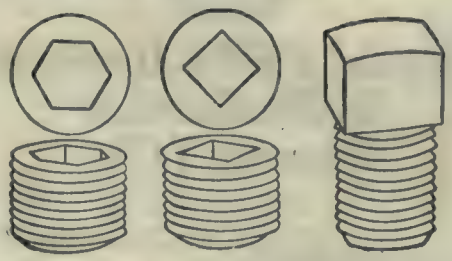
When locked, the Lovejoy is as rigid as a solid forged tool. Yet it is adjustable for wear, which means that it **lasts three** or **four times as long** as a solid tool—a real economy worth investigating.

Let us send you our catalog and price list.

LOVEJOY TOOL COMPANY, INC.
SPRINGFIELD, VERMONT, U.S.A.

AGENCIES:
The Chadwick Co., 549 W. Washington Blvd., Chicago, Ill. For British Isles: Selby Engineering Co., 92 Fenchurch St., E. C. 3. For France, Belgium and Spain: F. Auberty & Co., 182 Rue Lafayette, Paris, France.

What's the matter with these set screws?



They easily loosen
They split and crack
They mushroom

because they expand when they are tightened by the wrench—

And that is where





TRADE MARK
BRISTO
REG. U. S. PAT. OFFICE
Safety Set Screws Differ

They actually **contract** when tightened and the metal **expands** when the wrench is released, which action automatically locks them in place so that they cannot loosen. Do not mushroom, crack, split or fail from any cause. Special heat treated steel.

Send for Bulletin B-810

The Bristol Company, Waterbury, Conn.

Branch Offices:
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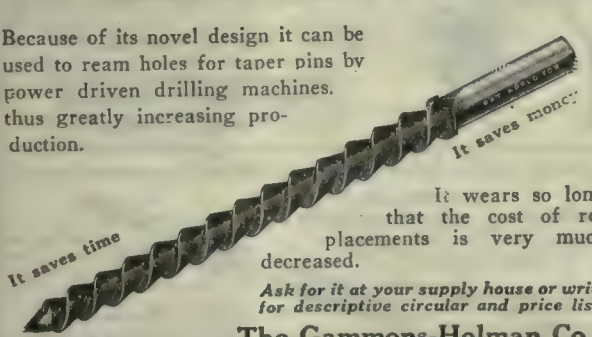


Cutters for every conceivable operation from plain milling to complicated gang cuts. Standard cutters of all kinds carried in stock. Specials to your specifications from blue prints.

The Sommer & Adams Co.
18511 Euclid Ave., Cleveland

The Gammons Taper Pin Reamer

Because of its novel design it can be used to ream holes for taper pins by power driven drilling machines. thus greatly increasing production.



It wears so long that the cost of replacements is very much decreased.

Ask for it at your supply house or write for descriptive circular and price list.

The Gammons-Holman Co.
Manchester, Conn.

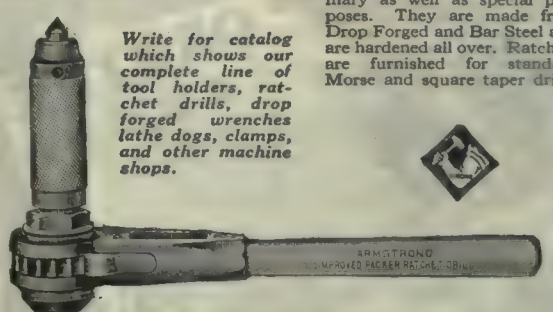
ARMSTRONG
RATCHET DRILLS



Every shop finds occasions where hand drilling is quicker and more economical than machine drilling, and every shop should be equipped with Armstrong Ratchet Drills.

Armstrong Ratchet Drills are built in styles to meet all ordinary as well as special purposes. They are made from Drop Forged and Bar Steel and are hardened all over. Ratchets are furnished for standard Morse and square taper drills.

Write for catalog which shows our complete line of tool holders, ratchet drills, drop forged wrenches lathe dogs, clamps, and other machine shops.



ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. Francisco Ave., Chicago, U. S. A.



Would a 64% Increase in Production Interest YOU

—particularly if this were possible solely by the adoption of a new development in screw cutting oil?

In a recent 30-day test at the plant of one of the largest and foremost manufacturers of automobile equipment in the world

D. A. STUART & CO.'S

"SUPER-KOOL"

SCREW CUTTING OIL

proved of such unexpected value in one of the largest departments, its use was immediately extended throughout the plant. (Name furnished on request.)

While it is not always possible to show a 64% increase in production through the use of Stuart's "Super-Kool" IT IS POSSIBLE in practically every case to substantially reduce costs and to improve shop conditions.

Can YOU afford NOT to test this remarkable new development? Order a trial drum of "Super-Kool" Base today! Stipulate on your requisition that the oil is not to be paid for unless found 100% satisfactory in handling your particular requirement.

D. A. STUART & CO., Inc.
2733 S. Troy St., Chicago, Ill.
ESTABLISHED 1865
Warehouses in Principal Cities

Style D. Opened.

You can't expect service from bearings—

if they are choked up with grit and dirt. There's one sure way to keep them clean—Fit Tucker Oil Hole Covers.

Catalog on request.

Style G. Opened.



W. A. & C. F. TUCKER, Hartford, Conn., U. S. A.
FOREIGN AGENTS: Fenwick Freres & Co., Paris, France
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THE HINGE

GITS OIL CUPS



Give perfect satisfaction where others fail. State style and size in which you are interested, and we will send free samples and catalog.



Gits Bros. Mfg. Co.
1940 S. Kilbourne Ave., Chicago

For Convenience Economy, Construction

and long lasting qualities the

Bennett Handy Top Oil Cups





have no superior. The attached top cannot be mislaid or lost and when in place is positively dust proof. Made for thread or drive fit in styles and sizes to suit your needs. Catalog M shows our full line—send for copy.

BAY STATE STAMPING CO.
380 Chandler Street, Worcester, Mass.

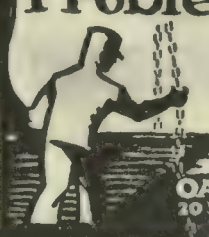
MINOLARD

If you are sincerely interested in cutting costs with a universal cutting oil—let us send a generous sample of Minolard—made by the makers of "Economy" grinding lubricant. Just a postcard will do—mail it today.

The White & Bagley Co.
Worcester, Mass., U. S. A.

OAKITE CLEANS

Put your Cleaning Problems up to us!



OAKLEY CHEMICAL CO.
10 THAMES STREET, NEW YORK



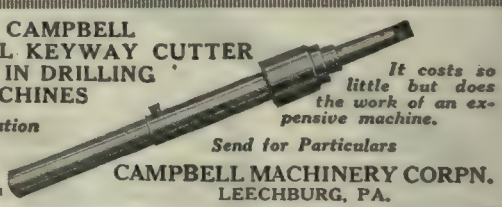
Don't Waste Oil

On Countershafts and Loose Pulleys. Eliminate them by using Mule-Pull Clutches. *Send for circular.*

Brown Engineering Co.
115 N. Third St., Reading, Pa.

CAMPBELL INTERNAL KEYWAY CUTTER FOR USE IN DRILLING MACHINES

Is a Revelation in Compact Machine Tool Construction



It costs so little but does the work of an expensive machine.

Send for Particulars

CAMPBELL MACHINERY CORPN.
LEECHBURG, PA.



Let Us Broach It

We guarantee to reduce your cost by broaching. Consult us on your broaching problems.

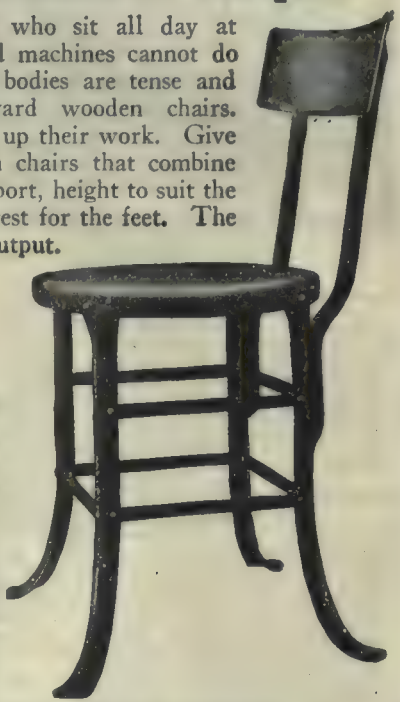
Prompt service and deliveries when manufactured by

J.N. LAPOINTE CO.
of
NEW LONDON, CONN.

Makers of Broaching Machines and Broaches.

Chairs *Do* Make A Difference in Output

Men and women who sit all day at tables, benches and machines cannot do their best if their bodies are tense and tired from awkward wooden chairs. Such fatigue slows up their work. Give them comfort with chairs that combine full, snug back support, height to suit the work and an easy rest for the feet. The result—increased output.



METAL MEECO PRODUCTS

Costs are Less

Meeco Steel Chairs cost you less than two cents per day per dozen with our five-year guarantee. Could you buy good wooden chairs and keep them repaired five years for that price? The investment is an economy from the start.

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Framingham Mass.

CRANES All types

WHITING CORPORATION
HARVEY-ILL. U.S.A.
(CHICAGO SUBURB)

Foundry Equipment

Only Reliable Products Can be Continuously Advertised

VICTOR

NUT FACING MACHINE

A Tool that can't help being accurate because the hardened threaded mandrel, on which the nuts are faced, has an equalizing collar making precision, a fact independent of the operator's skill. Furthermore, the nuts are automatically fed to the mandrel so that it is easy for a mere youngster to maintain high production.

Get full particulars

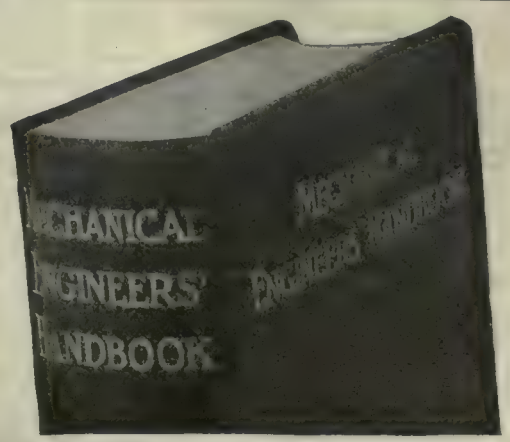
Victor Tool Co.
Waynesboro, Pa.

Today it's MARKS—

Wherever accurate mechanical engineering data are required, you will find Marks' Mechanical Engineers' Handbook. It is the modern book, the handbook of authority.

It will serve you constantly as a standard guide, as a memory-refresher, as a working tool.

Examine it for ten days free



McGraw-Hill Book Co., Inc., 370 Seventh Avenue, New York.

You may send me on 10 days' approval: Marks' Mechanical Engineers' Handbook, $6.00 net, postpaid. I agree to remit for the book or return it postpaid within 10 days of receipt.
....I am a member of the A.S.M.E.
....I am a regular subscriber to American Machinist.
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Name of Company .....
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Box Numbers in care of any of our offices count 10 words additional in undisplayed ads.

Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

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1 to 3 inches.....$5.00 an inch
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An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

A.M.

POSITIONS VACANT

District of Columbia

EXPERIENCED mechanical engineer with technical knowledge, thorough draftsman, familiar with worm gear and machine design. Progressive company located Baltimore vicinity. State fully previous experience and salary desired. P-722, American Machinist, Real Estate Trust Bldg., Phila., Pa.

EMPLOYMENT SERVICE

EXECUTIVES, engineers and other qualified men whose salary requirements are over $2,500 per year, find our confidential direct service to specific employers extremely satisfactory. An inquiry entails no obligation. The National Business Bourse, Inc., H. H. Harrison, President, Association Building, Chicago.

OVERTURES negotiated through the confidential correspondence service of the undersigned, for salaried positions $2,500 to $25,000—executive, mechanical, administrative, engineering, technical, financial, manufacturing, sales, advertising, professional, etc., etc.; all lines. Established fourteen years; not an employment agency. Our "Refund Contract" guarantees refund of retaining fee to client named therein, if service is not satisfactorily rendered and refund be requested within three months from date remitted. Send name and address only for particulars. R. W. Bixby, Inc., 703 Lockwood Building, Buffalo, New York.

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NATIONAL CLERICAL BUREAU, Wisconsin's only technical agency, offers special opportunity to technical men to locate in Milwaukee and vicinity, where diversified industries assure both opportunity for advancement and steady employment. No advance fee. Loan & Trust Bldg., Milwaukee, Wis.

POSITIONS WANTED

Illinois

SUPERINTENDENT or works manager, 12 years' experience as factory executive in the manufacturing of automotive hardware and metal specialties; familiar with stamping machining assembly tools, dies, centerless grinding and sheet metal work; location immaterial. PW-734, Am. Mach., Old Colony Bldg., Chicago, Ill.

Indiana

I AM A practical mechanic, 32, technical education, twelve years' of practical experience, including, tool and die making, designing production tools and fixtures, executive, wide experience in developing, design and building automatic machinery, located in Middle West; available Feb. 1. Interview preferred. PW-721, American Machinist, Old Colony Bldg., Chicago, Ill.

FOREMAN WANTED

For Punch Press Department

By plant manufacturing small sheet brass and steel products. Must be thoroughly experienced on draw and stamping work. Must be an executive and producer. Give full particulars in your reply, age, class of work done and salary expected.

P-727, American Machinist
1570 Old Colony Bldg., Chicago, Illinois

POSITIONS WANTED

Massachusetts

MACHINE shop superintendent or foreman, practical, mechanical engineer, 28 years' experience, good organizer, knows how to get results; well up in erecting engines, pumps and machinery. Would consider position abroad. Age 47. PW-729, Am. Mach., 10th Ave. at 36th St., New York.

New York

ALLROUND machinist (42), with some executive training and experience, wishes position of responsibility and trust in small American community having exceptional good schooling facilities. Location preferably in the Middle West or West. PW-708, Am. Mach., 10th Ave. at 36th St., New York.

DESIGNER and manufacturing executive on high grade electrical and mechanical apparatus; long and broad development, installation and sales experience; M. E., member A.I.E.E. PW-730, Am. Mach., 10th Ave. at 36th St., New York.

SUPERINTENDENT or general foreman, with fifteen years' practical shop experience in punch and dies, jigs and fixtures, inspection, adding machine construction, experimental work and maintenance work; age 34 years; can give best references. PW-711, American Machinist, 10th Ave. at 36th St., New York.

New Jersey

GENERAL foreman of machine shop wishes position with a reliable firm; A-1 mechanic, with broad experience; good on production and handling of help; best of references. PW-738, American Machinist, 10th Ave. at 36th St., New York.

Pennsylvania

MECHANICAL draftsman and designer desires position; wide experience on general automatic machinery, jigs, fixtures and tools; American; capable executive, with thorough shop training. PW-735, Am. Mach., Real Estate Trust Bldg., Philadelphia, Pa.

Wisconsin

MAN, experienced, and well acquainted with industries in Milwaukee and State, wishes to represent manufacturer, in small tools, machinery or similar lines. PW-732, Am. Mach., Old Colony Bldg., Chicago, Ill.

Factory Executive

Broad experience and wide acquaintance in the metal working industry. My experience has been gained during twenty years in five plants, holding positions as Works Manager, Sales Manager and General Superintendent. Their combined forces would total fifteen thousand employees and included the following departments, Iron Foundry, Drop Forge, Press Steel, Nickel Plating, Enameling, Automatic Screw and both Unit and Progressive Assembling. Married and enjoy exceedingly good health. Will go anywhere in the Eastern States.

PW-704, American Machinist
10th Ave. at 36th St., New York City.

SPARE TIME WORK WANTED

M. E. EXPERT in developing ideas, machines, fixtures, cutting manufacturing cost. Desire spare time work. STW-599, Amer. Mach., 10th Ave. at 36th St., New York.

AGENCIES WANTED

General Sales Engineers

with New York headquarters open for sales agency of a marketable engineering products of broad application. AW-731, Am. Mach., 10th Ave. at 36th St., New York.

SALESMEN AVAILABLE

SALESMAN, practical mechanic with wide executive experience; will handle a real mechanical proposition. Salary or commission. Western New York preferred. SA-733, Am. Mach., 10th Ave. at 36th St., New York.

POSITION on sales force of some reliable manufacturer of machinery, tools or special line, by man, age 28, with machinery, office and sales experience. SA-736, Am. Mach., Leader-News Bldg., Cleveland, Ohio.

PATENT ATTORNEYS

PATENTS. C. L. Parker, patent attorney. McGill Bldg., Washington, D. C. Inventor's handbook sent upon request.

PATENTS. Booklet free. Highest references. Best results. Send drawing or model for examination and opinion. Watson E. Coleman, Patent Lawyer, 644 G Street, Washington, D. C.

PATENTS—Send for form "Evidence on Conception" to be signed and witnessed. Form fee schedule, information, free. Lancaster and Allwine, 262 Ouray Bldg., Washington, D. C.

BUSINESS OPPORTUNITIES

Sales and Manufacturing Co-operation Desired

Experienced mechanical designing engineer and practical mechanic desires co-operation of sales organization or engineering and iron foundry for the exploitation of patents in the hotel and kitchen equipment line; fruit and vegetable paring machine, silver burnishing machine and small refrigerator, all electric driven. BO-737, American Machinist, Real Estate Trust Bldg., Phila., Pa.

FOR SALE

Patents Covering Oscillating Disc Valve

For Sale. This valve has been in sucessful use for over three years. It is suitable for use in such articles as automobile windshield cleaners and other devices requiring a forward and back motion. FS-728, Am. Mach., 10th Ave. at 36th St., New York.

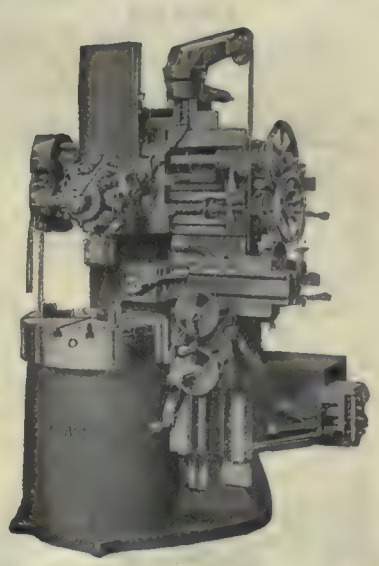
PATENTS

Send sketch or model today for examination and report. *Record of Invention* blank on which to disclose your invention and NEW *guide book*, "*How to Obtain a Patent*," sent free. Promptness assured. Highest references. WRITE TODAY. CLARENCE A. O'BRIEN, *Registered Patent Lawyer*, 120-B, Security Savings & Com'l Bank Bldg., directly across street from Patent Office, Washington, D. C.

(Additional Miscellaneous Ads on p. 100)

Bullard Vertical Turret Lathes

A few choice 24-in. BULLARD NEW ERA TYPE VERTICAL TURRET LATHES in our warehouse that can be inspected under belt if desired. These machines have late serial numbers and are offered in line with the rest of our BARGAIN SURPLUS TOOLS at a saving of **$1700.00 each.**



Our Guarantee:

Your money back if you return a machine within thirty days, freight prepaid. No excuses necessary.

WE HAVE HUNDREDS OF NEW TOOLS AT 2ND-HAND PRICES

LATHES

5—26-in. LeBlond Crankshaft.
1—10-12-in.x5-ft. Pratt & Whitney.
1—14-in.x6-ft. Pratt & Whitney.
1—14-in.x 6-ft. Fay & Scott.
7—14-in.x 6-ft. Rockford.
1—14-16-in.x8-ft. Lodge & Shipley.
2—16-in.x 6-ft. Flather.
6—17-in.x 6-ft. LeBlond Pl. Turning.
4—18-in.x 8-ft. Walcott.
1—18-in.x 8-ft. Rockford.
1—18-20-in.x 8-ft. Amer., Gd. Hd.
1—18-20-in.x10-ft. Amer., Gd. Hd.
12—20-in.x 8-ft. LeBlond.
65—20-in.x 8-ft. American.
1—20-in.x10-ft. Walcott.
2—20-in.x16-ft. American.
1—20-in.-22-in.x10-ft. Amer., Gd. Hd
5—22-in.x12-ft. Mueller.
1—24-in.x10-ft. American.
16—24-in.x10-ft. Cisco.
1—24-in.x20-ft. Lodge & Shipley.
7—25-in.x10-ft. LeBlond.
16—25-in.x12-ft. LeBlond.
1—24-in.x15-ft. Chard.
4—26-in.x10-ft. Walcott.
15—26-in.x10-ft. Whitcomb-Blaisdell.
4—26-in.x13-ft. Wickes.
150—26-in.x 8-18-ft. Bridgeford.
2—30-in.x11-ft. American.
2—36-in.x12-ft. Wickes.
3—36-in.x14-ft. Johnson, Gd. Hd.
1—36-in.x20-ft. Putnam.
6—36-in.x30-ft. Pittsburgh, Gd. Hd.
4—36-in.x37-ft. N.-B.-P., Gd. Hd.
2—36-in.x42-ft. LeBlond, Gd. Hd.
3—40-in.x12-ft. Fifield.
1—36-in.x42-ft. Gisholt Gun Boring.
1—42-in.x16-ft. Bradford.
2—45-in.x24-ft. Pond.
1—33-51-in.x20-ft. LeBlond.
1—60-in.x18-ft. Johnson.
1—56-64-in.x18-ft. Johnston.

SHAPERS

3—16, 20, 24 and 28-in. Ohio.
3—16, 20-in. Cincinnati.

DRILL PRESSES

1—22½-in. W. F. & J. Barnes.
2—25-in. W. F. & J. Barnes.
2—No. 310 Baker.
1—No. 24 Foote-Burt.
1—4-spindle Reed-Prentice.
1—4-spindle Allen.
10—6-spindle Allen.
1—No. 11 Natco.
6—No. M-4 Natco.
2—M-37 Natco Multiples.
1—No. 41 Natco.

RADIAL DRILLS

3—4-ft. Carlton, Sens.
1—3-ft. Prentice.
1—3-ft. Western Heavy.

VERTICAL BORING MILLS

6—24-in. Bullard, Vert. Turret Lathe.
8—24-in. Bullard, New Era.
1—48-in. Colburn.
1—54-in. Bullard, 2 Heads.
1—60-in. Bullard.

HORIZ. BORING MACHINES

3—No. 1 Barnes Horiz., 2 Heads.
1—Rockford Double Head.
1—4-in. Newark.
1—No. 1, 3¾-in. Bar Barrett.
1—Rochester Floor Borer.

GRINDERS

1—No. .6 Gardner Disc, B.B.
1—No. 16 Besley Disc.
1—No. 75 Heald, Internal.
1—No. 210 Heald, Ring.
1—22-in. P.&W., Vert.
1—15x96-in. Norton Surface.
1—No. 1 Landis, Univ.
1—No. 2 Fraser, Univ.
6— 6x32-in. Norton.
1—10x36-in. Landis.
12—10x36-in. Norton.
3—10x72-in. Norton.
5—12x36-in. Landis.
1—No. 3 Landis, Univ.
1—12x120-in. Landis.
1—14x 36-in. Norton.
1—14x 48-in. Queen City.
13—14x 50-in. Norton.
5—14x 72-in. Norton.
1—16x 48-in. Landis Crankshaft.
1—16x 72-in. Norton.

PLANERS

1—24x24-in.x 6-ft. American.
2—24x24-in.x 6-ft. Hamilton.
1—24x24-in.x 6-ft. Liberty, 2 Heads.
1—24x24-in.x12-ft. Whitcomb.
1—30x30-in.x 6-ft. Gray Spiral Gd.
1—30x30-in.x10-ft. Cincinnati.
1—30x30-in.x10-ft. W.&P.
1—30x30-in.x14-ft. Ohio, 2 hds., mot.
1—30x30-in.x14-ft. N.B.P., 2 hds.
1—36x30-in.x10-ft. Cincinnati, 3 hds.
1—36x30-in.x18-ft. W.-B.
1—36x30-in.x20-ft. W.-B.
1—36x36-in.x10-ft. Bickett.
1—36x36-in.x12-ft. Cincinnati, 4 hds.
3—42x42-in.x16-ft. Rockford.
1—72x56-in.x36-ft. Cincinnati.

MILLERS

45—No. 6 Whitney.
61—No. 3½ Fox.
1—No. 38-B Chicago.
20—12-in. Cincinnati.
1—No. 1-A Milwaukee.
1—No. 1 Kempsmith.
1—No. 1½ Rockford.
2—No. 1½-B Special Milwaukee.
3—No. 2 Rockford, S.P.D.
10—No. 2-B Brown & Sharpe, S.P.D.
7—No. 2-B Kearney & Trecker.
1—No. 2½ Rockford.
2—No. 3 Kempsmith.
1—No. 3 Kempsmith, Gd.
1—No. 3 Brown & Sharpe.
1—No. 3 Brown & Sharpe Univ.
1—No. 4 Brown & Sharpe.
2—No. 4-B Brown & Sharpe.
2—No. 4 LeBlond.
1—No. 13-B Brown & Sharpe.
3—No. 33 Kempsmith.
1—18-in. Cincinnati Auto.
2—Type A, 16 and 28-in. Briggs.
2—4-in. Pratt & Whitney Spline.

SLAB MILLERS

1—24x24-in.x 8-ft. Ing., 1 Vert. Hd.
7—24x24-in.x12-ft. Ingersoll Slab.
1—48-in.x10-ft. Newton.
1—No. 1½ Newton, Duplex.

GEAR CUTTERS AND HOBBERS

8—No. 1 Farwell.
1—No. 2½ Bilton Gear Cutter.
3—No. 1 Schuchardt & Schutte.
2—24-in. Gould & Eberhardt.
1—30-in. Flather.
7—No. 6 Fellows.
3—No. 3, 26-in. Brown & Sharpe.
1—36-in. Gould & Eberhardt.
1—No. 615 Fellows.

VERTICAL MILLERS

1—No. 1 Brown & Sharpe, Vert.
1—No. 2 Cincinnati, Vert.
3—No. 4-B Becker, Vert.
8—No. 3 Brown & Sharpe, Vert.
1—No. 3 Cincinnati, Vert.
3—Model S. D. Becker, Vert.
1—No. AB Becker, Vert.
3—No. 5-B Becker, Vert.
7—No. 5-C Becker, Vert., New.
4—No. 6 Becker, Vert.

TURRET AND SCREW MACHINES

2—No. 0 9/16-in. Foster.
1—No. 2 1-in. Bardons & Oliver.
3—No. 2 1-in. Warner & Swasey.
1—No. 2 ⅝-in. Pratt & Whitney.
2—No. 2 1/16-in. Foster.
4—No. 2 1¼-in. W.&S. Fox.
5—No. 3 1¼-in. Bardons & Oliver.
9—No. 3 1 5/16-in. Foster.
11—No. 4 1½-in. Wood.
1—No. 4½-in. Bardons & Oliver.
1—No. 6 2-in. Wood.
1—2x26-in. Pratt & Whitney.
1—2¼x26-in. Greenlee.
2—2½x26-in. P.&W. Gd. Hd.
3—3x36-in. Jones & Lamson.
1—No. 10 3-in. Bardons & Oliver.
1—3¾x36-in. Cincinnati, Acme.
1—No. 8 Warner & Swasey.
2—No. 5-A Potter & Johnston.
6—6-A Model 2, Potter & Johnston.
1—18-in. Libby.
2—21-in. Gisholt.
8—24-in. Gisholt Motor Drive.
1—24-in. Gisholt.
26—24-in. Davis.
33—24-in. Steinle.
1—34-in. Gisholt.

PRESSES

1—No. 1 Zeh & Hahnemann, Screw.
1—No. 57 Toledo Nosing.
2—No. D. G. G. 56 Ferracute, Gd.
3—No. 58 Toledo Nosing.
2—No. 87 Bliss Gd. Twin Drive.
1—No. 69 Stoll, Geared.

MISCELLANEOUS

1—Emery Wheel Stand.
1—No. 1 La Pointe Broach.
1—No. 3 La Pointe Broach.
1—No. 3 J. N. La Pointe Broach.
1—No. 3 J. N. La Pointe Double.
3—No. 4 La Pointe Broach.
70—Newton, Betts, Pratt & Whitney and Garvin Profilers.
18—Pilton Slotters.
3—Swind Bench Slotters.
1—Bausch, 5 spd. Nut Tapper.
2—No. 2 Garvin Auto. Vert. Tapper.
1—Oliver Filing Machine.
1—Geir Straightening Press.
1—125-lb. United Hammer.
1—1500-lb. Niles-Bement-Pond Steam Hammer.
1—8-ft. Dreis & Krump Hand Brake.
1—No. 1 13-in. Niagara Hd. Beader.
1—No. 2 30x2-in. Niagara Roll.
1—Buffalo Hand Wiring Machine.

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SECOND-HAND MACHINE TOOLS

DRILLS

1-spindle Avey, Allen, Henry & Wright ball bearing.
2-spindle Avey & Henry & Wright ball bearing.
4-spindle Avey & Henry & Wright ball bearing.
No. 3, 4-spindle Avey ball bearing high speed drill, power feed to each spindle.
20-in., 25-in., 28-in., 30-in., 32-in., 36-in. uprights.
3, 4, 5, 6-ft. radials.
D-2 Colburn mfg. drill.
No. 513 Baker heavy mfg. type.
No. 12 Natco multiple spindle drill.
No. 13 Natco multiple spindle drill.
8-spindle Fox multiple spindle drill.
4-spindle Rockford mfg. drills 23 in.
3-spindle Barnes drills 20 in.
4-spindle Barnes drills 20 in.

BORING MILLS

No. 0 Giddings & Lewis, table type, horizontal 3-in. bar.
No. 1 Lucas, table type, horizontal 3-in. bar.
No. 2 Rockford horizontal boring and drilling machine.
Bement-Niles R & L, table type, horizontal 3⅞-in. bar.
34-in. Colburn vertical type, turret head.
24-in. and 36-in. Bullard, New Era type turret head.
62-in. Rogers, 2 heads on rail.
100-in. J. M. Poole, 2 heads on rail.

GRINDERS

No. 1 Brown & Sharpe universal.
12x36-in. Cincinnati universal.
3-in., 6-in., 10-in. swing x 18-ft., 32-in., 36-in., 72-in. long Norton plain.
14-ft. Pratt & Whitney vertical, surface type.
10-in. Garrigus, rotary surface type.
No. 1 Cincinnati cutter and tool.
No. 2 Walker cutter and tool.
No. 1 and 2 Norton cutter and tool.
No. 2 Oakley cutter and tool.
No. 60 Heald cylinder.
Taylor high speed water tool.
No. 2 Morse plain.
No. 14 Brown & Sharpe, plain.
10x24-in. Landis, plain.

SCREW MACHINES AND TURRET LATHES

No. 0 B & S automatic.
⅜-in., ½-in., ⅝-in., ⅞-in. Cleveland automatic plain, Model "B."
½-in., ⅝-in., ⅞-in. Cleveland automatic turret, Model "A."
4½-in. Gridley automatic, arranged for motor drive, with motor.
1-in., 1½-in., 2¼-in. Cincinnati-Acme with wire feed.
⅜-in., 1-in., 1½-in. Pratt & Whitney, with wire feed.
No. 2 B & S with wire feed.
2¼-in. and 3¼-in. Jones & Lamson, flat turret type, with both bar and chucking equipment.
2¼-in. and 3¼-in. Cincinnati-Acme ditto.
16-in. Warner & Swasey, Fox turret type with chasing bar.
16-in. Cincinnati-Acme, Fox turret type with chasing bar.
2-spindle Jones & Lamson flat turret lathe, turret type, with chucking equipment.
No. 2-A Warner & Swasey turret machine.
24-in. Steinle heavy mfg. turret lathe.

LATHES

9-in.x20-in. Porter Cable mfg. type.
14-in.x 6-ft. Lodge & Shipley, C.R., P.C.F., Q.C. cone head.
14-in.x 6-ft. LeBlond C.R., P.C.F., Q.C.
16-in.x 8-ft. LeBlond C.R., P.C.F., Q.C.
16-in.x 6-ft. Champion C.R., P.C.F., Q.C.
18-in.x 8-ft. Prentice Bros. C.R., P.C.F., Q.C., geared head.
20-in.x12-ft. American C.R., P.C.F., Q.C., geared head.
20-in.x 8-ft. American C.R., P.C.F., Q.C., cone head.
20-in.x10-ft. Lodge & Shipley C.R., P.C.F., Q.C., cone head.
24-in.x22-ft. Lodge & Shipley C.R., P.C.F., Q.C., cone head.
25-in.x10-ft. LeBlond C.R., P.C.F., Q.C., cone head.
24-in.x12-ft. LeBlond C.R., P.C.F., Q.C., cone head.
32-in.x14-ft. Hamilton C.R., P.C.F., Q.C., cone head, triple geared.
14-28-in.x8-ft. Fay & Scott gap lathe, cone head.
18-36-in.x8-ft. Fay & Scott gap lathe, cone head.
24-46-in.x10-ft. Fay & Scott gap lathe, cone head.
2-32-in.x8-ft. LeBlond gap lathe, cone head.

SHAPERS AND PLANERS

12-in. Smith & Mills crank shaper.
14-in. Pratt & Whitney crank shaper
15-in. Kelly crank shaper.
16-in. Gould & Eberhardt crank shaper, back geared.
20-in. Gould & Eberhardt crank shaper, back geared.
24-in. Gould & Eberhardt crank shaper, back geared.
26-in. Smith & Mills crank shaper, back geared.
15-in., 20-in. Hendey friction driven shaper.
24x24-in.x 6-ft. Flather planer, 1 head.
36x36-in.x12-ft. Pond planer, 2 heads.
50x40-in.x14-ft. Pond planer, 2 heads.
66x54-in.x12-ft. Pond planer, 2 heads.
66x60-in.x30-ft. Bement planer, 3 heads.
72x72-in.x20-ft. Gleason planer, 3 heads.

MILLERS

No. 0 and ½-in. Van Norman duplex millers.
No. 2, 3, 4 Cincinnati plain.
No. 2 and 3 Cincinnati universal.
No. 2 Hendey universal.
No. 2-A Brown & Sharpe universal.
No. 2, 3, 4 Cincinnati vertical.
No. 2-C Becker-Brainerd vertical.
No. 4½x12 Pratt & Whitney, thread type.
34-in.x10-ft. Ingersoll, slab type.

HENRY PRENTISS & CO., 149 BROADWAY, NEW YORK

BOSTON BUFFALO HARTFORD SYRACUSE ROCHESTER

Machinery and Equipment

Planers

36x36-in.x18-ft. Gray, 2 heads.
36x36-in.x12-ft. Pond, 2 heads.
36x36-in.x10-ft. Pond, 2 heads.
32x32-in.x 8-ft. Pond, 2 heads.
30x30-in.x 8-ft. Flather, 2 heads.
24x24-in.x 4-ft. Wheeler, 1 head.
24x24-in.x 6-ft. Cincinnati, 2 heads.
24x24-in.x 8-ft. Pratt & Whitney, 1 head.
24x24-in.x10-ft. Powell, 1 head.
24x24-in.x12-ft. Pratt & Whitney, 1 head; and four others 16 to 22 in., from 4 to 6 ft. platen.

Grinders

2—No. 2 Cincinnati Universal.
No. 2 Brown & Sharpe Surface.
2—No. 2 Brown & Sharpe Plain.
Pratt & Whitney Surface.
No. 160 Heald Surface.
Norton Universal Tool Room.
No. 4 Besley Disc.
20—Modern, Brown & Sharpe, Norton, Pratt & Whitney, Diamond & Washburn.

Millers

2—No. 2A Hendey Universal, with dividing head, vise, chuck.
2—No. 2 Milwaukee Plain, with dividing head, vise, chuck.
No. 3 Milwaukee Universal, with dividing head vise.
No. 3 Cincinnati, Plain, with dividing head, vise, chuck.
No. 2 Cincinnati Plain, with dividing head, vise, chuck.
No. 4 and No. 6 Becker Vertical.
1—No. 5 Brown & Sharpe vertical.
Also 15 more Hendey, Brown & Sharpe and Chicago, Plain, Universal and Hand.

Drills

20-in. Baker Heavy Duty.
24-in. Baker "F" Heavy Duty.
20, 22, 24, 25, 26, 28, 30, 36 and 42-in. plain and back geared, stationary and sliding heads—Makers: Snyder, Prentice, Niles, Aurora, Hamilton.
4 to 20-spindle Multiple—Makers: Western, Pratt & Whitney, Foote-Burt & Bausch.

Keyseaters

No. 0 Baker, with countershaft.
No. 1 Baker, with countershaft.
No. 2 Morton, with countershaft.

Boring Mill (Horizontal)

Rockford, Betts, Beaman & Smith and Niles-Bement-Pond.

Shapers

New No. 61 Fellows Gear Shaper.
2—36-in. Fellows Gear Shaper.
24-in. Fellows Gear Shaper.
9-in. Pratt & Whitney, with vise.
12-in. Pratt & Whitney, with vise.
15-in. Hendey, friction, with vise.
5—14-in. Pratt & Whitney, with vise.
2—16-in. Pratt & Whitney, with vise.
2—16-in. Ohio, with vise.
16-in. Smith & Mills, with vise.
20-in. Smith & Mills, with vise.
3—Fitchburg and Pratt & Whitney Traveling Hd.

Presses
(Power, Hydraulic and Arbor)

No. 20 Bliss Inclinable Press.
3—Farrel, 6-in. stroke Stamping Press.
Screw Straightening Press.
Nos. 1 to 3½ Greenerd Arbor Presses.
10—10 to 225-ton Watson-Stillman Vertical, Hydraulic Presses.

Radial Drills

6-ft. Pond, plain.
30-in. Bickford, plain.

Slotters

Betts, Pratt & Whitney and Bement Miles, from 6 to 30 in.

Screw Machines and Turret Lathes

¾ to 3-in. Warner & Swasey, Pratt & Whitney, Bardons & Oliver, Jones & Lamson, Potter & Johnson and Gisholts.

Lathes

14 to 36-in. swing, with beds from 4 to 60 ft. long, many different types of the following makes: American, LeBlond, Hendey, Schumacker, Reed, Lodge & Shipley, Pratt & Whitney, McCabe, Niles, Johnson, Fitchburg, Blaisdell, Bradford, Flather, Putnam, Bullard and New Haven.

Gear Cutters

No. 4-48-in. Brown & Sharpe Gear Cutter.
24-in. Brown & Sharpe Spur and Bevel Gr. Cutter.

Motors

38—Direct Current, ½, ¾, 1, 2, 3, 5, 6, 7½, 10, 15, 20, 35, 50, 55, 75, and 80 hp., General Electric, Robbins & Meyer, Sprague, Wagner, Crocker-Wheeler, Allis-Chalmers, Westinghouse and Eddy. Also Generators of the above manufacture.

Miscellaneous

Broaching Machine, Bolt Threaders, Cold Saw, Hack Saw, Profilers, Cutting-Off Machines, Wood Planers, Jig Saw Table, Sander and a large quantity of small tools and equipment, Pulleys, Shafting and Hangers.

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DOUBLE GEARED, 65,000 LBS. Former Price $3500 **Sale Price $2500**

***NO. 20 PERKINS, GEARED,**
5 IN. STROKE, BED 96 IN. X 36 IN. 36,000 LBS. Former Price $3000 **Sale Price $2250**

NO. 168 JONES, GEARED,
3 IN. STROKE, BED 43 IN. X 34 IN. 24,000 LBS. Former Price $1800 **Sale Price $1200**

NO. 4¾ BLISS, GEARED,
4½ IN. STROKE, BED 50 IN. X 24 IN. 18,000 LBS. Former Price $1750 **Sale Price $1200**

NO. 3½ BLISS, TOGGLE, FRICTION CLUTCH,
5¾ IN. X 10 IN. STROKES, 16,000 LBS. Former Price $2000 **Sale Price $1500**

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A Gigantic SALE!

Ship builders and everyone interested in finest machine tools, power equipment and general plant supplies should get full particulars of the wonderful values offered in this great sale.

Dietrick & Harvey 74-in.x20-ft. open side planer.
Hugh Smith & Company heavy duty 7 roll plate straightening machine, 7-ft. between housings, with motor, 220 volts, D.C.
Ryerson No. 2 high speed steel friction saw, 44-in. dia. blade, with 45 hp., 220 volts D.C. motor.
Hyraulic Cranes, 5, 8 and 15 tons capacity.
Electric Overhead Traveling Cranes, 10 tons, 25 tons, and 50 tons capacity, 42-ft. to 52-ft. span.
3500 cu. ft., 4000 cu. ft. and 5000 cu. ft. motor driven, Cross Compound Air Compressors.

Ask for Complete List of SHOOTERS ISLAND Equipment

From Chicago We Offer:

LATHES

66-in.x22-ft. Fitchburg Heavy Duty, Triple Grd.
36-in.x32-ft. American, Q.C.G., H.D., 2 carr.
36-in.x32-ft. LeBlond, Q.C.G., H.D., 2 carr.
36-in.x33-ft. Niles-Bement-Pond, H.D., M.D.
36-in.x27-ft. Niles-Bement-Pond, H.D., M.D.
24-in.x30-ft. Universal, Q.C.G., T.A.

PIPE MACHINES

3-in. Eaton, Cole & Burnham.
6-in. Eaton, Cole & Burnham.
8-in. Saunder.

GRINDERS

16-in.x60-in. No. 24 Landis Crankshaft.
16-in.x60-in. Landis Universal.
No. 224 Diamond Roll Cylindrical.
12-in.x36-in. Fitchburg Plain.
New Britain Drop Head Polishing and Buffing.

SCREW MACHINES

3¼-in. Gridley Automatic, Single Spindle.
No. 1 Pratt & Whitney Hand, 7/16-in. capacity.

RADIAL DRILLS

5-ft. Bickford Plain, T.A., S.P.D.
6-ft. Niles Plain, T.A., M.D.

TURRET LATHES

24-in. Gisholt, 6¼-in. hole, T.A.
24-in. Steinlee, 6-in. hole.
28-in. Niles, 4¼-in. hole, Grd. Head.
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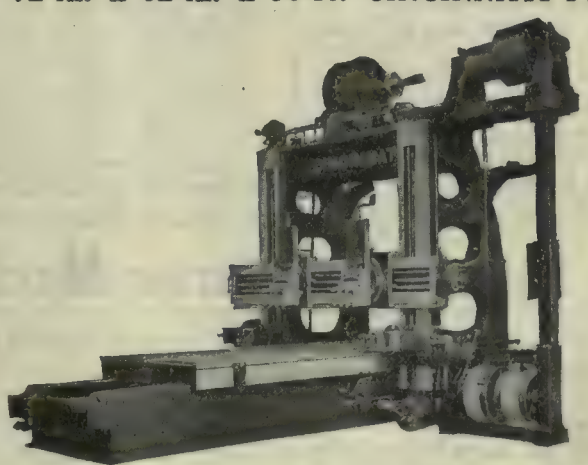
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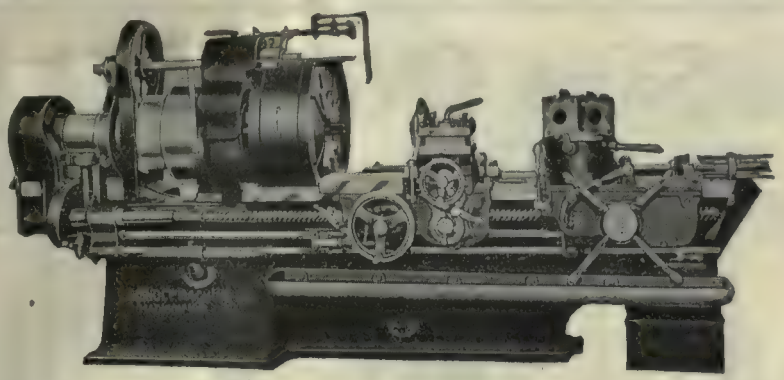
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These lathes have been entirely rebuilt in our own shop with same jigs and fixtures used when first built. We guarantee them to be as accurate as new machines. Also

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MILLERS—Single Pulley Drive

LONGITUDINAL FEED	26-in.
CROSS FEED	8-in.
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Used Machinery

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Powell Planer 48-in.x12-in.x36-in. high. Countershaft drive, Detroit Single Wheel Centerless Grinder, 4-in. face wheel. Horizontal Boring Mill. American Lathe, 30-in.x5-ft. with 30-in. face plate. Cleveland 2-in. Model "A" Automatic Screw Machine with complete equipment. Single Head Bullard Vertical Boring Mill, 14-in.x30-in. Bullard Lathe, No. 6 Whitney Hand Miller, Little Giant 1½-in. Bolt Cutter.

These machines all in good condition, can be seen set up in factory.

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Lathes
12 in. to 63 in. and most intermediate sizes.

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20x20 in. to 10x10 ft. and 11 intermediate sizes.

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Plain and Vertical Millers.
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Vertical and Horizontal, most of them our own make.

See Complete List First Issue of Each Month, Or Send for List.

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1—½" Radial Automatic Screw Machine.
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HANGERS 5000 pressed steel and cast iron, plain, ball and roller bearing.

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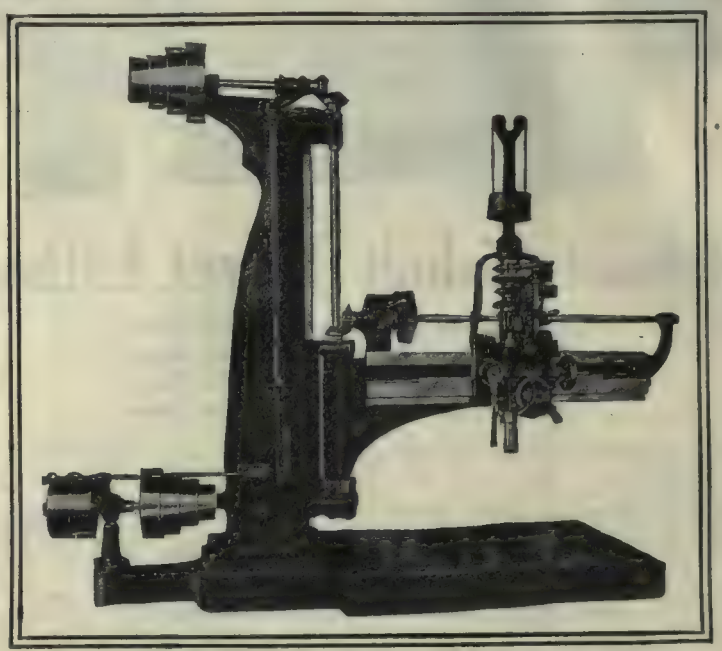
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42-in. Niles Bement Pond Vertical Boring Mill.
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No. 3 Brown & Sharpe Automatic Gear Cutter.
No. 13 Brown & Sharpe Automatic Gear Cutter.
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Ask For Complete List.

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Used Machine Tools

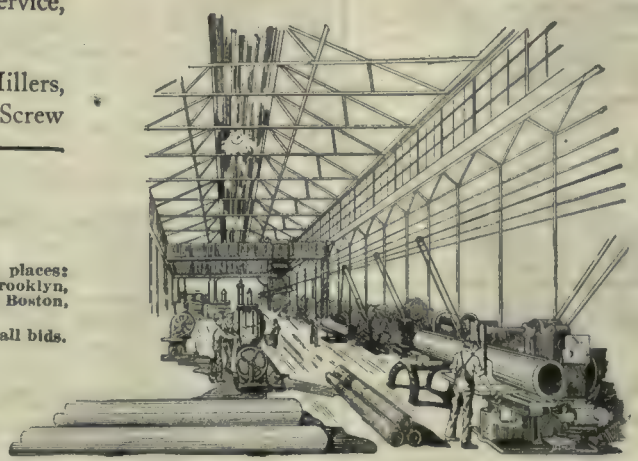
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(Continued from page 99)

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Cutting-off machine, Hurlbut-Rogers, 6-in. capacity	200
Cutting-off machine, Niles Tool Works, 10-in. capacity, 12-ft. bed, 2 carriages, 4-step cone pulley	300
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Drill, Superior Machine Co. 24-in., back geared	100
Drill, Aurora Tool Works 21-in. upright, stationary head, back geared	100
Grinders, Miami Valley Machine universal, 4x25½-in. table	100
Grinders, Espen Lucas 1⅜x13-in. spindle	75
Grinders, Oesterlein, 3x24-in. table	50
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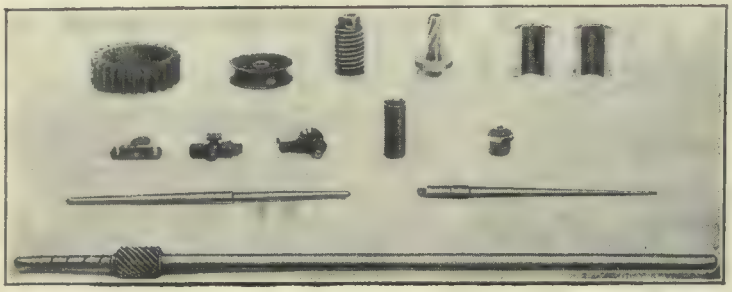
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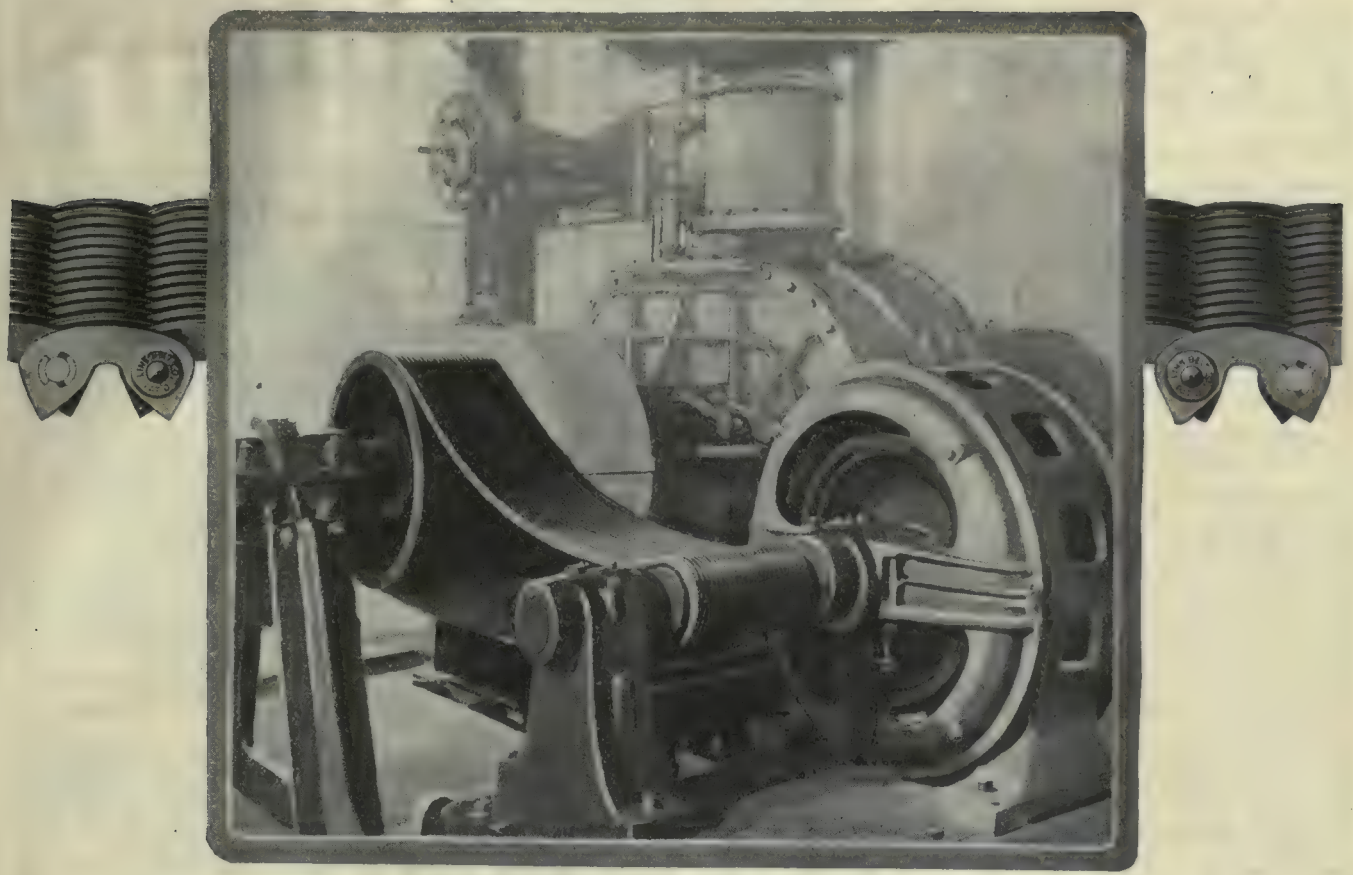
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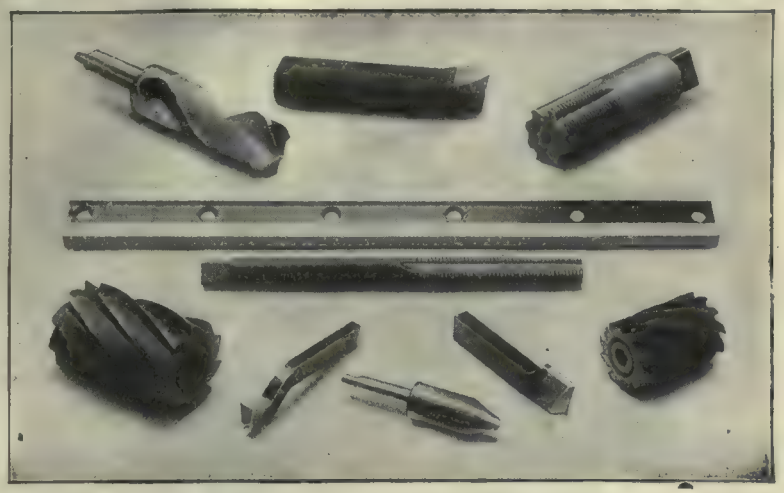
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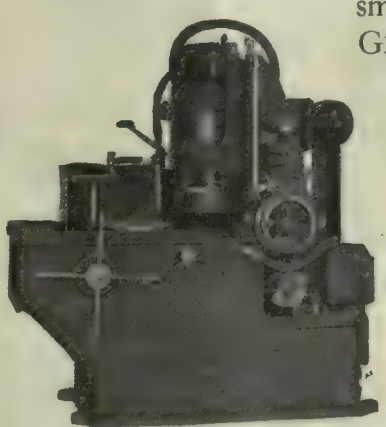
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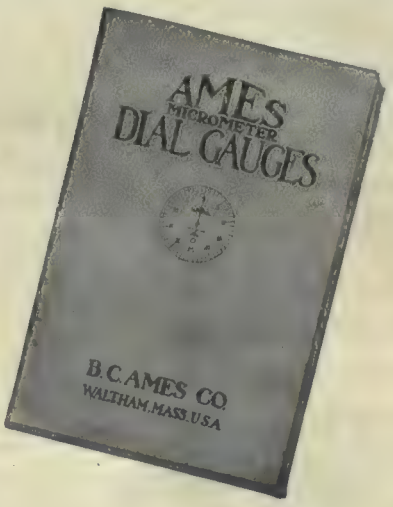
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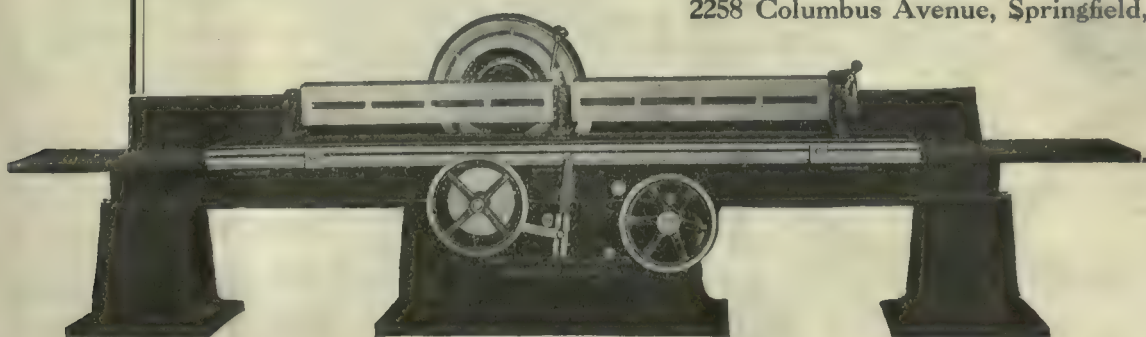
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Athol Machine & Fdry. Co., Athol
Brown & Sharpe Mfg. Co., Providence
Manufacturers Equip. Co., Chicago
Pratt & Whitney Co., Hartford
Randall & Stickney, Waltham
Starrett Co., L. S., Athol.

Mandrels, Expanding
Brown & Sharpe Mfg. Co., Providence
Nicholson & Co., W. H., Wilkes-Barre

Mandrels, Solid
Brown & Sharpe Mfg. Co., Providence
National Twist D. & T. Co., Detroit
Nicholson & Co., W. H., Wilkes-Barre
Union Twist Drill Co., Athol

Marking Devices (See Stamps, Steel)

Marking Machines
Hjorth Lathe & Tool Co., Boston
Luma Elect. Equip. Co., Toledo
Noble & Westbrook Mfg. Co., Hartford

Measuring Machines
Norma Co. of America, N. Y.

Metal Cleaning Equipment
Pangborn Corp., Hagerstown

Metal-Working Mchy.
Niagara Mach. & Tool Wks., Buffalo

Meters, Steam Flow
General Elect. Co., Schenectady

Micrometer Calipers
Almond Mfg. Co., T. R., Ashburnham
Brown & Sharpe Mfg. Co., Providence
Randall & Stickney, Waltham
Starrett Co., L. S., Athol

Milling Attachments
Adams Co., Dubuque
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mach. Co.
Garvin Mach. Co., N. Y.
Ingersoll Mill. Mch. Co., Rockford
Kearney & Trecker Co., Milwaukee
Kempsmith Mfg. Co., Milwaukee
LeBlond Mch. Tool Co., R. K., Cincinnati.
Potter & Johnston Mch. Co., Pawtucket.
Reed-Prentice Co., Worcester
South Bend Lathe Wks., South Bend
Whitney Mfg. Co., Hartford

Milling Machines, Automatic
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mach. Co.
Ingersoll Mill Mch. Co., Rockford

Milling Machines, Bench
Ames Co., B. C., Waltham
Pratt & Whitney, Hartford
Stark Tool Co., Waltham

Milling Machine, Continuous
Cons. Mach. Tool Corp., Rochester
Ingersoll Mill. Mch. Co., Rockford
Potter & Johnston, Mch. Co., Pawtucket.

Milling Machines Die
Anderson Die Mch. Co., Bridgeport

Milling Machines, Duplex
Cincinnati (O) Milling Mach. Co.
Ingersol Mill Mch. Co., Rockford
Knight Mchy. Co., W. B., St. Louis

Milling Machines, Hand
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mach. Co.
Fox Machine Co., Jackson, Mich.
Garvin Mch. Co., N. Y.
Pratt & Whitney, Hartford
U. S. Mch. Tool Co., Cincinnati
Whitney Mfg. Co., Hartford

Milling Machines, Horizontal and Planer Type
Beaman & Smith Co., Providence
Cons. Mach. Tool Corp., Rochester
Ingersoll Mill Mch. Co., Rockford
Niles-Bement-Pond Co., N. Y.
Reed-Prentice Co., Worcester

Milling Machines, Plain
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mach. Co.
Fox Machine Co, Jackson, Mich.
Garvin Machine Co., N. Y.
Ingersoll Mill. Mch. Co., Rockford
Kearney & Trecker Co., Milwaukee
Kempsmith Mfg. Co., Milwaukee
LeBlond Mch. Tool Co., R. K., Cincinnati.
Potter & Johnston Mch. Co. Pawtucket
Reed-Prentice Co., Worcester
Ryerson & Son, Joseph T., Chicago
U. S. Mch. Tool Co., Cincinnati

Milling Machines, Portable
Ingersoll Mill Mach. Co., Rockford
Underwood Corp., H. B., Phila.

Milling Machines, Thread
Foster Mch. Co., Elkhart
Gisholt Mach. Co., Madison
Hall Planetary Thread Milling Mch. Co., Philadelphia
Pratt & Whitney, Hartford
Waltham Mch. Works, Waltham

Milling Machines, Universal
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mach. Co.
Fox Machine Co., Jackson, Mich.
Garvin Mch. Co., N. Y.
Ingersoll Mill Mch. Co., Rockford
Kearney & Trecker Co., Milwaukee
Kempsmith Mfg. Co., Milwaukee
LeBlond Mch. Tool Co., R. K., Cincinnati
Potter & Johnston Mch. Co., Pawtucket
Ryerson & Son, Joseph T., Chicago
U. S. Mch. Tool Co., Cincinnati

Milling Machines, Vertical
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mach. Co.
Cons. Mach. Tool Corp., Rochester
Garvin Machine Co., N. Y.
Ingersoll Mill. Mch. Co., Rockford
Kearney & Trecker Co., Milwaukee.
Knight Mchy. Co., W. B., St. Louis
LeBlond Mch. Tool Co., R. K., Cincinnati.
Potter & Johnston Mch. Co., Pawtucket
Reed-Prentice Co., Worcester
Van Norman Mach Tool Co., Springfield, Mass.

Milling Machines, Worm
Cleveland (O.) Auto. Mch. Co.
Waltham Mch. Works, Waltham

Milling Tools, Adjustable Hollow
Geometric Tool Co., New Haven

Motors, Electric
Burke Electric Co., Erie
General Elect. Co., Schenectady
Masters Elect. Co., Dayton
Reliance Elect. & Eng Co., Cleveland
Sturtevant Co., B. F., Boston
Westinghouse Elect. & Mfg. Co., E. Pittsburgh
Wisconsin Elect. Co., Racine

Numbering Machines for Metal
Noble & Westbrook Mfg. Co., Hartford

Nut Tappers (See Bolt and Nut Machinery)

Nuts, Lock (See Lock-Nuts)

Oil and Grease Cups
Bay State Stamp. Co., Worcester
Gits Bros. Mfg. Co., Chicago
Tucker, W. A. & C. F., Hartford

Oil Stones
Norton Co., Worcester
White & Bagley Co., Worcester

Oils
Stuart & Co., D. A., Chicago

Packing, Hydraulic
Graton & Knight Mfg. Co., Worcester
Schieren Co., Chas. A., N. Y.

Paints Machinery
Dixon Crucible Co., Jos., Jersey City

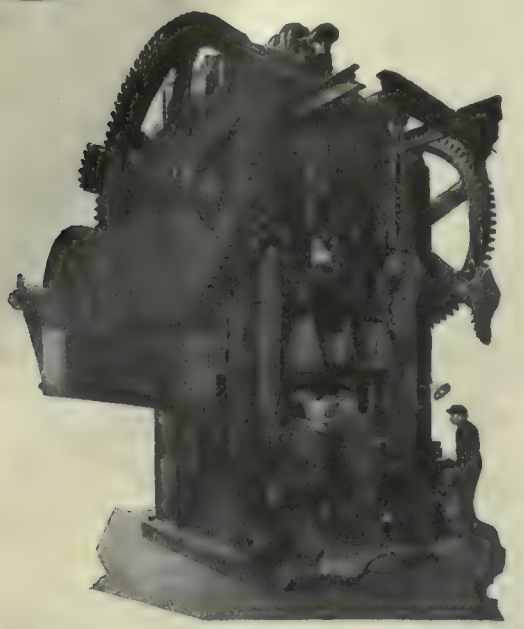
Pattern Shop Machinery (See Woodwork Machinery)

Patterns, Wood and Metal
Mehl Mch. T. & Die Co., Roselle

Pencils
Dixon Crucible Co., Jos., Jersey City

Pipe Bending Machines
Underwood Corp., H. B., Phila.

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for heavy stamping, punching cutting, piercing and trimming

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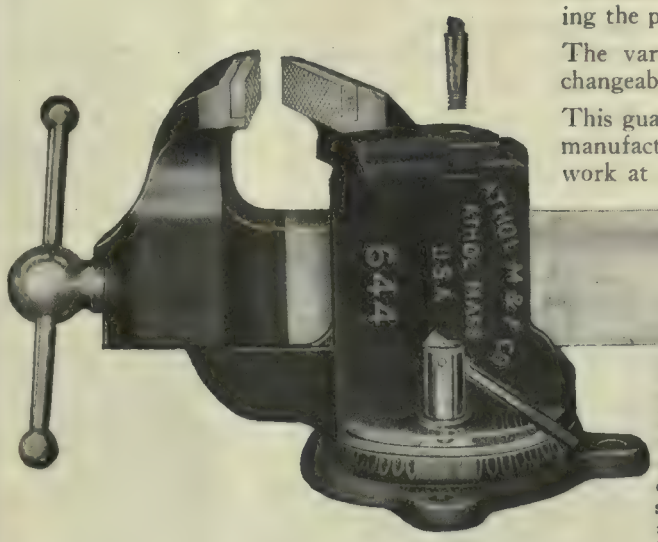
SALES OFFICES { DETROIT Dime Bank Bldg. CLEVELAND Cleveland Discount Bldg. CHICAGO Peoples Gas Bldg. PITTSBURGH Oliver Bldg. ST. LOUIS Boatmen's Bank Bldg. BUFFALO Marine Bank Bldg. CINCINNATI Union Trust Bldg. NEW HAVEN Second Nat'l Bank Bldg.

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To the last nut—



All Athol Vises are made complete in our own factory, including the pouring of the semi-steel body.

The various parts are made to gauges, insuring true interchangeability and the easy replacement of worn parts.

This guarantees their quality, while our 43 years of specialized manufacturing experience insures a Vise ideally suited for your work at a price surprisingly moderate.

Athol Vises

Here is a Machinist's Vise, with a swivel jaw and swivel base. Catalog No. 644. The swivel jaw is extra heavy and held in either position with a hardened taper pin. Just the thing to grip the irregular pieces that come along. The swivel base is quickly shifted and tightly held with a turn of the set screw. Body cast in our own foundry of semi-steel. Welded tool steel jaws. Screw has heavy buttressed thread to prevent wear and backlash. All parts made to interchangeable standards.

A postal brings catalog 36-A. Keep it in your files for ready reference. It lists the most complete line of Vises made in America.

Athol Machine & Foundry Co., Athol, Mass.

Pipe Cutting & Threading Machines
Bignall & Keeler Mch. Wks., Edwardsville
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Landis Mch. Co., Waynesboro.
Murchey Mch. & Tool Co., Detroit
Ryerson & Son., Jos. T., Chicago
Saunders Sons, D., Yonkers
Williams Tool Corp., Erie

Pipe Fitters' Tools
Butterfield & Co., Derby Line

Piston Ring Machines
National Acme Co., Windsor
Potter & Johnston Mch. Co., Pawtucket

Planer Tools
Haynes Stellite Co., N. Y. C.

Planing Machines
American Tool Wks Co., Cincinnati
Bethlehem Steel Co., Bethlehem
Cincinnati Planer Co., Cincinnati
Cons. Mach. Tool Corp., Rochester
Gray Co., G. A., Cincinnati.
Hamilton Mch. T. Co., Hamilton
Niles-Bement-Pond Co., N. Y.
Reed-Prentice Co., Worcester
Ryerson & Son, Joseph T., Chicago
Sellers & Co., Wm., Philadelphia

Planing Machines, Rotary
Niles-Bement-Pond Co., N. Y.
Underwood Corp., H. B., Phila.

Pneumatic Tools
Anderson Bros. Mfg. Co., Rockford
Chicago Pneu. Tool Co., N. Y.

Polishing and Buffing Machines
Barnes, John & W. F., Rockford
Blanchard Mch. Co., Cambridge
Blount Co., J. G., Everett.
Brown & Sharpe Mfg. Co., Providence
Bryant Chuck Grind Co., Springfield Vt.
Cleveland Armature Wks., Cleveland
Diamond Mch. Co., Providence
Gardner Mch. Co., Beloit
Heald Mch. Co., Worcester
Landis Tool Co., Waynesboro
Rivett Lathe & Grinder Corp., Boston
Rowbottom Mach. Co., Waterbury
Safety Emery Wheel Co., Springfield
Union Twist Drill Co., Athol.
U. S. Elect. Tool Co., Cincinnati
Wisconsin Elect. Co., Racine

Press Feeds
Littell Mch. Co., F. J., Chicago

Pressed Steel Parts
Standard Pressed Steel Co.

Presses, Arbor
Barnes, John & W. F., Rockford
Nicholson & Co., W. H., Wilkes-Barre

Presses, Drop and Forging
Bliss Co., E. W., Brooklyn
Elmes Eng. Wks., Chas. F., Chicago
Toledo Mch. & Tool Co., Toledo

Presses, Foot and Hand
Adriance Mach. Wks., Inc., Brooklyn
Bliss Co., E. W., Brooklyn
Ferracute Mach. Co., Bridgeton
Niagara Mach. & Tool Wks., Buffalo
Shuster Co., F. B., New Haven
Taylor & Fenn Co., Hartford.

Presses, Forcing
Barnes, John & W. F., Rockford
Lucas Mch. Tool Co., Cleveland

Presses, Hydraulic
Bethlehem Steel Co., Bethlehem
Burroughs Co., Newark
Elmes Eng. Wks., Chas. F., Chicago
Niles-Bement-Pond Co., N. Y.
Oilgear Co., Wilwaukee
Watson-Stillman Co., N. Y.

Presses, Power
Adriance Mch. Wks., Brooklyn
Barnes, John & W. F., Rockford
Bliss Co., E. W., Brooklyn
Ferracute Mach. Co., Bridgeton
Henry & Wright Mfg. Co., Hartford
Niagara Mach. & Tool Wks., Buffalo
Rowbottom Mch. Co., Waterbury
Stoll Co., D. H., Buffalo.
Toledo Mch. & Tool Co., Toledo

Presses, Screw
Barnes, John & W. F., Rockford
Bliss Co., E. W., Brooklyn
Niagara Mach. & Tool Wks., Buffalo

Profiling Machines
Garvin Machine Co., N. Y.
Pratt & Whitney, Hartford
Reed-Prentice Co., Worcester
Stark Tool Co., Waltham
Wade-American Tool Co., Waltham

Pulley Turning and Boring Machines
American Tool Wks. Co., Cincinnati.

Pulleys, Cork Insert
American Pulley Co., Philadelphia

Pulleys, Metal
American Pulley Co., Philadelphia
Brown Co., A. & F., N. Y.
Brown & Sharpe Mfg. Co., Providence
Caldwell & Son Co, H. W., Chicago
Johnson Mach. Co., Carlyle, Manchester
Jones Fdry. & Mch. Co., W. A., Chicago

Pumps, Hydraulic
Burroughs Co., Newark
Elmes Eng. Wks., Chas. F., Chicago
Oilgear Co., Wilwaukee

Pumps, Lubricant and Oil
Brown & Sharpe Mfg. Co., Providence

Pumps, Power
Buffalo Forge Co., Buffalo
Niagara Mch. & T. Wks., Buffalo
Sullivan Mchy. Co., Chicago

Punches, Center
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S. Athol

Punches, Hand
Armstrong-Blum Mfg. Co., Chicago

Punches, Power
Buffalo Forge Co., Buffalo
Ferracute Mach. Co., Bridgeton
Long & Allstatter Co., Hamilton
Mitts & Merrill, Saginaw
Niagara Mch. & T. Wks., Buffalo
Ryerson & Son, Joseph T., Chicago
Watson-Stillman Co., N. Y.

Punching & Shearing Mchs.
Cons. Mch. Tool Corp., Rochester

Pyrometers, Electric
Bristol Co., Waterbury
Taylor Inst. Co., Rochester

Rack Cutting Machines
Newark Gear Cut Mch. Co., Newark

Rack, Machine
Standard Gauge Steel Co., Beaver Falls

Racks, Cut
Meisel Press Mfg. Co., Boston
Moltrup Steel Prod. Co., Beaver Falls

Racks, Storage (See Furniture, Machine Shop)

Rammers, Foundry
Brown & Sharpe Mfg. Co., Providence
Chicago Pneu. Tool Co., N. Y.

Rawhide, Rope
Schieren Co., Chas. A., N. Y.

Reamer Holders
Gisholt Mach. Co., Madison
Victor Tool Co., Waynesboro

Reamers, Expanding
Brubaker & Bros. Co., W. L., N. Y.
Gisholt Mach. Co., Madison
Millersburg Reamer & Tool Co., Millersburg

Reamers, Solid
Brubaker & Bros. Co., W. L., N. Y.
Buckeye Twist Drill Co., Alliance
Butterfield & Co. Derby Line.
Gammon-Holman Co., Manchester
Hjorth Lathe & Tool Co., Boston
Morse Twist D. & M. Co., New Bedford
National Tool Co., Cleveland
National Twist D. & T. Co., Detroit
Paramount Reamer Corp., Parkersburg
Reed Mfg. Co., Erie.
Union Twist Drill Co., Athol.

Reamers, Taper
Brown & Sharpe Mfg. Co., Providence
Gammon-Holman Co., Manchester
Paramount Reamer Corp., Parkersburg
Union Twist Drill Co., Athol

Recorders, Pressure
Bristol Co., Waterbury

Recorders, Temperature
Bristol Co., Waterbury
Taylor Inst. Co., Rochester

Recorders, Time
Gisholt Mach. Co., Madison

Rheostats
General Elect. Co., Schenectady
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

Rivet Heating
American Gas Furnace Co., Elizabeth

Rivet Sets
Chicago Pneu. Tool Co., N. Y.
Hunter Saw & Mch. Co., Pittsburgh

Rivet Making Machinery
Cook Co., Asa S., Hartford.
National Machinery Co., Tiffin

Riveting Machines
Chicago Pneu. Tool Co., N. Y.
Grant Mfg. & Mch. Co., Bridgeport
Ryerson & Son, Jos. T., Chicago
Shuster Co., F. B., New Haven.
Townsend Mfg. Co., H. P., Hartford

Rod Cutters
Tucker, W. A. & C. F., Hartford

Rules, Steel and Wood
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol

Rust Preventives
Oakley Chemical Co., N. Y.

Safety Guards
Weisman Mfg. Co., Dayton

Sand Blast Apparatus
Pangborn Corp., Hagerstown

Sand Rammers, Pneumatic
Chicago Pneu. Tool Co., N. Y.

Saw Frames and Blades, Hack
American Saw & Mfg. Co., Springfield, Mass.
Diamond Saw & Stamp. Wks., Buffalo.
Independent Pneu. Tool Co., Chicago
Millers Falls Co., Millers Falls
Starrett Co., L. S., Athol

Saw Sharpening Machines
Hunter Saw & Mch. Co., Pittsburgh

Saw Tables, Universal
Silver Mfg. Co., Salem

Sawing Machines, Metal
Armstrong-Blum Mfg. Co., Chicago
Diamond Saw & Stamp. Wks., Buffalo.
Earle Gear & Mach. Co., Phila.
Peerless Mach. Co., Racine
Vandyck Churchill Co., N. Y.

Sawing Machines, Power Hack
Armstrong-Blum Mfg. Co., Chicago
Diamond Saw & Stamp. Wks., Buffalo
Millers Falls Co., Millers Falls
Peerless Mach. Co., Racine
Victor Saw Wks., Middletown

Saws, Metal Cutting
American Saw & Mfg. Co., Springfield, Mass.
Brown & Sharpe Mfg. Co., Providence
Hunter Saw & Mach. Co., Pittsburgh
Pratt & Whitney, Hartford
Silver Mfg. Co., Salem
Union Twist Drill Co., Athol.

Saws, Milling
Brown & Sharpe Mfg. Co., Providence
National Tool Co., Cleveland
Union Twist Drill Co., Athol

Saws, Screw Slotting
Brown & Sharpe Mfg. Co., Providence
Pratt & Whitney, Hartford
Starrett Co., L. S., Athol, Mass.
Union Twist Drill Co., Athol.

Scales
Brown & Sharpe Mfg. Co., Providence

Screw Cap & Cet
Standard Pressed Steel Co., Phila.

Screw-Machine Work
Cincinnati (O.) Automatic Mch. Co.
Eastern Mch. Screw Corp., New Haven
Link Belt Co., Chicago-Phila.
Morris Mch. Tool Co., Cincinnati
National Acme Co., Cleveland
National Blank Book Co., Holyoke

Screw Machy., Wood and Lag
Cook Co., Asa S., Hartford
Townsend Mfg. Co., H. P., Hartford

Screw Machines, Automatic
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Automatic Mch. Co.
Cleveland (O.) Automatic Mach. Co.
Cone Auto. Mch. Co., Windsor
National Acme Co., Cleveland

Screw Machines, Plain or Hand
Acme Mch. Tool Co., Cincinnati
Brown & Sharpe Mfg. Co., Providence
Cleveland (O) Auto Mach. Co.
Dreses Mch. Tool Co., Cincinnati
Foster Mach. Co., Elkhart.
Garvin Mach. Co., N. Y.
Jones & Lamson Mch. Co., Springfield, Vt.
Warner & Swasey Co., Cleveland

Screw Plates
Brubaker & Bros. Co., W. L., N. Y.
Butterfield & Co., Derby Line.
Card Mfg. Co., S. W., Mansfield
Carpenter Tap & Die Co., J. M., Pawtucket
Morse Twist D. & M. Co., New Bedford

Screws, Cap and Set
Allen Mfg. Co., Hartford
Bristol Co., Waterbury
Eastern Mch. Screw Corp., New Haven
National Acme Co., Cleveland

Screws, Machine
Allen Mfg. Co., Hartford
Bristol Co., Waterbury
Eastern Mch. Screw Corp., New Haven

Seamless Steel Tubing (See Tubing, Seamless Steel)

Second-Hand Machinery (See Searchlight Section)
Bisgood, A. C., Bridgeport
Botwinik Bros., New Haven
Broadway Mchy. Co., N. Y. C.
Brownell Mchy. Co., Dayton
Carbon Steel Co., Pittsburgh
Cincinnati Planer Co., Cincinnati
Eastern Machy. Co., Cincinnati
Elec. Weld. Sup. & Sales Co., Boston
Essley Mchy. Co., E. L., Chicago
Factory & Mill Supply Co., Boston
Gisholt Mach. Co., Madison
Harris Bros. Co., Chicago
Hill, Clarke & Co., Chicago.
Hirsch, G. B.
Hoe Corp., Poughkeepsie
Hyman & Sons, Jos., Philadelphia
Ideal Mchy. Co., Plainsville
Kellogg Co., M. W., Jersey City
Lamberg & Co., A., N. Y.
Lucas & Son, Inc., J. L., Bridgeport
Machinery Dealers, nc., New Haven
McMullen Mchy. Co., Grand Rapids
Marshall & Huschart Machy. Co.
Matheson Co., F. F., Wilkes-Barre
Miles Mchy. Co., Saginaw
Morey & Co., N. Y.
Mueller Mch. Tool Co., Cincinnati
Myers Mach. Tool Corp.
New Jersey Machy. Exch., Newark
Niles-Bement-Pond, N. Y.
O'Brien Mchy. Co., Phila.
Osborne & Sexton Mchy. Co., Columbus
Prentiss & Co., Henry, N. Y.
Simmons Mach. Tool Corp., Albany
Smith Bearings Co., L. C., Chicago
Stokvis & Son, R. S., N. Y.
Van Dyck Churchill Co., N. Y. C.

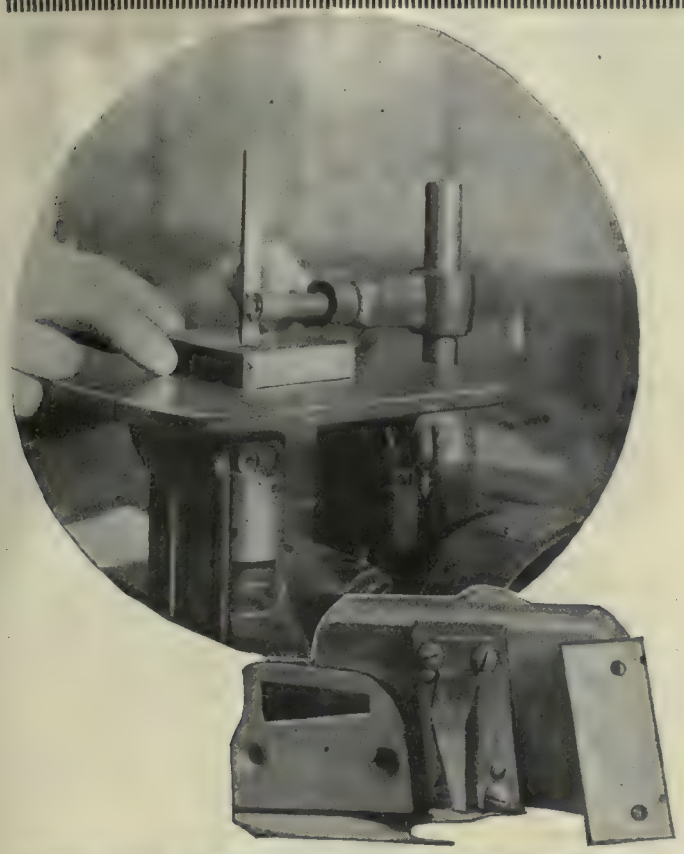
Separators, Oil and Waste
Pangborn Corp., Hagerstown

Shaft Hangers, Pressed Steel
American Pulley Co., Philadelphia

Shafting
Strand & Co., N. A., Chicago.
Union Drawn S. Co., Beaver Falls

Shafts, Flexible
Haskins Co., R. G., Chicago
Strand & Co., N. A., Chicago

Shapes, Cold-Drawn Special Steel
Moltrup Steel Prod. Co., Beaver Falls
Standard Gauge Steel Co., Beaver Falls
Union Drawn S. Co., Beaver Falls



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Where the Quality shows up—

One hour of Machine Filing will reveal more about the quality of a File than months of hand usage. If it hasn't got the backbone it soon lays down and quits cold. But that's the kind of a test that

American Swiss

"files of precision"

warm up to, because the inherent quality of 24 years' experience has given them an exact spacing that enables each tooth to do its share of cutting—a standard temper that insures an *exceptionally long life* and a surety of "bite" that results in a decided saving in your costly Toolmaker's time. A trial box is the surest way to prove it.

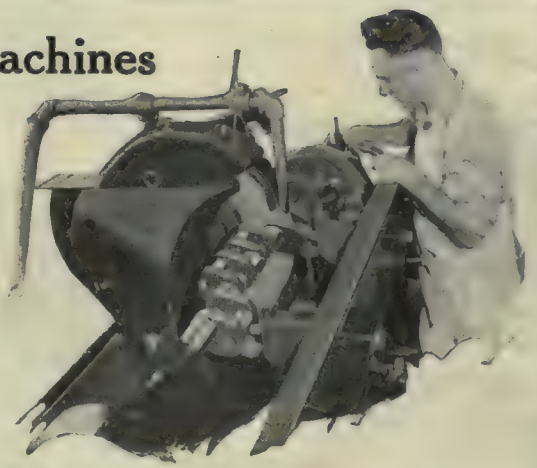
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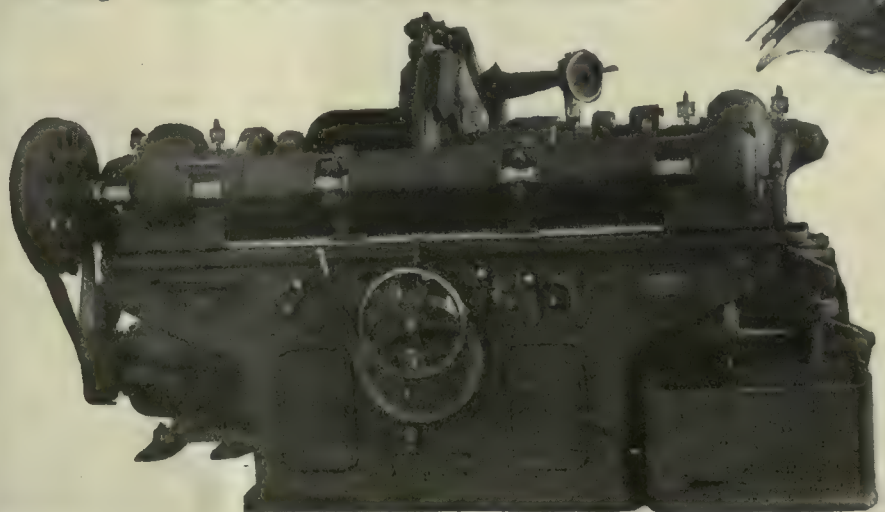
American Swiss File & Tool Co.
410-416 Trumbull St., Elizabeth, N. J.

LANDIS **Crank Grinding Machines**

drive the crankshafts from both ends, both right- and left-hand crank heads being geared together. A micrometer sliding adjustment with graduated dial on the crank carrying fixtures adjusts the machine for the grinding of different throws.

The crank head spindles are of large diameter, with long phosphor bronze bearings adjustable for wear. The spindle gear is mounted between spindle bearings, an arrangement which permits of mounting the work carrying fixtures directly on the end of the spindle, close to the bearings. This construction reduces overhang to the minimum.





Pin diameters are ground to 2.126 in. with tolerance limits of ± 0.0005 in. Pin width is 2¾ in. with limits of 0.005 in. to 0.008 in.

There are many factors that make the LANDIS "just a little better"—let us enumerate them.

LANDIS Tool Company
Waynesboro, Pa.
New York Office: 30 Church St.

Shaping Machines
American Tool Wks. Co., Cincinnati
Cincinnati Shaper Co., Cincinnati
Gould & Eberhardt, Newark
Kelly Co., R. A., Xenia
Morton Mfg. Co., Muskegon Hgts.
Potter & Johnston Mch. Co., Pawtucket.
Reed-Prentice Co., Worcester
Ryerson & Son, Joseph T., Chicago
Smith & Mills Co., Cincinnati
Springfield (O.) Mach. Tool Co.
Steel Products Eng. Co., Springfield, O.

Shear Blades
Cleveland (O.) Knife & Forge Co.

Shears, Hand
Armstrong-Blum Mfg. Co., Chicago
Tucker, W. A. & C. F., Hartford

Shears, Power
Adriance Mach. Wks., Brooklyn
Buffalo Forge Co., Buffalo
Ferracute Mach. Co., Bridgeton
Long & Allstatter Co., Hamilton
Mitts & Merrill, Saginaw
Niagara Mch. & T. Wks., Buffalo
Stoll Co., D. H., Buffalo
Toledo Mch. & Tool Co., Toledo.

Sheet Metal Working Machinery
Adriance Mach. Wks., Brooklyn
Bliss Co., E. W., Brooklyn
Ferracute Mach. Co., Bridgeton.
Ryerson & Son, Jos. T., Chicago
Savage Co., W. J., Knoxville.
Toledo Mch. & Tool Co., Toledo

Shelving, Steel
Mfg. Equip. & Eng. Co., Framingham

Slotting Machines
Cons. Mach. Tool Corp., Rochester
Garvin Mach. Co., N. Y.
National Acme Co., Cleveland
Sellers & Co., Wm., Philadelphia

Sockets & Sleeves
Pratt & Whitney, Hartford

Soldering Equipment
Luma Elect. Equip. Co., Toledo

Speed Reducers
Jones Fdry. & Mch. Co., W. A., Chicago
Philadelphia Gear Wks., Philadelphia

Spring Winders
Wjorth Lathe & Tool Co., Boston

Sprockets and Chains
Baldwin Chain & Mfg. Co., Worcester
Bilgram Mch. Wks., Philadelphia
Boston Gear Wks., Norfolk Downs
Cullman Wheel Co., Chicago.
Grant Gear Wks., Boston.
Jones Fdry. & Mch. Co., W. A., Chicago
Link-Belt Co., Chicago-Phila.
Morse Chain Co., Ithaca
Massachusetts Gear & T. Co., Woburn
Philadelphia Gear Wks., Phila.
Whitney Mfg. Co., Hartford

Squares
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol

Stampings, Metal
American Pulley Co., Philadelphia
Bay State Stamp. Co., Worcester
Detroit Stamp. Co, Detroit
Lacey Mfg. Co., Bridgeport
National Blank Book Co., Holyoke
Rockwood Sprinkler Co., Worcester

Stamps, Steel
Hoggson & Peters Mfg. Co., New Haven
Noble & Westbrook Mfg. Co., Hartford

Stands, Portable (See Furniture, Machine Shop)

Steam Specialties
Dart Mfg. Co., E. M., Providence

Steel, Cold Rolled Strip
Hawkridge Bros. Co., Boston
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Union Drawn S. Co., Beaver Falls
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Victor Tool Co., Waynesboro

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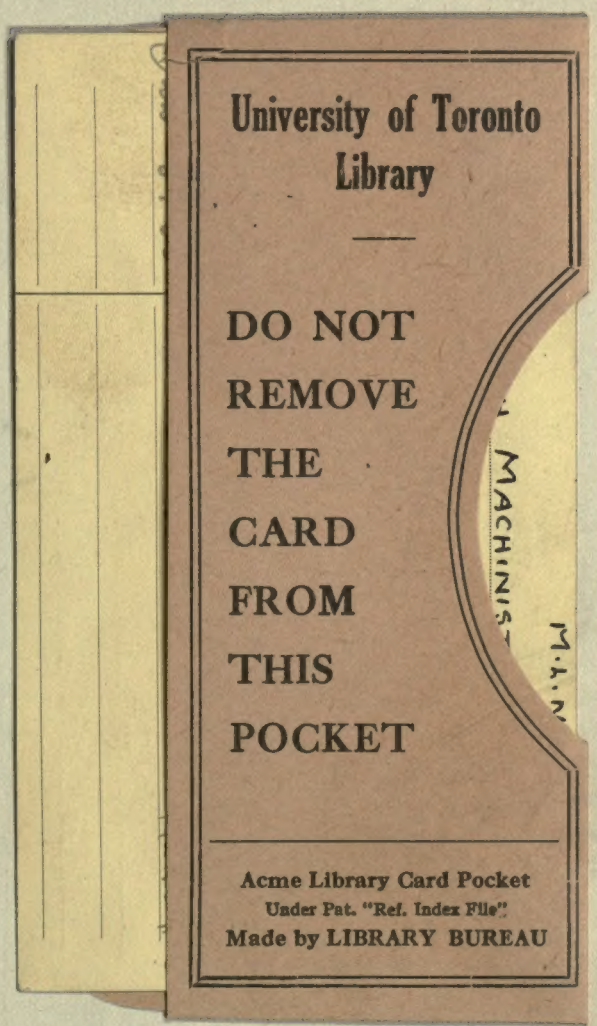
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